Book of Abstracts

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Editors

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CSCI 2017 BOOK of ABSTRACTS

The 2017 International Conference on Computational
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Message from Program and General Co-Chairs

It gives us great pleasure to introduce this collection of papers to be presented at The 2017 International Conference on Computational Science and Computational Intelligence (CSCI'17), December 14-16, 2017, Las Vegas, Nevada, USA.

The CSCI'17 International Conference includes papers from diverse communities, including researchers from: universities, corporations, and government agencies. Accepted papers are published by Conference Publishing Services (CPS). Papers published in the proceedings present solutions to problems in many important areas of computational science and computational intelligence.

Computational Science (CS) is the study of addressing problems that are impossible to solve (or difficult to solve) without computers. CS can be considered to be the bridge between computer science and other sciences. The field is interdisciplinary by nature and includes the use of advanced computing capabilities to understand and solve complex problems. In short, CS is the science of using computers to do science. Computational Intelligence (CI) is the study of computational methods in ways that exhibit intelligence. These methods adapt to changing environments and changing goals. There is a significant overlap between the fields of CI and Artificial Intelligence (AI). However, there is also a difference: in general AI techniques often involve top-to-bottom methods (i.e., methods to the solutions are imposed from the top) whereas CI techniques often involve bottom-up methods (i.e., solutions emerge from unstructured beginnings). An important part of CI includes a set of Nature-inspired computational approaches to address complex problems to which traditional methods are infeasible. Computational Science and Computational Intelligence, both share the same objective: finding solutions to difficult problems. However, as stated earlier, the methods to the solutions are different.

Considering the above broad outline, the International Conference on Computational Science and Computational Intelligence (CSCI'17) is composed of the following topical symposiums: Computational Science (CSCI-ISCS); Computational Intelligence (CSCI-ISCI); Signal & Image Processing, Computer Vision & Pattern Recognition (CSCI-ISPC); Mobile Computing, Wireless Networks, & Security (CSCI-ISMC); Artificial Intelligence (CSCI-ISAI); Social Network Analysis, Social Media, & Mining (CSCI-ISNA); Cyber Warfare, Cyber Defense, & Cyber Security (CSCI-ISCW); Software Engineering (CSCI-ISSE); Education (CSCI-ISED); Computational Biology (CSCI-ISCB); Internet of Things & Internet of Everything (CSCI-ISOT); Big Data and Data Science (CSCI-ISBD); Cloud Computing and Data Centers (CSCI-ISCC); Parallel & Distributed Computing & Computational Science (CSCI-ISPD); Health Informatics and Medical Systems (CSCI-ISHI); and Consumer Electronics (CSCI-ISCE).

The main objective of the CSCI Conference is to facilitate increased opportunities for cross-fertilization across CS and CI. The CSCI Conference is committed to encouraging diversity and eliminating discrimination in both its role as a conference and as a provider of services. CSCI aims to create a culture that respects and values each others' differences, that promotes dignity, equality and diversity, and that encourages individuals to develop and maximize their true potential. We are committed wherever practicable to organizing a conference that broadly reflects the international community. We hope that we have achieved these important objectives.

The Steering Committee and the Program Committee would like to thank all those who submitted papers for consideration. The conference had paper submissions from 60 countries. About 48% of the submissions were from outside the United States. Each submitted paper was peer-reviewed by at least two experts in the field for originality, significance, clarity, impact, and soundness. In cases of contradictory recommendations, a member of the conference program committee was charged to make the final decision; often, this involved seeking help from additional referees. In addition, papers whose authors included a member of the conference program committee were evaluated using the double-blinded review process. One exception to the above evaluation process was for papers that were submitted directly to chairs/organizers of sessions/workshops; in these cases, the chairs/organizers were responsible for the evaluation of such submissions. The overall paper acceptance rate for regular and short papers was 21%; and 19% of the remaining papers were accepted as poster papers (at the time of this writing, we had not yet received the acceptance rate for one track.)

We are very grateful to the many colleagues who offered their services in organizing the conference. In particular, we would like to thank the members of the Program Committee and the Steering Committee of CSCI'17. The members of the committees will be requested (after the conference) to provide their expertise and services for selecting papers for publication

(extended versions) in various research book series (to be prepared for publishers including: Springer, Elsevier, and others). We would also like to thank the main sponsor of the conference: American Council on Science & Education.

We express our gratitude to all speakers and authors - the list of speakers appears in the conference schedules. We would also like to thank the followings: UCMSS (Universal Conference Management Systems & Support, California, USA) for managing all aspects of the conference; Dr. Tim Field of APC for managing the printing of the conference schedules; the staff of the Monte Carlo Resort (Conference division); and Mr. Juan Guerrero of CPS Production Editor of Conference Publishing Services of IEEE Computer Society.

We present the proceedings of CSCI'17.

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Keynote Lecture

Data Science in Industry and Transport

Prof. Diego Galar
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Pro-Vice-Chancellor; Division of O&M Engineering
Lulea University of Technology, Sweden
Head, Maintenance and Reliability at TECNALIA, Spain;
VOLVO Chair for Reliability and Maintenance, Skovde University, Sweden

Abstract: Industrial systems are complex with respect to technology and operations. For the operations and control of such complex environments, a viable solution is to apply intelligent computerized systems. Industry 4.0 is a term that describes the fourth generation of industrial activity which is enabled by smart systems and Internet-based solutions. Prediction in general and prognosis of asset condition in particular are the main application areas of this revolution, referred to as maintenance 4.0, in form of self-learning and smart systems that predicts failure. Indeed, all the efforts are focused on the search for the swan song of the assets in the way of final gesture, effort, or performance given just before shutdown or unexpected stoppage. Thus, for complex assets, much information needs to be captured and mined to assess the overall condition of the whole system. Therefore the integration of asset information is required to get an accurate health assessment of the whole system, and determine the probability of a shutdown or slowdown. Moreover, the data collected are not only huge but often dispersed across independent systems that are difficult to access, fuse and mine due to disparate nature and granularity. If the data from these independent systems are combined into a common correlated data source, this new set of information could add value to the individual data sources by the means of data mining. However, the data collected are not sufficient due to the black swan effect in industry which pop up by the means of rare events not considered by the data driven models due to low latency events. The black swan events is a metaphor that describes an event that comes as a surprise, has a major effect, and is often inappropriately rationalized after the fact with the benefit of hindsight. This talk will address the issues and challenges of data science in industry and transport emphasizing the positive effects for swan song identification and detection considering its limitations if black swans are neglected.

Announcement

Initiatives to Alleviate the Challenges Faced by Researchers and PhD Students in Africa and most Developing Countries

Nnenna Christine Martin
ResearchLink International LLC, Greensboro, North Carolina, USA

Abstract: The decline in research and scientific production of African universities on a global level is motivated by different factors including poor research infrastructure, poorly-equipped libraries, limited access to new technologies, lack of financing for research, lack of access to good and well equipped labs and lack of funds to publish research in journals and attend conferences to present research. These factors generate accumulative effects and problems in the institutions and for the researchers. The development of innovative practices, initiatives and strategies on an international level for PhD and research studies can have a positive impact on the quality of training and developed research. Academic and research collaboration is a very valuable tool that not only accelerates the progress but also enhances the quality of the work and extends the repertoire of the partners. Academic collaboration is beneficial to the faculty in learning new teaching tools, and to the students in increasing the breadth of their knowledge and learning different approaches to solving a problem. One of the priority objectives of ResearchLink African Initiative (RAIN) is to establish a permanent forum of cooperation, dialogue, study and exchanges between African research students and researchers, universities and companies in developed countries.

Regular Research Papers:
Symposium on Cyber Warfare, Cyber Defense, & Cyber Security (CSCI-ISCW)

Real-Time Cyber-Physical False Data Attack Detection in Smart Grids Using Neural Networks

Erik M. Ferragut, Jason Laska, Mohammed M. Olama, Ozgur Ozmen
Computational Sciences & Engineering Division, Oak Ridge National Lab, Oak Ridge, Tennessee, USA

Abstract: Attacks on cyber-physical systems have recently increased in frequency, impact, and publicity. In this paper, a cyber-physical false data attack detection mechanism is proposed to protect the operation of power transmission and distribution systems by automatically inferring underlying physical relationships using cross-sensor analytics in order to detect sensor failures, replay attacks, and other data integrity issues in real-time. We investigate a neural network based mechanism acting on voltage and current readings resulting from a wide variety of load conditions on the IEEE 30-bus power system standard and compare its performance with a support vector machine based mechanism. Experiments showed that 99% detection accuracy of replay attacks was achieved using the proposed neural network mechanism. More importantly, we showed that the best approach was to not create physics-based features using what we knew about the system, but rather to use a neural network to automatically learn the laws, and then use the outputs of that to build a classifier to identify whether and where data spoofing occurs. Thus, it is preferable to infer and exploit the physics using a single machine learning solution rather than to add features first and then build a detector.

Tracking Cyber Adversaries with Adaptive Indicators of Compromise

Justin E. Doak, Joe B. Ingram, Sam A. Mulder, John H. Naegle, Jonathan A. Cox,
James B. Aimone, Kevin R. Dixon, Conrad D. James, David R. Follett
Sandia National Laboratories, Albuquerque, New Mexico, USA;
Lewis Rhodes Laboratories, West Concord, Massachusetts, USA

Abstract: A forensics investigation after a breach often uncovers network and host indicators of compromise (IOCs) that can be deployed to sensors to allow early detection of the adversary in the future. Over time, the adversary will change tactics, techniques, and procedures (TTPs), which will also change the data generated. If the IOCs are not kept up-to-date with the adversary's new TTPs, the adversary will no longer be detected once all of the IOCs become invalid. Tracking the Known (TTK) is the problem of keeping IOCs, in this case regular expressions (regexes), up-to-date with a dynamic adversary. Our framework solves the TTK problem in an automated, cyclic fashion to bracket a previously discovered adversary. This tracking is accomplished through a data-driven approach of self-adapting a given model based on its own detection capabilities.In our initial experiments, we found that the true positive rate (TPR) of the adaptive solution degrades much less significantly over time than the naïve solution, suggesting that self-updating the model allows the continued detection of positives (i.e., adversaries). The cost for this performance is in the false positive rate (FPR), which increases over time for the adaptive solution, but remains constant for the naïve solution. However, the difference in overall detection performance, as measured by the area under the curve (AUC), between the two methods is negligible. This result suggests that self-updating the model over time should be done in practice to continue to detect known, evolving adversaries.

Deep Learning Approach to Malware Multi-Class Classification Using Image Processing Techniques

Mamta Kumari, George Hsieh, Christopher A. Okonkwo
Computer Science, Norfolk State University, Norfolk, Virginia, USA;
Information Directorate, Air Force Research Lab, Rome, New York, USA

Abstract: Malicious software has been growing exponentially during the past years. One of the major challenges for anti-malware industry is the vast amounts of data and files which need to be evaluated for potential malicious intent. To effectively analyze such large amounts of files, machine learning based malware classification approaches have been developed to classify malware into families based on the same forms of malicious behaviors. This paper presents our design and implementation of a malware classification approach using the Convolutional Neural Networks (CNN), a deep learning algorithm. It makes use of CNNs to learn a feature hierarchy for discriminating among samples of malware files represented as gray-scale images. It also uses transfer learning techniques to facilitate model building. Three different models of CNNs were developed and these implemented methods achieved validation accuracy around 97% using the large malware dataset provided for the Microsoft Malware Classification Challenge (BIG 2015).

Security Mechanisms for Signaling in WebRTC-based Peer-to-Peer Networks

Dennis Boldt, Sebastian Ebers
Institute of Telematics, University of Lubeck, Lubeck, Germany

Abstract: In this paper, we present and evaluate an approach using a combination of Chord and WebRTC to store data items evenly distributed in a peer-to-peer network and transfer them via direct WebRTC connections between browsers. Chord is an efficient and well-known way to create an overlay for a structured peer-to-peer network. However, it lacks mechanisms for authentication and end-to-end confidentiality. Thus, a man-in-the-middle attack could occur when Chord is used to locate a data item. We solve this security vulnerability with hybrid encryption. Each host generates a unique asynchronous key pair for message authentication and to establish a secret key. By this, the peers can exchange WebRTC connection parameters via end-to-end authenticated and encrypted messages over multiple hops and thus establish a direct connection in a secure fashion.

Deception in Cyberspace: Performance Focused Con Resistant Trust Algorithm

Md. Chodhury, Kendall E. Nygard, Krishna Kmbhampaty, Maryam Alruwaythi
Department of Computer Science, North Dakota State University, Fargo, North Dakota, USA

Abstract: A con man trick appears in cyberspace as a deception around cloud services from the service provider. Con man resistant trust algorithm continuously monitors cloud service's performance to detect this con man behavior. A cloud service is identified as a con when a lapse in service performance repeats by an amount more than the consumer of this service can accept. Like the repetition, performance of a degraded amount is another service performance attribute affecting consumer satisfaction. The work presented in this paper includes performance degradation following various models. The algorithm's mathematical scheme tracks the performance degradation amount. This revision evaluates con behavior in proportion to the performance degradation. This proportional affect follows an exponential function. Three alternative exponential functions are evaluated. Each of these functions is applicable for specific cloud services. These functions are compared with each other and their properties effecting con resistant Trust are analyzed resulting in a set of principles. Also, the relationship between performance degradation amounts and con behavior detection speed are unlocked resulting in a principle. The result correctness and effectiveness of the principles.

A Study on Construction and Security of Computer-Aided Security Schemes

Yasuyoshi Jinno, Takashi Tsuchiya, Tetsushi Ohki, Kenta Takahashi, Masakatsu Nishigaki
Shizuoka University, Hamamatsu, Japan; Hitachi, Ltd., Totsuka, Japan

Abstract: CPU performance has been increasing continually. To resist attacks in such a technological environment, we must increase the entropy of secrets. However, the progress of CPU performance benefits not only attackers but also legitimate users. Security schemes specifically designed to enhance legitimate users' security by exploiting CPU performance have been proposed. In this paper, we call such schemes "computer-aided security schemes" (CASS) and classify them into two types in terms of the aiding mechanism. We propose general constructions and provide a security proof of CASS for one type. We discuss the feasibility of CASS in this type, and show that an increase in the length of a password, which a legitimate user should memorize, can be suppressed by using CASS of this type even if CPU performance increases in the future.

Security Evaluation of an Airbag-ECU by Reusing Threat Modeling Artefacts

Jurgen Durrwang, Johannes Braun, Marcel Rumez, Reiner Kriesten
Institute of Energy Efficient Mobility (IEEM), University of Applied Sciences Karlsruhe, Germany

Abstract: In this work we present an approach to derive test cases for security testing by reusing threat modeling artefacts. We suggest to perform a threat modeling in an early stage of the product life cycle and show how these threat models, originally created for the security design phase, can be reused for security testing. We further show the practical applicability of our approach by describing the creation, execution and evaluation of a penetration test for an Electronic Control Unit (ECU). For the evaluation of our approach we selected a Pyrotechnic Control Unit (PCU) due to its safety critical functionality, which is commonly referred to as an Airbag-ECU. This scenario leads to a safety impact as a PCU is connected to pyrotechnic charges, e.g., airbags, that can lead to serious injury or death, if deployed in a non-appropriate scenario. During this penetration test, the selected PCU was installed on a test bench. We were able to successfully exploit a found vulnerability, causing the deployment of charges.

Security Governance, Management and Strategic Alignment via Capabilities

George W. Jackson, Jr., Shawon S. M. Rahman
Department of Computer Science and Engineering, University of Hawaii-Hilo, Hilo, Hawaii, USA;
Capella University, Minneapolis, USA

Abstract: Stripped down to its essentials a business is a collection of capabilities organized to achieve a purpose. Exactly how well those capabilities are organized and optimized around a strategy impacts the performance of the entire enterprise. Capabilities are the adhesive which holds together information security governance and organizational strategy. There is a domino effect in that the potency of day-to-day security operations is a byproduct of a security management, which is a byproduct of security governance which is a byproduct of organizational governance. Organizational governance is concerned with ensuring the enterprise maintains alignment with its short and long-term strategic goals. Thus, the work of aligning security governance and organizational strategy is consonant with the work of recognizing which capabilities are aligned with short and long term goals and ensuring those capabilities remain protected through a sound and comprehensive security governance and security management program.

An Integrated Mechanism for Resetting Passwords in Web Applications

Ching-Yu Huang
School of Computer Science, Kean University, Union, New Jersey, USA

Abstract: It is very common for people to forget their passwords and request to reset their password through web browsers. This leads to the critical question of how a software developer should simply and safely, store and change a user.s password for a web application. When an application stores a user.s password in a database, the password must be encrypted so nobody can query the fields and see the original value. It is bad design to send or display the original password to the user when a user resets their password, as the information could be seen or intercepted. On the other hand, it is also inconvenient that users must memorize additional information in the form of security questions when attempting to reset the password. When resetting a password, it is better to use a user.s basic personal information and email or text them a reset URL link with encrypted codes. This paper presents an integrated mechanism that utilizes PHP and MySQL functions to reset user passwords and improve the security for resetting passwords. The method can also protect the database from being attacked by reducing unnecessary access to the database. A case study is discussed in this paper.

A Highly-Reliable Virtual Primary Key Scheme for Relational Database Watermarking Techniques

Maikel Lázaro Pérez Gort, Ernesto Aparicio Díaz, Claudia Feregrino Uribe
National Institute of Astrophysics, Optics and Electronics, Puebla, Mexico

Abstract: Watermarking techniques for relational data have been proposed to allow copyright protection and data authenticity, among other things. Almost all proposals depend on the primary key of the database relations for deciding where and how to place the marks. The primary key could be easily updated or deleted if the attacker does not require watermarked data to be placed back in the database. The few techniques trying to avoid this dependency create a virtual primary key through schemes that frequently compute non-unique values, which may cause watermark synchronization problems. Also, the deletion of attributes compromises obtaining same values for the virtual primary key used for the mark embedding. In this paper, we propose a solution that solves the dependency of the primary key, avoiding the problem of non-unique values and showing more resilience against attribute deletion attacks than previous schemes.

Mathematical Model for Using Moving Target Defense to Mitigate Memory Randomization Weaknesses

Sultan Aldossary, William Allen, Shengzhi Zhang
School of Computing, Florida Institute of Technology, Melbourne, Florida, USA;
Prince Sattam Bin Abdulaziz University, Saudi Arabia

Abstract: In 1988, worms started spreading. The first known worm was released by Robert Morris. This worm was intended to propagate slowly to measure the Internet but, because of a coding error, it spread faster. This worm took advantage of a vulnerability in Fingerd on the VAX system and used a buffer overflow attack as a technique. It was self-replicating malware. By sending a special string to the Finger daemon, the worm used the buffer overflow technique to execute code to create new copies. In this paper, we address the problem of weakness of address space layout randomization. The address space randomization technique was proposed to make determining the address of a shared library more difficult since each instance of the program is loaded into a different shared library address. However, when address space randomization layout (ASLR) is implemented on a 32-bit system, an attacker can use a brute force attack to guess the address of the shared library. The main goal of the research described in this paper is to study the use of a dispatching algorithm and multiple back-end servers as a moving target defense technique for mitigating ASLR weaknesses. In this paper, we present a probabilistic model for three types of attacks. First, we present a brute force attack when the number of servers is known. Second, we present a brute force attack when the number of servers is unknown. Then, we present the probability of the attacker's success on all attacks.

DynamicPIN: A Novel Approach Towards Secure ATM Authentication

Jong-Hoon Kim, Gokarna Sharma, Irvin Cardenas, Do Yeon Kim, Nagarajan Prabakar, S. S. Iyengar
IEEE Fellow; Department of Computer Science, Kent State University, USA;
Department of Biomedical Engineering, Hanyang University, South Korea;
Discovery Lab, SCIS, Florida International University, USA

Abstract: Along with the popularity and widespread use of automated teller machines (ATMs), ATM frauds are also increasing drastically these days. Shoulder-surfing attacks are the most common methods used by adversaries. The main problem lies in the existing static PIN-based authentication mechanism which does not provide any security measure. In this paper, we give a novel approach called DynamicPIN for secure ATM authentication, which is resilient to shoulder-surfing attacks. DynamicPIN is very simple, does not require any hardware changes, and does not pose any significant overhead to the system. A realtime experimental study showed that DynamicPIN improves significantly the ATM authentication compared to the existing static PIN-based authentication mechanism.

Security Mental Model: Cognitive map approach

Tahani Albalawi, Kambiz Ghazinour, Austin Melton
Department of Computer Science, Kent State University, Kent, Ohio, USA

Abstract: Security models have been designed to ensure data is accessed and used in proper manner according to the security policies. Unfortunately, human role in designing security models has been ignored. Human behavior relates to many security breaches and plays a significant part in many security situations. In this paper, we study users' decision-making toward security and usability through the mental model approach. To elicit and depict users' security and usability mental models, crowd sourcing techniques and a cognitive map method are applied and we have performed an experiment to evaluate our findings using Amazon MTurk.

Enhancing Trojan Detection by Finding LTL and Taint Properties in RTL Circuit Designs: A Case Study

Juan Portillo, Eugene John
Department of Electrical and Computer Engineering, University of Texas at San Antonio, Texas, USA

Abstract: The advent of multi-vendor participation for circuit design has introduced new hardware security concerns, mainly, exploitation of code bugs and insertion of malicious circuits (Hardware Trojans). In this work, we detect register transfer language (RTL) Trojan designs using Linear-time Temporal Language (LTL) and Taint Propagation (TP) to verify components and signal paths on suspicious circuits. We demonstrate that LTL methods can detect denial of service (DoS), data leak, and change of functionality attacks while TP methods can detect DoS, and data leak attacks. Some Trojans can also be described as an LTL and a Taint problem which allows multiple tools to be used for security validation and improves the odds of detecting Trojan vulnerabilities.

ESeizure: A Mobile App for Digital Forensics First Responders

Cheryl Hinds, Peter Fenton
Department of Computer Science, Norfolk State University, Norfolk, Virginia, USA

Abstract: As the use of technology has increased, so has the number of crimes which are committed with electronic devices. Quite often, these devices are confiscated as evidence and the data stored on them is used in a court of law to prosecute criminals. One problem that prosecutors can run into, is that if the evidence was not properly acquired at the crime scene or properly handled in the digital forensics lab, it can be thrown out in a court of law, and the accused can go free. It is very important that the digital forensics first responders follow the correct procedures after legal formalities. This is essential

because if proper procedures are not followed, the evidence on the electronic device may be dismissed. In this paper, we report on the design and development of a mobile application for Apple Devices which will give guidance to Digital Forensics First Responders. It outlines the steps they should follow to secure the evidence when they reach a crime scene, so that it will be admissible in a court of law. This application not only outlines the steps for the first responders, but it also follows user interface design guidelines for small devices. This application is useful because not only does it provide an easy way for first responders to see all of the steps for proper seizure but it is also on a user friendly interface. The fact that the application is on a mobile device means that it can be used in the field saving the first responders time and also gives them the ability to quickly acquire needed instructions at the scene.

Drone Forensics: A Preliminary Flight Log Analysis of Micro Drones

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Abstract: In the early 1990s, unmanned aerial vehicles (UAV) were solely a domain of the military uses of various developed countries. Now, the ease of availability and affordability in the electronic device market, this aerial vehicular technology has augmented its familiarity in public. However, expanded use of UAVs, colloquially known as drones is raising understandable security concerns. Because of their abilities to get close-in to potential targets, drones are thought to present a threat and, therefore, the investigation of crimes committed by UAVs is a much-needed aspect currently. This motivated us to devise a forensics framework proficient enough of analyzing the drone's activities after its flight. In particular, this paper analyzes the basic major log parameters of the autonomous drone and proposes a comprehensive drone-forensics related software architecture with preliminary results. Our under-development software will provide a user-friendly graphical user interface (GUI) to allow users extract and examine the on-board flight information. This would provide the forensic science community with a tool for investigating drone-related crime cases.

Hunting Malware: An Example using Gh0st

Jonathan Graham, Cheryl Hinds, Sandi Samuel
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Abstract: A Remote Access Trojan (RAT) is a form of malware which once installed on the victim.s machine, passes command and control (C2) back to the attacker. RATs can be used to steal sensitive information, spy on victims, and remotely control infected hosts. RATs are increasingly difficult to detect because they behave in ways that many firewalls and other cybersecurity tools do not perceive as malicious. In this research, we demonstrate how a RAT can be identified by searching for evidence left behind after the attack.Our approach is based on the Locard principle, which essentially states that when an intruder comes into contact with an environment, the intruder leaves some form of forensic evidence behind. Inspired by this principle we started the hunt for a specific virus, Gh0st RAT. We know that the RAT has to contact the command and control, so we looked for evidence in the network traffic, by using the Wireshark software. Viruses can hide, but they still have to run, so we performed forensic analysis of the memory using the Volatility software to locate any evidence of the RAT. We also searched for evidence of the RAT on the hard drive. We are pleased to report that we were able to find traces of Gh0st in both the network traffic, running in memory and on the hard drive.

A Platform for Raising Awareness on Cyber Security in a Maritime Context

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Abstract: In this paper, we present a platform we have designed and built in order to raise awareness on cyber security issues for stakeholders involved in a maritime context (e.g., ship officers, pilots, crew, harbor agents, officers in training), and to support our research in the context of a strong partnership with industry and academy. Maritime traffic contributes to a very

large extent to the trade and exchange of goods between countries and continents. For decades, security on the boat was restricted to fire prevention and the avoidance of pirates. Internet and computer-based systems inside the boats have changed the relative quietness of a ship at sea to deal with new challenges and threats, viruses, cyber attacks, remote operation and control, etc. Even when in a harbor, a ship appears as very vulnerable as it relies on information systems that can be corrupted. Ensuring security and protection of a ship when at sea or by the coastline raise numerous challenges, as the ship design did not anticipate impacts of recent omnipresence of information and communication technologies. In this paper, we present our current platform, its rationale and the initial feedback we have obtained when teaching cyber security and presenting cyber risks. We also detail how we used it to detect potential attacks.

Anonymity of Tor Users Demystified

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Abstract: As the importance and prevalence of Web analytics have increased over the last decade, so has the number of user trying to maintain their online anonymity. The Onion Routing (TOR) system is often seen as the best anonymity tool out there, and is used by nearly 2.5 million people daily. For a significant number of these users, many of TOR.s features and terms are rather difficult to comprehend; yet, these users tend to believe that TOR offers more privacy protection than what it is actually intended or able to provide. In this paper, the authors specifically focus on the TOR browser . one of the two key components of the TOR system. In particular, the authors demonstrate that, if used in its default settings, the TOR browser provides little if any protection against four most common forms of user tracking. Hence, to achieve true online anonymity, extra efforts and vigilance need to be exercised on the part of the TOR user.

Dynamic Re-Planning for Cyber-Physical Situational Awareness

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Abstract: Modern warfare increasingly depends on interconnected computers where cyber security plays an essential role. Events from the battlefield are reported to decision-makers verbally, in a textual format, but rarely graphically. In this paper we conduct a feasibility study of a real-time 3D simulation system that visually communicates cyber-physical data to obtain situational awareness. We identify whether such a system is plausible for the real-time planning of simulated battle scenarios, and how such a tool may help real-time decision-making. As part of this feasibility study, we investigate whether the addition of .presence. often described in VR literature helps or detracts value from such a simulation system. We hypothesise that experiencing the situation in virtual reality is beneficial for decision-makers. reaction time and quality of their decisions. Our simulation is built using Unreal Engine 4. It is then evaluated in a study involving four cyber security experts. The results indicate that the simulation is successful in the situational awareness aspect. Most users rate the regular monitor version higher than its virtual reality counterpart, stressing that while the immersion in VR is better, it is not as good in terms of controls, image quality, decision-making and comfort.

Analyzing the Effect of Ransomware Attacks on Different Industries

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Department of Mathematics and Computer Science, The Citadel, Charleston, South Carolina, USA;
The Military College of South Carolina, Charleston, South Carolina, USA

Abstract: Ransomware is currently the fastest growing malware attack compromising pertinent data from businesses that leads to loss of sales and trust from future customers. In this paper we provide an analysis of ransomware attacks to determine correlation factors that will help users/business organizations allocate resources efficiently. Our results of analysis have identified four important correlation factors for ransomware attacks. First one is the time of year that a ransomware attack is most likely to occur based on the past years. history. We have observed that the months from June to September

where important data collection during tax season takes place is the most vulnerable time for ransomware attack. Second is the location where the attacks occur. We have found that the areas that deal with public data and require public announcement of attacks are more vulnerable. Third is the amount of ransom payments requested. This factor is used to determine the cost of data that is not backed up. The payment request offers which are as low as $100 and as high as $35,000 are solely dependent on what the attacker believes is most likely to be paid. Percentage of attacks on industry has shown three highest targeted areas: medical, business, and education. Lastly, the amount of people affected is used to show the amount of information that can be leaked. This provides the greatest return on attack for hackers. Since 2016 around 128,904 individuals from medical industry have reported to be the victim of ransomware attacks. In this paper we have also discussed proactive recommendation measures to counter ransomware attacks and provided an analytical study to demonstrate a positive Return On Investment (ROI) along with ransomware mitigation methods.

Regular Research Papers:
Symposium on Computational Science (CSCI-ISCS)

Graph Algorithm Alternatives via Polynomial-Time Transformations: An Empirical Study Using Boolean Satisfiability and Integer Linear Programming

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Department of EE & CS, University of Tennessee, Knoxville, Tennessee, USA

Abstract: Deciding the satisfiability of Boolean expressions (SAT) and solving integer linear programming (ILP) are among the first combinatorial problems shown to be NP-hard. So too are the graph problems clique, independent set and vertex cover. The research community has produced significant algorithmic improvements for all of these. The three graph problems are so closely related that advances for one can often be applied to the others. SAT and ILP, on the other hand, are different enough from each other, and from graph problems in general, that advances for one may not readily translate into advances for the others. This study is aimed at determining whether highly efficient SAT and ILP algorithms can outperform fast, direct clique algorithms, and if so, under what conditions. Large-scale tests are conducted to compare highly efficient SAT and ILP solvers with a state-of-the-art maximum clique solver. Main results indicate that, in the vast majority of cases, a direct clique solver remains the algorithm of choice. Extreme cases, characterized by unusually high density or contrivance, were nevertheless identified for which SAT and ILP can outperform even the best current direct methods. Thus, a secondary finding suggests that foreknowledge of input graph structure has the potential to aid in proper algorithm selection.

Stochastic Path Finding Under Congestion

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Abstract: Most of the path planning algorithms use the edge weights in order to select the best path for navigation from an origin point to a specific target. This research focuses on the case where the edge weights are not fixed. Depending on the time of day/week, edge weights may change due to the congestion through the network. The best path is the path with minimum expected cost. The cost is typically travel time which is highly dependent on the level of congestion in the network. Minimizing the costs helps in reducing traffic in the city, alleviates air pollution, and reduces fuel consumption. For modelling cost functions, we consider three possible cost functions (linear, exponential, and step cost functions) in order to model realistic goals. The interpretation of best path depends on the point of view of car drivers. We model two different goals: 1) drivers who desire the path with the highest probability of reaching the destination before the deadline while minimizing waiting time at the destination and 2) the drivers who desire the best time slot to leave in order to meet the deadline and have a shortest travel time. Our findings show that using a realistic path planning algorithm which satisfies users. goals and picks the least congested path is a cost efficient option.

Toward Developing a Hybrid Storage Format for Efficient Storing of Configuration Interaction Sparse Matrices Working with CPU/GPU

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Abstract: Graphics Processing Units (GPUs) are designed for faster computations and efficient data processing. They manipulate data faster than Central Processing Units (CPUs). The first GPU was introduced by NVIDIA in 1999. Compute Unified Device Architecture (CUDA) is a parallel computing platform created by NIVIDIA in 2006. It works along with GPUs in order to solve numerous problems in a faster fashion than CPUs. CUDA can be considered as a layer between the programmer and the GPU. Sparse matrix-vector multiplication (SpMV) can be used to solve diverse-scaled linear systems and eigenvalue problems that exist in numerous and varying scientific applications. One of the scientific applications that SpMV is involved in is known as Configuration Interaction (CI). CI is a linear method for solving the nonrelativistic Schrodinger equation for quantum chemical multi-elctron systems and it can deal with the ground state as well as multiple excited states. The CI sparse matrix is usually an enormously huge matrix, the matter that makes it useful for detecting and capturing more electron correlation, nevertheless multiplying the large CI sparse matrix by a vector (what we have called previously, SpMV) is an extensive and very time-consuming process in CI computations. Some of the elements of the CI matrix are hard to recreate and some aren.t, which implies that different parts of the CI sparse matrix can be calculated using different ways, either pre-calculating the sparse matrix once at the beginning or calculating the elements of the CI sparse matrix on the fly. In this paper, we have developed a hybrid approach in order to deal with CI sparse matrices. The proposed model includes a newly-developed hybrid format for storing CI sparse matrices on the CPU/GPU. In addition to the new developed format, the proposed model includes the SpMV kernel for multiplying the CI matrix by vector using the C language and the CUDA platform. We have gauged the newly developed model in terms of two primary factors, memory usage and performance.

Adaption of Levenshtein Algorithm for Albanian Language

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Abstract: Levenshtein Algorithm also known as Levenshtein distance, is an algorithm which measures distance between words and also it is also used for conversion from one word to another. Measuring the distance between words is done by measuring the distance between the characters used in those words. Levenshtein algorithm works quite well for alphabets which in their composition have only letters consisting of a single character such as English language, but in cases where the alphabets have letters in their composition consisting of two or more characters such as Albanian language, this algorithm does not calculate the proper distance. Albanian language has 9 letters composed of two characters, namely dh, gj, sh, th, ll, rr, nj, xh and zh, therefore a new approach has been proposed for such cases.

AidData.org: A Donation Analysis

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Advanced Institute of Industrial Technology, Tokyo, Japan

Abstract: Every year, in order to improve the lives of people the government and people are spending a lot of money in developing countries. For better country future, the government can take better decisions if they have relevant and accessible data like citizens who are willing to donate and invest few dollars to increase the developments. Aiddata.org is a kind of website which provides data to visualize, and analyze data on $40 trillion in financing for development. Aid Data is a research lab which maintains development finance related activities that help to improve profitable outcomes by providing development finance data to government and people at their fingertips. Aid Data dataset includes over 1 million aid activities funded by more than 90 donors from the 1700s to present. The analysis of this dataset mainly helps us to understand the

process about the donation analysis between the countries and many different organizations which undertook this donation activity. Using the Donation Database Data from AidData.org we can successfully analyze the Business Process data like Donations made between countries. Data analysis includes both Donation analysis and Casual Analysis. The analysis starts with Data Profiling, identifying the analytical themes and also understanding the business story about the data. We have implemented a Hadoop data mart in order to analyze aspects like Number of Donations a country or a sector made in a particular year and the results are displayed using Tableau tool.

Calculating Persistence Homology of Attractors in High-Dimensional Chaotic Systems

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Abstract: While persistent homology is a basic but useful tool for describing the topological features of spaces, it has rarely been applied to describe the chaotic attractor whose shape could be very intriguing and complex. Especially for high-dimensional chaotic attractors, on one hand it reveals the evolution and stability of dynamical systems yet on the other hand, since it is a natural restriction for human researchers that they are unable to see more than three dimensionalities, methods for categorizing high dimensional attractors are lacking. Therefore, in this article we propose the method of applying persistent homology calculation to high-dimensional chaotic attractors and give several representative examples from different genres of chaotic systems for whose topological structure being displayed.

Battery Storage Integration into the Electric Grid

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Abstract: Energy storage is expected to flourish considerably, requiring large investments in tools and instruments that support its integration into the electric grid. This paper addresses the research question: "How can we determine the optimal locations for energy storage for proper integration into the electricity system?" Therefore, we have developed a conceptual framework for decision-making that caters to utilities for it considers the impacts of the energy storage placement on the grid, and the electric circuit capacity constraints. Additionally, we have built a prototype of Geographic Decision Support Systems (GDSS) to aid in the battery storage systems location choices and provide actionable information for utilities and other stakeholders who are concerned about the grid reliability and the urgency of energy storage deployment as a distributed energy resource.

Probabilistic Tit-for-Tat Strategy versus Nash Equilibrium for Infinitely Repeated Games

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TTH Innovation Lab, Tata Consultancy Services Ltd (TCS), Chennai, India

Abstract: In Game theory, Nash equilibrium is a fundamental concept where any player in a game cannot unilaterally change his/her behavior(s) and obtain a higher payoff. When players obtain equal payoffs in a game or repeated games, it is better not to use Nash equilibrium solution every time. In this paper, we have proved that Nash equilibrium does not give an optimal solution for repeated games; the payoffs can be transformed into a robust shape (Pareto optimality) through PTFT (probabilistic tit-for-tat) strategy with case studies illustrated. We have applied the 'invented and derived' results to Braess's paradox that could fetch an optimal network path by removing a shortest path through the benefits of using PTFT strategy.

Proposition of a Method for Assessing Similarity Between two Ontologies

Aly Ngone Ngom, Fatou Kamara-Sangare, Moussa Lo
LANI, Gaston Berger University, Louis, Senegal

Abstract: This paper presents a new method for assessing similarity between two ontologies O1 and O2. This method is based on set theory, edges based semantic similarity and feature-based similarity. We can summarize our method in 3 steps. In the step 1, we determine set of concepts that is shared by two ontologies (stackCommon) and sets of concepts that are different from them. We note stackDiff(O1\O2) (respectively stackDiff(O2\O1)) the representing set of concepts of O1 which are not include in O2 (respectively of O2 which are not include in O1). Once the sets have been determined, we have assessed, in step 2, the average value of semantic similarity for each set by using edges based semantic similarity. Then, in step 3, we have computed similarity between ontologies by using averages values of each set and by using also feature-based similarity measure. We have illustrated our method with some examples.

Online Updating for Gaussian Process Learning

Hongjun Su, Hong Zhang
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Abstract: Gaussian processes for regression and classification have become an effective machine learning methodology with a number of distinctive advantages. One notable disadvantage of Gaussian process methods is the computational complexity related to the inversion of matrices, especially for applications that involve large datasets. In this paper, an exact online updating algorithm is presented to significantly reduce the amount of computations for repeated progressive trainings of Gaussian processes.

New Techniques to Solve Differential Equations Automatically

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Abstract: Solving differential equations is a very important task in mathematics, science and engineering. Laplace transform is a well known and very widely used method for solving differential equations; although Laplace transform is very powerful and widely used in that regard, however, it suffers a serious drawback, which is the calculation of inverse Laplace transform. Such kind of inverse calculation is problematic or simply impossible, except some very basic functions. Sumudu transform is a new integral transform with new features. In this work, a new computational method is proposed to solve differential equations, the new method combines both Laplace transform and Sumudu transform such that the calculation of the inverse Laplace transform can be avoided; it is also shown that the traditional method by power series can be improved. Furthermore, it is demonstrated that the new method and techniques presented in this work can be implemented in computer algebra systems such as Maple to solve a wide range of differential equations automatically.

Numerical and Evolutionary Approaches for the Optimization of Electrical Microgrid Control Parameters

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Abstract: The choice of automated control strategies for an electrical microgrid can have a significant impact on the cost and performance of that system. For that reason, it is desirable to find control parameters that are optimal with respect to several

metrics of particular interest. This paper describes the modeling and simulation of an electrical microgrid incorporating mobile power transfer systems, and highlights how to formulate the selection of control parameters for such a microgrid as an optimization problem. Further, it compares optimization algorithms exemplifying two approaches -- numerical and evolutionary – with respect to this optimization task. We discuss and show through the results of a set of comparisons against several objectives that the evolutionary optimization approach seems more promising for this type of problem.

Unsolved Lattice Path Problems in Computational Science

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Abstract: Lattice path enumeration and its applications have been studied by researchers in many areas such as computer science, mathematics, biology, physics, chemistry and statistics. They are related to number theory, geometry theory, combinatorics, graph theory, linear algebra and group theory. They are easy to state and understand although they are very difficult to be solved by researchers in mathematics or computer science. It seems to us that it is very challenging to find suitable mathematical methods or efficient algorithms to deal with them. In this paper, we will discuss some enumerative problems on pattern avoidance in lattice paths. And many closed formulas, integer sequences, generating functions, and open problems are posted.

Improvement of Voltage Sags Rates by Applying Optimal Reconfiguration of Electrical Networks in Presence of DG by Using Tabu Search

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Abstract: This paper proposes a methodology to analyze the impact of the inclusion of distributed generation when the electric network is reconfigured to improve the voltage sag indices. The optimization algorithm for reconfiguring the electrical system is implemented using a Tabu Search technique. In order to show the effectiveness of the developed methodology, case studies using the IEEE-57 test system are presented.

Computation in Markoff-Hurwitz Equations II

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Department of Computer Science, University of North Carolina at Charlotte, North Carolina, USA

Abstract: In the more than 100 years since Markoff-Hurwitz Equations, they play a decisive role, have turned up in an astounding variety of different settings, from number theory to combinatorics, from classical groups and geometry to the world of graphs and words, from discrete mathematics to scientific computation. This paper is the continuation of our previous paper under the same title, which we refer to as Part I. In Part I: we introduced other people's work in this area, presented general properties of solutions, proved solution does not exist when n = 3 and k = 2, integer sequences and solutions were reported for n <= 10 and conjectures were posted. In this paper we prove that solution does not exist when (n=4, k=2), (n=4, k=3), (n=5, k=2) or (n=5, k=3).

Solving Minimum k-supplier in Adleman-Lipton Model

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Institute of Bioinformatics, University of Georgia, USA;
Mechanical Engineering, Yasouj University, Yasouj, Iran

Abstract: In this paper, we consider an algorithm for solving the minimum k-supplier problem using the Adleman–Lipton model. The procedure works in O(n^2) steps for the minimum k-supplier problem of an undirected graph with n vertices, which is an NP-hard combinatorial optimization problem.

From Blockchain to Internet-Based Voting

Elham Akbari, Qing Wu, Wenbing Zhao, Hamid R. Arabnia, May Qu Yang
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Abstract: Blockchain is one of the hottest topics in the discussion of technologies lately. As the enabling technology for Bitcoin, the pioneering cryptocurrency, blockchain is an appendonly distributed ledger that is virtually impossible to attack given sufficient scale of participants. Hence, blockchain holds great promises as the fundamental technology to enable Internet-based electronic voting. However, Internet-based voting has additional requirements than monetary transactions. In this paper, we analyze these requirements, review existing proposed solutions, and outline possible improvements. Specifically, we propose to use live biometrics of the voter to perform secure and highly reliable remote authentication. We also propose a scheme to protect the secrecy of the ballots and eliminate the influence of votes already cast. Finally, we propose to impose a hierarchy to the voting infrastructure that aligns naturally with traditional voting, which enables parallel processing of multiple blockchains, to overcome the intrinsic scalability limitation of the blockchain technology.

Advance Gender Prediction Tool of First Names and its use in Analysing Gender Disparity in Computer Science in the UK, Malaysia and China

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Abstract: Global gender disparity in science is an unsolved problem. Predicting gender has an important role in analysing the gender gap through online data.We study this problem within the UK, Malaysia and China. We enhance the accuracy of an existing gender prediction tools of names that can predict the sex of Chinese characters and English characters simultaneously and with more precision. During our research, we found that there is no free gender forecasting tool to predict an arbitrary number of names. We addressed this shortcoming by providing a tool that can predict an arbitrary number of names with free requests. We demonstrate our tool through a number of experimental results. We show that this tool is better than other gender prediction tools of names for analysing social problems with big data. In our approach, lists of data can be dynamically processed and the results of the data can be displayed with a dynamic graph. We present experiments of using this tool to analyse the gender disparity in computer science in the UK, Malaysia and China.

An Improved Bank Credit Scoring Model - A Naive Bayesian Approach

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Department of Electrical & Information Engineering, Covenant University, Ota, Ogun state, Nigeria

Abstract: Credit scoring is a decision tool used by organisations to grant or reject credit requests from their customers. Series of artificial intelligent and traditional approaches have been used to building credit scoring model and credit risk evaluation. Despite being ranked amongst the top 10 algorithm in Data mining, Naïve Bayesian algorithm has not been extensively used

in building credit score cards. Using demographic and material indicators as input variables, this paper investigate the ability of Bayesian classifier towards building credit scoring model in banking sector.

Computer Aided Writing - A Prototype of an Intelligent Word Processing System

Andre Klahold, Johannes Zenkert, Madjid Fathi
Institute of Knowledge Based Systems and Knowledge Management, University of Siegen, Siegen, Germany

Abstract: There are more and more capable computer based concepts feasible for the writing process. In the coming years a new generation of tools supporting text production will originate. They will by far exceed modern word processing software and change the writing process itself fundamentally. This work presents a prototype of an intelligent word processing system "VAC" aimed at "Computer Aided Writing". It gives a glimpse of what will be and an impression on what already is.

An Occam's Razor Approach to Hedonic Pricing Theory

Timothy Oladunni, Sharad Shama
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Abstract: The variety, velocity, veracity and volume of data availability since the early 90's continues to pose a major challenge to the traditional and conventional data analytical methodologies. Therefore, by either mere serendipity or assiduous trawling, the emergence of learning algorithms in computational economics is a paradigm shift in the analysis, computation and manipulation of most economic transactions. The analysis of the hedonic pricing model is the focus of this study. Hedonic pricing theory explains prices and implicit markets of a differentiated commodity. An improved model simplifies the decision-making of an economic actor. Empirical analysis was based on the principle of parsimony and plurality of Occam's razor approach using correlation matrix, marginal cost, significance test, Bayesian information criterion and variance inflation factor. Learning algorithms include; best subset and forward stepwise subset selectors.

Registered After Deadline:

The Challenge of Technological Generation of Young Creative Entrepreneurs in Global New Economy - Entrepreneurship Creativity of Youth and its Impact on Global Social Welfare

Matthew Tritto, Alexander Marsh-Drikos, Sumana Das, Sohini Roy, Pradeep K. Jha, Rakhi Jha, Alice Karoubi Nordon, Olivier Younes, Andrew Marsh, Sujoy Guha, Giuseppe Tritto

World Academy of Biomedical Sciences and Technologies - WABT, UNESCO NGOs House, Paris, France; WABT European Institute for Life - WEIL, Budapest, Hungary; HealthLife Creative Enterprise Ltd, London, UK; HoIP Telecom Ltd, London, UK; Secretary-General WABT, Paris, France; Chairman Commission BioTech & VirusSphere, WABT - UNESCO, Paris, France; College of Science and Tech, Temple University, USA; President Foundation Teresa & Luigi De Beaumont Bonelli for Cancer Research, Naples, Italy; Partner, Ascott Associes Lawyer Firm, Paris, France, EU; Information Technology and TeleMedicine, Milano, Italy; President IITM - International Institute of Tele-Medicine, University Milano Bicocca, Milano, Italy; President Italian Society of TeleMedicine; IT & TeleMedicine, Budapest, Hungary; President Hungarian Association for Telemedicine and e-Health, Budapest, Hungary; President, Research Centre on Intelligence (U.N.I.), Rome, Italy

Abstract: TBA

Registered After Deadline:

Computer Aided Design using a Rational Quadratic Trigonometric Spline with Interval Shape Control

Shamaila Samreen, Muhammad Sarfraz, Nabila Jabeen, Malik Zawwar Hussain
Department of Information Science, Kuwait University, Safat, Kuwait;
Department of Mathematics, University of The Punjab, Lahore, Pakistan

Abstract: An interpolation curve scheme is constructed to design planar objects using a rational quadratic trigonometric spline with interval shape control (RQTSISC). The spline curve, achieved through the constructed scheme, possesses the best possible geometric properties such as convex hull, partition of unity, affine invariance and variation diminishing and some important shape properties such as local and global interval shape (tension) properties which provide good control on the curve and help in modifying the shape as one can desire. The proposed method performance has smoothness of degree 2.

Short Research Papers:
Symposium on Computational Science (CSCI-ISCS)

Stochastic Methods for Air Quality Prediction

Kaixi Zhu, Mitchell Thayer, Amir Assadi
University of Wisconsin-Madison, Madison, Wisconsin, USA

Abstract: Not provided (refer to proceedings).

A Method to Use Power Generated from a Solar Energy Generator

Jihyun Lee, Youngmee Shin, Ilwoo Lee
IoT Research Department, Electronics and Telecommunications Research Institute, Daejeon, South Korea

Abstract: In order to utilize the power generated from solar photovoltaic systems in the existing electrical grid, it is necessary to develop the new market opened to trade power of small-scale renewable energy resources. This paper presents a systematic method to help small and medium sized photovoltaic generation system owners to sell the generated energy and the renewable energy certificates and then make an additional profit as a new market participant. Here, it is essential to mediate to able to sell the renewable energy sourced from solar. Hence, we evaluated a concept and intermediate trade transaction in trading small-sized solar energy between a seller and an intermediate trader. We choose the rapid prototype development evaluation method.

Filter Optimization for Enhancing Transformed Voice

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Hearing Impairment & Rehabilitation Research Institute, Algorkorea Co. Ltd., Seoul, South Korea;
Department of Computer Science, Biola University, Los Angeles, California, USA

Abstract: A tiny microphone inside the ear canal had been used for capturing the voice that was transferred through the oral and nasal cavities from the vocal code of the speaker. We designed a digital filter optimized for enhancing the transformed voice signal due to the inner facial cavities.

Research Experience on the DC House Project for Rural Electrification

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Abstract: The DC House project, initiated in 2010, aims to increase the low ratio of rural electrification in many developing countries around the world. The project incorporates technologies that enable the provision of low-power low-voltage residential dc electricity especially in geographically hard to reach areas utilizing renewable energy sources. Numerous ideas and projects have stemmed out of this research project which further established research partnerships with several universities. This paper summarizes the research experience by presenting examples of student projects that have been conducted in the development of the DC House system. This paper will also presents the collaborative efforts resulted from the research project with the universities outside of the U.S.

vcBalancer: Dynamic Volunteer Manager for Self-Adaptive Task Pulling

ChungGeon Song, BongWoo Bak, HeonChang Yu
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Abstract: The operation of volunteer computing application depends on the setting of user. Because the number of setting methodologies is diverse, it is difficult for ordinary users to apply an ideal setting to their volunteer applications. In this paper, we propose vcBalancer, a manager which periodically analyze the idle resources of volunteer system and dynamically apply the optimized user setting information to volunteer computing application. Our experiment shows that the vcBalancer improves the overall performance by 3% on average as compared with BOINC client's default configuration.

Analyze Unstructured Data Patterns for Conceptual Representation

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College of Engineering, Qatar University, Doha, Qatar

Abstract: Online news media provides aggregated news and stories from different sources all over the world and up-to-date news coverage. The main goal of this study is to find a solution that is considered as a homogeneous source for the news and to represent the news in a new conceptual framework. Furthermore, the user can easily and quickly find different updated news in a fast way through the designed interface. The Mobile App implementation is based on modeling the multi-level conceptual analysis frame. Discovering main concepts of any domain is captured from the hidden unstructured data that are analyzed by the proposed solution. Concepts are discovered through analyzing data patterns to be structured into a tree-based interface for easy navigation for the end user. Our final experiment results show that analyzing the news before displaying to the end-user and restructuring the final output in a conceptual multilevel structure produces a new display frame for the end user to find the related information of interest.

Regular Research Papers:
Symposium on Computational Intelligence (CSCI-ISCI)

Automatic Code Generation for Microcontroller-Based System Using Multi-Objective Linear Genetic Programming

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Department of System Engineering, San Agustin National University of Arequipa, Arequipa, Peru

Abstract: Microcontroller-based systems often include peripheral devices such as matrix keyboard and character LCD module among others. We propose the application of the multi-objective linear genetic programming, for automatic generation of the assembly driver routines for these devices, to perform the operations: matrix keyboard scan, LCD module initialization and character display on LCD. For fitness evaluation, we assign a function to be maximized to each bit of the binary result or to the timing diagram of each used microcontroller Port pins. This decomposition of the problem used in a multi-objective evolutionary algorithm allows generating programs, in some cases, with smaller code size or shorter execution time than programs written by a human programmer.

A Genetic Algorithm Based Approach for Data Fusion at Grammar Level

Mohammad Faridul Haque Siddiqui, Jackson D. Carvalho, Ahmad Y. Javaid
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Abstract: Multimodal interaction is a type of Human-Computer Interaction, which involves a combination of multifarious modalities to effectuate a task. Human-to-human interactions necessitate the use of all modalities such as speech, gestures, facial expressions and assorted media available for brainy communications. The single modalities often introduce the ambivalent interpretation of the ideas being conveyed. Multimodal interaction plays a major role in resolving such ambiguities. The various modalities used can be combined as a way to recover the semantics of the messages involved. This strategy, known as data fusion is the main focus of the research presented here. This paper proposes a new genetic algorithm based approach for achieving intelligent data fusion for inferred context-free grammars. Grammar inference methods are applied to generate the grammars, and the resulting production rules are fused to generate a correct grammar. Related results, their implications, and future work are presented.

Opinion Mining Techniques and Tools: A Case Study on an Arab Newspaper

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Abstract: Opinion mining or sentiment analysis is a type of natural language processing that extracts the knowledge of people by means of opinion about a particular topic. The identification of opinion sentiment orientation (positive, negative and neutral) is an essential part of the opinion mining process. This article presents tools and techniques of opinion mining. Related work has been presented. Also, an experiment done on NEWS ARAB newspaper is also conducted. The newspaper text was preprocessed and then term frequency was calculated. The main goal of the experiment was to identify the overall polarity of the newspaper. The results show that the newspaper is more oriented to political news. Furthermore, more opinion techniques could be applied to the newspaper corpus.

Agent-based Models Predicting Collective Behaviors

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Department of Integrative Biology, University of Colorado Denver, Denver, Colorado, USA

Abstract: We present a Virtual Ant Laboratory agent-based model, an interactive and prediction tool to simulate the ants' environment and their decisions making and foraging behaviors. The proposed simulation model provides the ability to generate customized complex ant environments and to explore the interaction between the environment features and ants' behavior. As expected, the results showed that the quality of the food and the distance between food sources and the nest have a significant impact on the ants' decisions. The model was partially validated via live-ants laboratory experiments and can easily be generalized to other environments/agents.

Bio-Inspired Neural Network Model Applied to Urban Traffic Control in a Real Scenario

Nelson Murcia Garcia, Andre R. Hirakawa, Guilherme B. Castro
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Abstract: Global economic development has the disadvantage of increasing the population in large urban centers that causes an increase of traffic in cities and results in traffic jams. Several types of research have been developed to provide solutions to the problem of urban traffic. This paper aims to implement a Bio-Inspired Neural Network model to control urban traffic semaphores and present the evaluation of the model applied to a real scenario of a big city through simulations. Were considered characteristics such as vehicle speed, streets and avenues lengths, traffic semaphore positions and different traffic demands. The chosen scenario was the Paulista Avenue in the central region of the city of Sao Paulo, well known for its high traffic demand. The Bio-Inspired Neural Network algorithm was compared with the fixed-time control, which is currently used for the control of semaphore phases in the city of Sao Paulo. In addition, the behavior of control algorithms was analyzed for low, average and heavy traffic demands. The performance indicators used were the vehicles average travel time and the roads occupation level. The results show that the Bio-Inspired Neural Network model is better in all the simulations made, with the different situations of traffic demands. Tests results show performance up to 44,67% in terms of average travel time, if compared to the fixed time control.

Graph based AHC Algorithm for Text Clustering

Taeho Jo
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Abstract: In this research, we propose the graph based AHC algorithm where a graph is given as the input, as the approach to the text clustering tasks. The ontology is the popular and standard representations of knowledge as a graph, so it may be more natural to encode texts into graphs rather than numerical vectors. In this research, we encode texts into graphs, define the similarity measure between graphs, and modify the AHC algorithm into the graph based version. As the benefits from this research, we may expect the better performance and more graphical representations of data items, by proposing that texts should be encoded so. Therefore, the goal of this research is to implement the text clustering system which has the benefits.

Fuzzy System for Human Resource Performance Evaluation

Anderson Silva De Oliveira Goes, Roberto Celio Limao
Federal University of Para, Belem, Brazil

Abstract: The human resource performance evaluation process is an important issue for many companies around the world. This paper presents a proposal for a development of a Fuzzy Logic system designed for this goal. Directed to the business environment, the proposed models seeks to accomplish an evaluation with different characteristics directed to basic

hierarchical levels of medium and large institutions, considering the need of a different approach to each employee, given the kind of job position that it occupies. The input variables, membership functions and base rules in this article were developed through analysis of similar systems. Two different fuzzy models were developed and applied to the collected data with their results being compared to a decision tree model.

Graph Based KNN for Text Segmentation

Taeho Jo
School of Computer and Information Engineering, Inha University, Incheon, South Korea

Abstract: In this research, we propose that the graph based KNN should be applied to the text segmentation task, as well as other tasks of text mining. The text segmentation may be interpreted into the binary task of texts where each pair of adjacent sentences or paragraphs is classified into whether we put the boundary between topics, or not, and the ontology which has been used as the popular and standard knowledge representation is given as a graph. In this research, we encode the adjacent sentence or paragraph pairs into graphs, and use the graph based K Nearest Neighbor for the text segmentation task. As benefits from this research, we may expect the more graphical, symbolic, and compact representations of texts as well as the improved performance. Therefore, the goal of this research is to implement the text segmentation system with the benefits.

GSO: A New Solution for Solving Unconstrained Optimization Tasks Using Garter Snake's Behavior

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Abstract: Solving the unconstrained optimization problems with swarm intelligent algorithms has received significant consideration recently. In this paper, a novel algorithm called GSO (Garter Snake Optimization) is proposed for solving unconstrained optimization tasks. In the proposed algorithm, individuals emulate a group of garter snakes, which interact to each other based on the biological laws of the cooperative colony. The explored solutions achieved by GSO are analyzed with that of well-known methods namely KA and PSO. The results show that GSO is competitive in comparison with the representative algorithms.

Movie Master: Hybrid Movie Recommendation Engine

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Advanced Institute of Industrial Technology, Tokyo, Japan

Abstract: In an extant era of customer relational service personalization plays a vital role, where a user expects individual personalized service, which seeds to a new form of intelligent customer service known as Recommendation System. It is an exemplification of personalization software and this paper describes our research conducted to develop and implement a Movie Recommendation engine in the form of a full-blown Web Application using two simple approaches such as Non-Personalized Recommendation and Content based recommendation techniques using a machine-learning algorithm. The former is achieved by implementing a well known technique known as Bayesian Estimation and the later is derived based on Term Frequency and Inverse Rating Frequency (TF-IRF) Approach coupled with the Cosine Similarity Measuring Technique. Our results indicate that the proposed approach Bayesian Estimation and TF-IRF approach is efficient in terms of calculating the prediction and recommendation factor for a movie with a minimum webpage loading time, when compared to the existing methods such as Aggregate Opinion Mining and Product Association.

Predicting Personal Transitional Location Based on Modified-SVM

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Abstract: Location prediction is an attractive research area because of its potential application in location-based services such as location-based advertisements, route planning and so on. In this paper, a method based on mining history trajectory logs is proposed to predict people's next location for a transition from current location. The training samples of this model considers temporal features containing daily and hourly features as well as spatial features like the current location which are all extracted from the historical trajectory dataset. In the learning process, the location-prediction problem can be treated as a multi-class classification and a modified support vector machine (SVM) approach is adopted to learn the classifier models. The method is tested on the Geolife project dataset which is a real life dataset of 182 users over five years. The experimental result shows that the method can provide about a 4% improvement compared with the space time features-based recurrent neural network (STF-RNN) model and a 16% improvement over the Markov models.

Multilayer Artificial Neural Network Design and Architecture Optimization for the Pattern Recognition and Prediction of EEG Signals based on Henon Map Chaotic System

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Abstract: This paper investigates the training performances of multilayer artificial neural network (ANN) architectures design for the implementation of chaotic systems. The designed ANN models can be employed for pattern recognition and prediction of dynamic chaotic systems time series, in order to simulate and analyze brain activities captured by Electroencephalogram (EEG). Previous research shows that EEG signals demonstrate chaotic patterns. Chaotic systems can be represented by a set of mathematical equations, and therefore are predictable and controllable. The ANN is trained with Henon map chaotic system outputs. The ANN architecture optimization is important for improving the performance of hardware implementation. The training performances are compared using three training algorithms: Levenberg-Marquardt, Bayesian Regulation and Scaled Conjugated Gradient. Nonlinear autoregressive (NAR) training model is used for ANN architectures design. ANN architectures with up to 3 hidden layers combined with different number of hidden neurons are compared by measuring the training performance using the mean square errors (MSE). The training results demonstrate that the training performance can not be improved simply by increasing the complexity of the ANN architecture in terms of the number of hidden layers and hidden neurons. It is therefore necessary to optimize the ANN architecture on a case-by-case basis in order to improve the efficiency of the ANN implementation for specified applications.

Extraction of the Essential Constituents of the S&P 500 Index

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Abstract: The S&P 500 index is a leading indicator of the stock market and U.S. equities which is highly influenced by its essential constituents. Traditionally, such constituents are identified by the market capitalization weighting scheme. However, the literature rejects the efficiency of the weighting method. In contrast, we introduce data mining approaches of the entropy and rough sets as two separate methods for extraction of the essential S&P 500 constituents. The legitimacy of the findings in comparison with the S&P 500 weighting scheme have been investigated using the discrete time Markov Chain Models (MCM) and Hidden Markov Chain Models (HMCM) which lend themselves easily to the nature of the time-series data. The investigation is done against data for the full sample and pre/post crisis subsamples collected for the period of 16 years. We find the entropy method provides the highest forecasting accuracy measure for the full sample and post-crisis subsample.

Educational Data Mining Based on Multi-objective Weighted Voting Ensemble Classifier

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Abstract: In recent years, data mining techniques have been widely applied in different topics such as education, medical, security, etc. In this research and in the first step, we apply educational data mining two well-known methods including J48 and Multilayer Perceptron (MLP). In addition, we will create some simple rules using J48. Our results in this part of research indicate that we get the best performance when class is "High". We also show that most generated rules using J48 algorithm are related to "Low" class. By using generated rules, cut-off points presented that we observe that "STR" feature is not involved in the production of rules. Finally, by utilizing voting approach, we introduce a new Multi-objective Weighted Voting Ensemble Classifier (MWVE) using J48 as well as MLP algorithms which is called "MWVE-J48MLP" algorithm. According to our outcomes in this step, we observe that the proposed model has better performance than both J48 as well as MLP algorithms in previous step.

Multi-Perspective Machine Learning (MPML) - A Machine Learning Model for Multi-faceted Learning Problems

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Abstract: Machine learning has been applied to various learning problems across a number of disciplines. The availability of data, algorithms and the success of machine learning methods has made machine learning a popular choice for analyzing and solving big data problems. In this paper, we propose a novel machine learning model based on ensemble learning, feature method pairs and multi-view learning concepts. This model targets learning problems with multiple factors or facets. Using botnet detection as an example multi-faceted learning problem, we explain the desirable properties this model promises. The aim of the model is to provide a guideline for designing machine learning based solutions for a specific type of learning problem.

A Deep Dive into Automatic Code Generation Using Character Based Recurrent Neural Networks

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Northwood High School, Irvine, California, USA

Abstract: Deep Learning is an emerging field in Artificial Intelligence that uses biologically inspired neural networks to recognize patterns in the natural world. These neural networks have an amazing ability to process large amounts of data and learn from them. Recurrent Neural Networks (RNN) are used in applications involving natural language processing like text translations and text generation. This research evaluates the effectiveness of a RNN to be able to automatically generate programming code. Programming languages are different from natural languages in that they have unique structure and syntax. The goal for this research is to conduct experiments on a character RNN model with for three programming languages; Java, Python and C#, and evaluate the results by testing and analyzing the ability for the RNN to automatically produce code that is able to compile.

A Multivariate Discretization Algorithm Based on Multiobjective Optimization

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Centro de Investigacion en Inteligencia Artificial, University of Veracruz, Xalapa, Mexico

Abstract: In this paper, a new multivariate discretization algorithm called multiCAIM is presented. Discretization consists of transforming continuous attributes into discrete ones. Most discretization algorithms are univariate and find a discretization scheme using only a discretization criterion. On the other hand, the proposed approach obtains a set of discretization schemes guiding the search by using a discretization criterion and the prediction accuracy of Naïve Bayes. The obtained datasets using multiCAIM are evaluated employing three popular and competitive classifiers: Naïve Bayes, KNN and C4.5. The overall assessment suggests that the proposed algorithm outperforms classical discretizers, moreover, it allows to the expert to select more than one discretization scheme.

Evacuation Evaluation using Machine Learning and Wearable Sensors

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Computer Science, School of Computing, Tokyo Institute of Technology, Kanagawa, Japan;
School of Management, Tokyo University of Science, Tokyo, Japan;
Department of Management Science, Tokyo University of Science, Tokyo, Japan

Abstract: This research proposes a method of evacuation evaluation using machine learning techniques. Evacuation evaluation must identify when and where people tend to make abnormal movement in emergency evacuation situations. Conventional method asks plenty of manpower to detect abnormal movement time periods. Our method detects the time periods automatically, using classifier and heuristics about human movement.

Short Research Papers:
Symposium on Computational Intelligence (CSCI-ISCI)

A Fuzzy Controller for Fault Tolerant Control of Nuclear Reactor

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Abstract: In this paper, fuzzy control approaches are used to model human expert knowledge in fault tolerance of nuclear power plant. Firstly, the reactor in a nuclear power plant model was built using Matlab based on pressure features of a primary circuit within a nuclear power plant. Secondly, a fuzzy controller was designed to control pressure of the reactor model based on the expert experience. Thirdly, the different type of faults: sensors faults, actuator faults and plant faults, were added to the reactor model during the control process based on the fuzzy controller. Finally, the performance of the fuzzy controller was evaluated using normal running and fault tolerant test case.

Deep Learning Art History from Data: Baroque Intellectual Influence on the Romantic Era Painting

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Beijing No. 8 High School, China; Zhejiang University, China

Abstract: Baroque art is a unique period for emergence of creative novelties in artistic idea development and artistic technique improvement. Baroque art shows the influence of pre-Baroque period's humanism perspective; in turn, it exerted an extraordinary influence on artistic styles and contents following it. This research reports advances in art history made through computational intelligence and deep learning from Big Data, to elucidate the relationships among painting in the three artistic periods. This paper outlines the methodology and reports a successful preliminary feasibility study from limited data. Specifically, our study explored the concepts or techniques that have remained, or disappeared during the historical changes, and elucidated the connection among the Pre-Baroque Period, Baroque Period and the Post-Baroque Period.

Deep Learning Empirical Topology for Classical Music Style Decision Making

Peter Han, Ehsan Qasemi, Adel Ardalan, Huijing Gao, Amir H. Assadi
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Abstract: This research provides computational/mathematical models to elucidate the human brain's ability in pattern recognition and feature extraction from music in tasks such as classification of music pieces according to style and historical period, such as Baroque, Classical and Romantic periods. We propose deep learning as the computational intelligence medium of choice to implement the model. The feasibility study reported below explores a special case to design an algorithm that could distinguish different styles of music, especially the Baroque music and the romantic music. The input is a piece of music, and the output will be the style of the music.

The USPTO's §101/Biotech Workshop: The USPTO's PE-Test is too Vague to Help; The Supreme Court's SPL-Framework Provides the Only Safe PE-Haven

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Abstract: For years, all US-wide "patenteligibility, PE" meetings focused on the CAFC's PE-decisions. By contrast, the USPTO focused its recent nationwide Biotech/PE-meeting on its "USPTO's 2-step PE-test" and its PE-Guidelines ─ for figuring out the helpfulness of both for drafting, prosecuting, and/or attacking/protecting biotechnical ETCI patents. The meeting participants' answers to this question: There is no help. They found the USPTO's 2-step PE-test (and its PE-Guidelines) too vague to provide any guidance on how to apply it to a Biotech ETCI for assuring its being PE. Yet consensus existed that a safe PE-haven is urgently required ─ based on the Supreme Court's PE-analysis in Alice. To this end, the "PE-Theorem" proves that the Alice decision's PE-analysis provided by the Supreme Court causes no vagueness, as it is indeed caused by the USPTO's 2-step PE-test, namely by its incompletely interpreting Alice's PE-analysis. Hence, completely interpreting it excludes this vagueness: It even delivers a forensic instrument of hitherto nonexistent power and ease for qualifying an ETCI as being PE or ^{lim}PRE. This renders the US SPL much more innovation- & investor-friendly than ever before ─ or worldwide anywhere else ─ also for all Biotech (and Businesstech) ETCIs.

Regular Research Papers: Symposium on Signal & Image Processing, Computer Vision & Pattern Recognition (CSCI-ISPC)

A Fast Incremental Spectral Clustering Algorithm for Image Segmentation

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School of Information Engineering, Changan University, Xi'an, China

Abstract: Clustering aims at grouping a given set of data points into a number of clusters without resorting to any a priori knowledge. Due to its important applications in data mining, many techniques have been developed for clustering. Being one of the most popular modern clustering algorithms, spectral clustering is simple to implement, can be solved efficiently by standard linear algebra software, and very often outperforms traditional clustering algorithms such as the k-means algorithm. However, it is not very well scalable to modern large datasets which typically have millions of items. To partially circumvent this drawback, in this paper, we propose an integration-based fast incremental spectral clustering algorithm which is particularly designed for image segmentation tasks. The algorithm first divides a given large dataset into several smaller partitions, next applies spectrum clustering to each partition, and finally integrates them using a BIRCH tree. Experiments performed on image data demonstrate the efficacy of our method.

A Survey on Audio Content-Based Classification

Amal Dandashi, Jihad Aljaam
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Abstract: With the increased usage of mobile electronic devices, social media platforms, and electronic based applications in everyday life, the upload and usage of multimedia clips is exponentially increasing every year. There are many research initiatives tackling the challenge of multimodal video classification and it has been found that audio-based classification is less computationally expensive and just as effective, in many cases. However, research targeted towards acoustic-based detection is still in its initial stages. Audio content-based classification pertains to several domains: music and speech signal processing, which are relatively popular research interests, and event, genre and scene-based classification which are still areas that need a lot of development. There is also a problem with the difficulty of assessing performances of different systems with a unified audio dataset, due to the lack of development in this field. The objective of this study is to present information about audio processing techniques and studies conducted under several classification tracks; namely acoustic-based event, genre, and scene detection, as well as combination-based classification works.

Age Estimation with Local Statistical Biologically Inspired Features

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School of Engineering, University of KwaZulu-Natal, Durban, South Africa

Abstract: Biologically inspired features (BIF) have proven to be robust object representation technique for image visual artifacts. Derived from primates visual cortex, BIF extraction consist of alternating layers of simple (S1) and complex (C1) cells. Although studies reveal that there exists spatial frequency processing in primates visual cortex, BIF techniques mostly employ scale and orientation selectivity in feature extraction. A series of processor intensive pooling operations above C1 cells significantly limit application of BIF in real-time computer vision problems. This paper proposes local statistical BIF (LS-BIF) for age estimation. MAX pooling is applied to S1 units for each frequency band to obtain frequency tolerant features. Local means and standard deviations in $n \times n$ grid search are used to obtain orientation tolerance features. AVG pooling is applied to orientation tolerance features to obtain scale-tolerant features. Adopting hierarchical age estimation

approach that consists of between group classification followed by within group regression, LS-BIF achieves better age estimation accuracies compared to BIF with scale and orientation selectivity only and Multi frequency BIF (MF-BIF) with holistic (global) pooling in C1 layer.

Algorithmic Approaches and Embedded Architectures for Robotic Search and Rescue

Manuel Garcia, Aleksander Milshteyn, Airs Lin, Garth Herman, Khosrow Rad, Charles Liu, Helen Boussalis
Structures Pointing and Control Engineering (SPACE) University Research Center (URC), Department of Electrical and Computer Engineering, California State University, Los Angeles, California, USA

Abstract: Robots facilitate exploration of dangerous environments in response to catastrophic events. Advances in robotic technology have increased their utility and application. Risk in search and rescue operations are greatly reduced due to robotic intervention. Recently Structures, Pointing, and Control Engineering (SPACE) University Research Center (URC) of excellence at California State University of Los Angeles has developed a robotic system for search and rescue. This paper focuses on the development of the algorithms and embedded architecture employed in the system. The Eulerian Video Magnification algorithm was utilized as a means to extract biometric information such as pulse and breathing rate of a human body. The path-finding algorithms were developed for expedite navigation of the robot racing towards the potential victim. A layered model was adopted for the system architecture to facilitate the development and implementation of the designated mobile robot platform.

Estimation of Illumination Map from Dermoscopy Images for Extracting Differential Structures Using Gabor Local Mesh Patterns

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Abstract: Melanoma is the most deadly form of skin cancer and its incidence rate is significantly increasing. The design of an assisted diagnosis system for the detection of melanoma is a challenging task involving various steps related to computer vision. Researchers have concluded that the accurate identification of melanoma requires robust preprocessing steps on dermoscopy images including hair removal, illumination correction etc., that can help in a better detection of melanoma. In this paper, we propose a novel illumination correction algorithm followed by robust feature extraction from dermoscopy images, leading to a better identification of cancer. Illumination correction is based on statistical estimation of illumination content in the images, followed by the extraction of differential structures using a combination of Gabor filtering followed by extracting local mesh patterns, which exhibit physiological significance based on various clinical rules for detecting melanoma. Our experiments show that the proposed technique outperforms all the other methods that have been considered in this paper.

FaceNet Based Face Sketch Recognition

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Abstract: Despite significant recent achievements in the field of face recognition, implementing face sketch recognition effectively presents serious challenges to existing methods. In this paper, we propose a novel face sketch recognition approach based on FaceNet which can directly map face image to a feature vector. Instead of matching the face sketch images to photo images directly, we firstly transfer the photo images in gallery into sketch style to reduce the great texture discrepancy between face sketches and photos. Extensive experiments on public datasets demonstrate the superiority of the proposed method.

Facial Action Unit Recognition using Data Mining Integrated Deep Learning

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Department of Electrical & Computer Engineering, Louisiana State University, Louisiana, USA

Abstract: Facial action unit detection is an ongoing research area in image processing and computer vision. Different methods have been proposed in the recent years for accurate detection of action units in facial images for various views and lighting conditions. In this paper, we propose a new deep learning scheme that integrates convolutional neural networks with association rule mining. Convolutional neural network is used for automatic extraction of features from input images, and the results are exploited to build two different association rule mining-based classifiers. The obtained results show an improvement compared to a fully connected neural network, for which the features are originally designed, for some action units.

Fingerprint Minutiae Point Matching in a Biometric Authentication System

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Abstract: To determine that two fingerprints are from the same finger, the general pattern configuration must agree, this means that the two fingerprints must have the same pattern configuration. Therefore, this paper reports several stages of fingerprint minutia point matching in a biometric authentication system in other to achieve its maximum security. It also specifies its significance and the errors that can highly affect the efficiency and effectiveness of a biometric authentication system.

Flood Event Recognition from Images Based on CNN and Semantics

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Abstract: Recognizing sensitive events in images, such as flood events, is significant for the maintenance of normal public opinion and social stability. By now, it is still a challenging problem. In this paper, we propose a novel method for recognizing flood events using semantics and CNN-based multi-label image classification. Our method utilizes the empirical information of people so as to improve the recognition result. We first define the semantic model of flood event and introduce it into a multi-label classification model which is based on CNN, and then use the event discrimination model to predict the results. Concretely, for the multi-label classification, we propose a novel end-to-end model, which takes the images as inputs and outputs the predictions of multi-labels. The model can be pre-trained with a single-label dataset, and no ground-truth bounding boxes are required for training. The experimental results demonstrate that our proposed flood event recognition method is superior to others.

HSV and NDVI Color Space Analysis and Sampling Procedure for Counting of Seedlings in Eucalyptus spp Plantations from High Definition Aerial Images

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Sao Paulo State University at Ilha Solteira, Brazil;
Universidade Estadual Paulista, Ilha Solteira, Brazil

Abstract: A methodology was developed in this work for the automatic counting of individual seedlings in plantations of Eucalyptus spp from high definition photographs with the help of Scientific Python Libraries from literature. The problem to

be investigated was presented and two different ways of solving it were discussed together with their implications. With the algorithm properly validated on training data, an actual business case of seedlings detection and counting out of a mosaic aerial image was proposed as testing data. The high-definition pictures were taken by multispectral sensor onboard an UAV from an Eucalyptus spp plantation stand of approximately 25 hectares and provided by Eldorado Brasil. The results were considered very encouraging, stimulating future works in this line of research.

Identification of Cashmere/wool Based on Pairwise Rotation Invariant Co-occurrence Local Binary Pattern

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Key Lab of Textile Science and Technology, Ministry of Education, Shanghai, China

Abstract: The identification of cashmere and wool fibers is a challenge of textile field. The two animal fibers are very similar in surface morphology, performance of physics and chemistry. In this paper, we proposed a new method for automatic identification of cashmere and wool fibers with high accuracy. The Pair-wise Rotation Invariant Co-occurrence Local Binary Patterns was used to represent the microscopic images of cashmere/wool fiber. Every fiber image was converted to a vector, which is a histogram of LBPs extracted from fiber images. The vectors were fed into Support Vector Machine for a supervised classification. The experimental results indicated that identification accuracy is about 90% and the proposed method is robust under datasets with various blend ratios.

Multi-Camera Smart Surveillance System

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Department of Computer Science, Tennessee State University, Tennessee, USA

Abstract: This paper presents a multi-camera surveillance system that detects and tracks a moving object in indoor and out-door environments. Since each camera has specific field of view (FOV), the problem is how to keep track of the object when it is out of the FOV of a camera. The system uses landmarks to coordinate the tracking tasks among the cameras. In this work we proposed and developed an algorithm to switch from one camera to another, according to the current location of the object of interest. The algorithm attempts to switch to the nearest camera which can observe the object of interest. Experimental test results showed that the system can coordinate the camera activities and track objects of interest as they move in the monitored area.

Time Series Data Classification using Discriminative Interpolation with Sparsity

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University of Florida, Gainesville, Florida, USA

Abstract: Here we consider a novel approach for the categorization of time series data, called Classification by Discriminative Interpolation with Sparsity (CDIS), that circumvents the need for feature extraction as in traditional machine learning techniques. During training, the wavelet representations of functions in the same class are warped to become more similar to each other while moving away from functions in different classes. This process—termed discriminative interpolation—leads to gerrymandering of functional neighborhoods in service of supervised learning. We detail a full multiresolution wavelet expansion, incorporated with sparsity, for the functional data. The utility of the proposed CDIS method was experimentally validated on several data sets, thus demonstrating its competitiveness against contemporary and state-of-the-art feature-based methods.

Facial Recognition: A Combined Approach Utilizing CICA, PCA, and FFT

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Department of Computer Science, Multimedia, Isra University, Amman, Jordan

Abstract: Facial recognition (visual Biometric) is an individual identification system based on analyzing facial features. It is used to authenticate or identify persons by comparing a facial image with images in facial database or any other digital image sources. The process of facial recognition (FR) should be accurate regardless of image affecting factors (translation, expression, illumination, etc.), which is still a challenging problem. In this research, a combined Facial recognition technique is suggested utilizing principle component analysis (PCA), Constrained Independent Component Analysis (CICA), and Fast Fourier Transform (FFT). FFT is used to overcome the problems of translation, and slight illumination sensitivity. The paper aims, at first, to study the effect of combining PCA with CICA for facial recognition. The next step is to evaluate the systems performance when transforming facial images (using FFT) before applying PCA and CICA. The experimental results (conducted on ORL & Yale databases) indicate that the accuracy is highly improved when FFT is applied.

Object Movement Detection by Real-Time Deep Learning for Security Surveillance Camera

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Abstract: Developing a smart Web Video Player application connected to a security surveillance camera to keep track of the object of interest is an ongoing research. This paper presents a methodology to real time data mining of the sequence of frames from a live stream collected by security camera by processing trajectories of an object of interest. Two classifiers and a clustering method are implemented all working in real-time. Real-time Deep Learning and Support Vector Machines (SVM) machine learning algorithms are implemented on a local server without the use of cloud computing. This is a popular architecture for many buildings and industries who want to have an in-house smart security camera application.

An Empirical Evaluation of Machine Learning Approaches for Species Identification Through Bioacoustics

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Abstract: In this paper, we investigate a complete system for identifying species from audio files. Audio data from both high quality and low quality sound files with varying degrees of background noise are collected and preprocessed for enhancing the learning capability of machine learning models. Then, fine-scale features are extracted to quantify acoustic properties of audio streams. Based on the proposed system, we evaluate a set of popular machine learning approaches on audio data from the cat and dog families. The experimental results show that the use of appropriate quality data and machine learning models yield compelling identification accuracy of species with limited user assistance.

A Generalized State of the Art Model for Precise Visualization and Analysis of Defected Portions of Fruits using Choice Based Segmentation Technique

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Department of ECE, Amity School of Engineering & Technology, Amity University Uttar Pradesh, India;
Department of Electrical and Computer Engineering, Texas A&M University, Kingsville, Texas, USA

Abstract: There are number of computer vision based quality analysis of products and process have been developed in the past where image analysis and image understanding plays a key role in the systems for faithful operation. In this paper, we have developed a generalized state of the art model for fruit inspection and defect detection based on external features of fruit images. As fruits are exported and imported in volume and it becomes difficult for farmers to check each and every fruit manually. Hence, the proposed novel approach will provide an efficient interactive tool between the user and the system. This generalized model gives a close analysis of fruit images under different image segmentation methods for better image understanding in computer vision. The proposed technique helps in analyzing the defected fruit portions accurately.

Analytic Signal Decomposition using M-Channel Signal Matched Filter Bank

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Abstract: Current signal decomposition and TFA methods like STFT (uses pre-defined computation window), EMD (not completely intrinsic, uses interpolator), PCA and ICA (both statistical based) have inherent limitations of decomposing signals into uncorrelated narrow bands and are not completely signal adaptive. In this paper, we propose an algorithm for a given data case based on signal matched filter banks having signal adaptive feature to decompose and analyze any time varying signal into uncorrelated narrow bands evaluated at immediate arrival of data. To achieve this, we have modified synthesis side of SMFB and used analytic counter-part of the original signal.

Edge Detection using Spectral Intrinsic Decomposition

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Abstract: In this paper, a framework for autoadaptive edge detection is proposed. First a multiresolution method called Spectral Intrinsic decomposition (SID) is used to perform signal decomposition process. The edge detection method is based on thresholding a sequence of filter parameter. Its algorithm includes three steps processing: image decomposition, image recomposition with some components and extraction of local maximums. The proposed edge detector is adaptive, robust to noise and can extract straightforwardly key components. The effectiveness of this proposed method is illustrated with some results on a set of images samples and compared with previous work. The results shows that this new method can outperformed other existing edge detection methods and can be used for many applications in various fields like in medical image processing.

Hand Motion Recognition Based on a 3D Fingertip Detection Fusion Method

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Abstract: Fingertips positions play an important role in Human Computer Interaction. Traditional methods for fingertip detection, based on RGB images, are designed for stretched fingers only. Recent research, based on only depth images, could not perform well. In this paper, we propose a method for detecting and tracking the 3D position of a single fingertip, and recognizing its motion. Our algorithm is a fusion of 2D and depth detection. In order to promise the accuracy of detection and

smooth the movement trajectory, a 3D Kalman filter is proposed. Finally, the hand motion is recognized based on the 3D coordinate sequences of the fingertips. Experiment results have demonstrated that the proposed method performs well because it can achieve an accuracy of 92.86% for fingertip detection.

Real-time Object Detection and Classification of Small and Similar Figures in Image Processing

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Abstract: In the current work we present an image processing architecture for real time object detection and classification. We use a combination of the widely known techniques YOLO v2 and Convolutional Neural Network classifiers, obtaining great improvements in the detection level with a minimum loss of performance compared to YOLO v2. We apply this technique in a domain where the objects to be detected are like each other and occupy small areas in the images, as it occurs with video traffic signs domain. With this approach, we achieve real-time video processing capabilities for a test set of 10 different signs classes. The tests results achieved process time levels faster than widely recognized algorithms, such as Fast R- CNN and Faster R-CNN, so it allows to project its use in real- time object detection.

Hierarchy-Dynamic Embedding for Zero-Shot Object Recognition

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Abstract: Zero-shot object recognition is aiming to attach unseen category labels to images which are out of the training set. The key challenge in Zero-shot learning is building the map between visual domain and semantic domain. However, visualsemantic embedding ignores the essential difference between the vector of category name and the entity. Rather than previous work, which maps visual vectors to word vectors, this paper proposes a novel framework named Hierarchical-Dynamic Embedding. First, Hierarchical Network Embedding (HNE) takes advantage of the internal hierachical taxonomy of the entity names. We then provide Dynamic Hybrid Model (DHM) to map unseen images from visual vectors to entity vectors. Moreover, we train the model on 1,000 seen categories and evaluate on 1,548 unseen categories, and obtain state-of-the-art performance.

Real Time Eye Gaze Estimation

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Salahaddin University, Erbil, Iraq; University of Nevada, Las Vegas, Nevada, USA;
Polytechnic University, Erbil, Iraq

Abstract: In this paper we used a set of searching techniques that allow to gain information about eye movement, its location and point of view in real time. The algorithm determines the point on the monitor at which the user is looking at. To obtain such data it is necessary to determine the relative position of the eye and the head. The first step is the initialization during which a head model is created. After initialization, the tracking phase is started using an Active Appearance Models (AAM) and Pose from Orthography and Scaling with ITerations (POSIT) algorithm for head position estimation. The purpose of eye gaze estimation or eye tracking can be used for testing the effectiveness of the text, game, or advertising message. The aim of this work is to develop and implement a system for real time eye gaze estimation using PC's webcam only without any additional hardware.

A Novel Approach to the Approximation of Conformal Mappings and Emerging Applications to Shape Recognition of Planar-Domains

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Department of Computer Science, University of Georgia, Georgia, USA

Abstract: There have been significant advances in computer graphics and computer vision for description and recognition of rigid shapes and objects. However, the problem of description and recognition of non-rigid shapes and objects is still an open problem. In an earlier study, we proposed a geodesic field space-based approach to describe and analyze non-rigid shapes from a point correspondence perspective. In this current study, we describe a canonical set of shapes, very much like a dictionary with mathematical structures that are inherently relevant to the shape classification task. We propose a novel method of representing 2D shapes where every planar shape will be assigned a unique fingerprint, which is a conformal map of the shape to a canonical shape in the plan. We believe that the study presented in this paper can be extended to describe and recognize both, rigid and non-rigid shapes and objects. The main focus of this paper is to provide an insight into the mathematical and geometrical fundamentals. We will restrict our attention to the case of doubly-connected planar domains.

Real-time Hand Gesture Recognition Based on a Fusion Learning Method

Weihang Wang, Rendong Ying, Jiuchao Qian, Hao Ge, Jun Wang, Peilin Liu
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Abstract: With the development of artificial intelligence, hand gesture recognition plays a significantly important role in human-computer interaction applications. However, due to the complex background and volatile illumination, it is still challenging to recognize hand gestures in real-world scenarios. To overcome the mentioned problems and achieve real-time dynamic and accurate recognition, a novel fusion learning method is proposed based on depth images. The algorithm is composed of efficient statistical hand segmentation algorithm, static hand pose classification via simplified shallow CNN and an improved model matching method. The experimental results demonstrate that the proposed method shows remarkable performance in complex real-world scenarios. The accuracy of the proposed method is over 98% running on the CPU, 0.08s per frame. Compared with end-to-end DNN, our algorithm has lower computational complexity and better applicability.

Review of Person Re-identification Methods

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Abstract: The automated surveillance of persons of interest across multiple videos is considered to be a challenging problem. Person re-identification and human tracking, form the core of the automated surveillance systems. Research has heavily relied on using visual appearance for identification and made many advances in the new feature design and identification accuracy. Meanwhile, more practical problems from the real situation are raised to push researchers to solve them and make the automated surveillance systems more practical. This paper provides a detailed technical review of some well-known successful methods and discusses new ideas to assist re-identification task in solving issues from the real situation such as appearance missing due to occlusion.

A Content-Aware Quantisation Mechanism for Transform Domain Distributed Video Coding

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Abstract: The discrete cosine transform (DCT) is widely applied in modern codecs to remove spatial redundancies, with the resulting DCT coefficients being quantised to achieve compression as well as bit-rate control. In distributed video coding (DVC) architectures like DISCOVER, DCT coefficient quantisation is traditionally performed using predetermined quantisation matrices (QM), which means the compression is heavily dependent on the sequence being coded. This makes bit-rate control challenging, with the situation exacerbated in the coding of high resolution sequences due to QM scarcity and the non-uniform bit-rate gaps between them. This paper introduces a novel content-aware quantisation (CAQ) mechanism to overcome the limitations of existing quantisation methods in transform domain DVC. CAQ creates a frame-specific QM to reduce quantisation errors by analysing the distribution of DCT coefficients. In contrast to the predetermined QM that is applicable to only 4x4 block sizes, CAQ produces QM for larger block sizes to enhance compression at higher resolutions. This provides superior bit-rate control and better output quality by seeking to fully exploit the available bandwidth, which is especially beneficial in bandwidth constrained scenarios. In addition, CAQ generates superior perceptual results by innovatively applying different weightings to the DCT coefficients to reflect the human visual system. Experimental results corroborate that CAQ both quantitatively and qualitatively provides enhanced output quality in bandwidth limited scenarios, by consistently utilising over 90% of available bandwidth.

Automated Diagnosis of Retinal Edema from Optical Coherence Tomography Images

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Department of CE, National University of Sciences and Technology (NUST), Islamabad, Pakistan

Abstract: Retinal edema (RE) is commonest macular syndrome which is caused by formation of cyst segments within intra-retinal pathology. RE can cause severe visual impairments or even blindness. Optical coherence tomography (OCT) imaging is the recently introduced eye testing technique that can detect early syndromes of retinal pathology. Many researchers have worked on the automated diagnosis of retinal pathology from fundus images. However, it is very difficult to detect early RE from fundus images and here we propose a discriminant analysis (DA) classifier based fully automated algorithm for the classification of RE using OCT images. We studied 75 OCT scans of 62 patients in which 14 persons had RE and 48 patients were healthy. Our proposed system achieved 100% accuracy for classification of RE patients and 91.86% for healthy subjects.

Learning Via Decision Trees Approach for Video Super-Resolution

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Abstract: In this paper, we propose an unsupervised learning-based multi-frame video super-resolution (SR) approach via decision trees model (DTSRV). This novel approach utilizes the temporal redundancy and coherence in consecutive video frames. Motion estimation is applied between consecutive frames to form concatenated motion compensated patches. The low resolution (LR) - high resolution (HR) pairs are then formed to be the training input of the decision trees. After the classification process with decision trees, a linear regression model is learnt to map the relationship between the concatenated LR patches and the HR patches. Results of our experiments show that the approach outperforms state-of-the-art model-based algorithms with an average of 0.97 dB PSNR increase and a much faster speed. It also achieves a 1.4 dB better results for large video sizes than the frame-by-frame image SR using decision trees learning techniques. This is the first time reporting in the literature to use comprehensive random trees/forests structures for video SR. Now the scheme only utilizes two

neighbor frames and can already have a good result, which proves its efficiency in real-time application. Our analysis also proves it to have more promising possibilities and advantages for future development.

Design and Implementation of a Student Attendance System Using Iris Biometric Recognition

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Department of Electrical and Electronic Engineering, Ambrose Alli University, Ekpoma, Edo State, Nigeria

Abstract: Attendance taking is a standard practice in every educational system. The methods that can be used to take class attendance are quite numerous but emphasis keeps shifting towards automating the process. The use of biometrics in taking class attendance is fast gaining ground and the traditional way of taking attendance is fast losing ground especially when the class is very large and time is of great essence. The iris was used as the biometric in this paper. After enrolling all attendees by storing their particulars along with their unique iris template, the designed system automatically took class attendance by capturing the eye image of each attendee, recognizing their iris, and searching for a match in the created database. The designed prototype is also web based. This paper proposes an alternate and accurate method of taking attendance that is both spoof-proof and relatively cheap to implement.

Short Research Papers: Symposium on Signal & Image Processing, Computer Vision & Pattern Recognition (CSCI-ISPC)

Optimal Camera Pose and Placement Configuration for Maximum Field-of-View Video Stitching

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Abstract: In this paper, we consider the task of stitching video frames captured by an array of micro-cameras in order to create an enlarged field of view video for surgical applications. We propose a method for mitigating the problem of parallax when dealing with non-planar scenes with moving objects that cross boundaries of adjacent views, causing discontinuities at view boundaries of the stitched video. The discontinuities created by parallax are especially noticeable when the object has long straight lines that cross the boundary. In this work, we propose a method of aligning the edges of objects affected by the parallax in the scene using epipolar geometry and then applying secondary transformations to correct parallax discontinuities. Our method leverages the regular shape of the object and is suitable for surgical applications where few if any feature points may be extracted from the appearance of the objects.

Frequency-domain Based Video Irregularity Analysis

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Abstract: A typical task of camera systems in industrial environments is to observe cyclically recurring production patterns. This paper deals with the comparison of videos with the aim of revealing irregularities from these repeating patterns. We suggest interpreting each pixel of a video as a temporally varying signal. We show that irregularities can be detected easily in

the frequency domain. Compared to existing methods, e.g. based on structure or color, we obtain a nearly lossless comparison that is able to deal with the stroboscope effect. The result is a 2D-irregularity map that shows deviations from the regular production process on a pixel-by-pixel basis.

Facial Recognition via Transfer Learning: Finetuning Keras_vggface

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Environmental Lab, US Army Engineer Research and Development Center, Vicksburg, Mississippi, USA;
Center for Logistics, Trade & Transportation, The University of Southern Mississippi, Mississippi, USA

Abstract: The challenge of developing facial recognition systems has been the focus of many research efforts in recent years and has numerous applications in areas such as security, entertainment, and biometrics. Recently, most progress in this field has come from training very deep neural networks on massive datasets. Here, we use a pre-trained face recognition model and perform transfer learning to produce a network that is capable of making accurate predictions on a much smaller dataset. We also compare our results with results produced by a selection of classical algorithms on the same dataset.

AI Humanoid through Computer Vision, Real-Time Facial Reenactment and Adaptive Reinforcement Learning

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Abstract: Artificial Intelligence (AI) has taken over and is the promising hope for the future of Computing. The modern man will no longer rely on his intellect to process information but rather on the AI. We present our latest breakthrough research in the field of Artificial Intelligence which we have developed that we call the Artificial Humanoid Intelligent Assistant which we believe will be prominent and instrumental in the modern world of computing. Our goal is not to make turn computers into humans but to integrate humanity on it and remove the misconception of it being conceived as a robot to being more user friendly and simple to use. We believe this will be a great approach to welcoming Artificial Intelligence humanoids to the society. To develop our AI humanoid we have leveraged Computer Vision to give it the eyes to view and interpret the environment, Real-Time Facial Reenactment to generate a friendly synthetic physiognomic facial appearance, Speech recognition paired text to voice to give it ears and a voice, and lastly we have used Adaptive Reinforcement Learning (ARL) to make it smart and be able to adjust, interpret and learn any given environment. This is far more better than the existing intelligent personal assistants of today who cannot tell or say anything about their environment or let alone learn about a new one. Results from our work in progress prototype show a developed humanoid AI which can act and interpret any given environment. With the power of the internet of things our AI humanoids can be regarded as a super computer humanoid with super skills but which can exist only inside the screen of a computer. We believe that this smart AI humanoid will be the key cornerstone of the promising future of AI powered digital assistants in computing.

A Computational Model for Mental Face Spaces: Deep Learning Empirical Space of Faces

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Abstract: This research investigates the following hypothesis about the mental constructs in the human brain processing of faces. We propose a computational model using Deep Learning. Hypothesis. The neuronal dynamics during face processing can be interpreted as exploration of a holistic mental construct that we call a Mental Face Space.

Mitosis Detection in Breast Cancer by Inference of Segmentation and Bag of Features

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Abstract: Breast cancer is one of most prevalent form of cancers in females worldwide. Normal as well as cancerous cells multiply through a biological process called as mitosis. Mitosis count is a paramount feature in determining the aggressiveness or growth rate of cancer. The cells that undergo mitosis exhibit certain stages due to which they can be distinguished from non-mitotic cells. Usually pathologists identify mitotic cells in histological images, which is a laborious and time consuming task. In this paper we have developed a procedure to automate this process. The proposed methodology constitutes of segmentation, feature extraction and classification using support vector machine. Classification of cells is performed based on features extraction of statistically segmented sub images. Bag of features has been adapted as feature extraction technique, specifically utilizing constraints of intensity, shape, texture and curvity of the cells. We have utilized MITOS-ATYPIA 14 data-set for our research. System is verified against the ground truth using two evaluation parameters sensitivity and F1 score. Adopting the proposed methodology produced the adequate results in specifying the sensitivity of mitotic cells, with sensitivity of 100% and F1 score 71.4%.

Design and Implementation of an Iris Biometric Door Access Control System

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Department of Electrical and Electronic Engineering, Ambrose Alli University, Edo State, Nigeria

Abstract: Over the years, security has soared in importance as concerned individuals, companies and organizations continue to implement measures to improve the security of lives and properties. Smart cards still remains the most popular means of implementing door access control. The card grants the holder access to a restricted area upon authentication by a card reader installed close to the door. However, there is the constant threat of theft and impersonation. The iris has found niche applications in the world of security and has been applied in diverse ways to secure lives and properties. This paper proposes the design and construction of an iris biometric door access control system. The system was developed as a means of getting into a restricted area by securing the door and limiting access. A database containing the particulars of those allowed access to the area was created to work in tandem with the mandatory iris authentication process. The implemented design worked satisfactorily.

Regular Research Papers:
Symposium on Mobile Computing, Wireless Networks, & Security (CSCI-ISMC)

A New API for Android Accessibility Testing

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Abstract: For the visually impaired, one of the biggest problems when using mobile devices are applications that do not have efficient support for a screen reader. When creating Android applications, you must follow the rules that ensure integration with TalkBack, the native screen reader of the system. But following the rules and standards of accessibility is a time

consuming and manual task. The purpose of this paper is to provide an API that automatically runs tests, analyzing whether the interfaces of an application conform to the rules proposed by TalkBack and offer tips for improving accessibility.

A Novel Secure Signaling Technique for Underwater Communication Channels Based on Differential Frequency Hopping and Spinal Codes

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Abstract: Underwater acoustic communication channels suffer from many problems, such as limited bandwidth, propagation delays, Doppler shifts, time-varying nature and multipath fading. To reduce the effect of fading and time-varying nature of the underwater communication channel, a new Differential Frequency Hopping (DFH) technique, in which the hopping sequences are derived from Spinal Codes (SPC), is used. Spinal Codes are subsets of rateless error-correcting codes. They have two main features, namely, nonlinearity due to the use of hash functions which provide secure communication and randomness due to the use of Random Number Generator functions that make the distribution of hopping frequencies almost uniform. To show the efficient performance of the presented DFH based on Spinal Codes (DFH-SPC) signaling, simulations have been performed for a short range-shallow water environment with Rayleigh multipath fading channel model, with and without Doppler shifts. The results show that the performance of DFH-SPC is highly improved than the traditional DFH based on Trellis, in addition to the inherent security.

A High Abstraction Level Constraint for Object Localization in Marine Observatories

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Abstract: A sensor network is a specific type of network that consists of a set of distributed sensors with a main objective to observe and analyze its environment. Therefore, an underwater sensor network can be defined as a sensor network deployed underwater that monitors underwater activity. The sensors deployed, such as Hydrophones, are responsible for registering underwater activity and transfer it to more advanced components. The process of data exchange between the aforementioned components perfectly define the Marine Observatory (MO) concept. The first step towards the implementation of this concept is defining the environmental constraints and the required tools and components (Marine Cables, Specific Servers, etc). The logical and physical components that are used in these observatories supply interchange procedures between the various devices of the environment (Smart Sensors, Data Fusion Servers). In this paper, we present an extension to our already extended Meta- Model that is used to generate a new design tool (ArchiMO). Thus, we propose new constraints to be taken under consideration at design time. We illustrate our proposal with an example from the MO domain. Additionally, we generate the corresponding simulation code using our self-developed domain-specific model compiler. Our approach helps to reduce the complexity and time of the design activity.

An Overview of Ransomware in the Windows Platform

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Abstract: Malware proliferation and sophistication has drastically increased and evolved continuously. Recent indiscriminate ransomware victimizations have imposed critical needs of effective detection techniques to prevent damages. This form of malware has drawn attention among cyberspace researchers. This paper contributes a comprehensive overview of ransomware attacks and summarizes existing detection and prevention techniques in the Windows platform. Additionally,

it highlights the strengths and shortcomings of those techniques as well as current challenges. Then, aiming to educate, it gives recommendations to users and system administrators.

Crowd-Based Mobile Sensor Cloud Services; Issues, Challenges, and Needs

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Shihezi University, China; The University of Tennessee, USA

Abstract: Sensors have become an integral part of today's technology. Today, the use of sensors is rapidly increasing than ever before, especially mobile sensors. This drives a strong demand for crowd-based mobile sensor applications and services for mobile device users. It brings out a great business and research opportunity in crowd-based mobile cloud computing. This paper firstly discussed the trend and opportunities. Then it presented an overview of crowd-based mobile sensor in terms of its concepts, features, process and applications. Moreover, it discussed its issues, challenges and needs.

e-Government Services in Ghana - Current State and Future Perspectives

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Abstract: Current trends have proven that services provided by Electronic Government (e-Government) are helpful in the realization of good governance objectives. These e-Government services leverage on modern Information and Communication Technologies to provide an effective electronic public administration platform through which citizens and a government's Ministries, Departments and Agencies (MDAs) interact with one another. The openness of these e-Government services enhances a government's ability to achieve transparency, citizen trust and participation, while cutting down on the cost of governance. It is for these and many other benefits that the Government of Ghana has placed in pragmatic efforts in enacting e-Government policies and deploying pilot projects in several parts of the country. These deployments have mainly been spearheaded by the National Information Technology Agency (NITA). These pilot projects, to some extent, have achieved objectives such as creation of external relations (e-society); refinement of governance procedures (e-administration); and connecting nationals (e-services and e-citizens). Whilst these pilot projects have improved governance structures, dissemination of information and growth of the economy, lack of good infrastructure and sustainable funding schemes for these projects have been identified as major challenges that have affected the full realization of the set goals. This paper investigates the key mitigating factors associated with the pilot e-Governance projects in Ghana by evaluating the existing systems and then looks towards the future.

Interference of Overhearing by Eavesdropper Nodes for Secure Wireless Multihop Networks

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Abstract: In ad-hoc networks, data messages are transmitted from a source wireless node to a destination one along a wireless multihop transmission route consisting of a sequence of intermediate wireless nodes. Each intermediate wireless node forwards data messages to its next-hop wireless node. Here, a wireless signal carrying the data message is broadcasted by using an omni directional antenna and it is not difficult for an eavesdropper wireless node to overhear the wireless signal to get the data message. Some researches show that it is useful to transmit a noise wireless signal which collides to the data message wireless signal in order for interfering the overhearing. However, some special devices such as directional antennas and/or high computation power for complicated signal processing are required. For wireless multihop networks with huge number of wireless nodes, small and cheap wireless nodes without such special devices are mandatory for construction of the network. This paper proposes a novel method for interfering the overhearing by the eavesdropper wireless nodes by a routing

protocol and a data message transmission protocol with cooperative noise signal transmissions by 1-hop and 2-hop neighbor wireless nodes of each intermediate wireless nodes.

Investigating the Effect of Imperfect Sensing in Cognitive Radio Network

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Abstract: In Cognitive Radio (CR), much research is yet to be done in addressing the spectrum scarcity issues. CR has been considered as a tool to detect unused frequency bands called spectrum holes, which are not used by the licensed users, also known as primary users (PUs) and allocate this unused frequency bands to the unlicensed users also known as secondary users (SUs). The state of the frequency band can either be idle (Not occupied by the PU) or busy (Occupied by the SU). The SU have the ability to sense and use spectrum holes when primary users do not transmit data on the assigned spectrum. However, spectrum sensing errors may happen due to uncertainty of wireless channels and unpredictable interference. Because there can be unpredicted interferences. Therefore, this research paper designed a network model which is simulated using OPNET Modeler v14.0. The results obtained from the simulations were analyzed to investigate the effect of imperfect sensing on spectrum performance in cognitive radio networks.

Secure AODV Protocol for Mobile Networks using Short Digital Signatures

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Abstract: Security is a primary issue in Mobile Ad-hoc networks (MANETs). Unlike the wired networks, mobile network faces a number of challenges in security threats which are difficult to prevent due to limited computational resources, shared wireless medium, energy/battery power, limited wireless range. In this paper we review existing security attacks in MANETs and proposed an enhanced mechanism to prevent them. We modify Ad-hoc on demand distance vector routing protocol (AODV) by introducing short digital signature scheme for authentication and name it Secure AODV(SAODV).The use of Short digital signature aims at gaining the same security level but with more efficiency and less computation. The performance of SAODV is evaluated against the known security threats which is significant as it proves highly resistant to a number of malicious attempts in MANETs. We also evaluated the proposed protocol for its limitations.

Simplifying Client Side Server Communication on Android

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Abstract: Smart phones have become extremely popular in recent years. Many developers have started designing for mobile phones because of the demand for native applications on mobile devices that can provide the user with the desired experience, often requiring communication with a server. There are libraries native to Android to make this process easier but fail to address the need for a simple API for a developer performing standard tasks. What we did is create a library for the Android platform that makes the process of communicating with a server simpler. Our results show that using the library we created code became more readable, less complex in its steps of implementation and with fewer lines of code than the standard Android implementation. We report on the results of our library by comparing Android's standard implementation against our library.

Simulation Study of QoS in Wireless Sensor Networks

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Abstract: Wireless Sensor Networks (WSNs) have been a desired choice for monitoring and automatic control of remote and unreachable objects and environments due to their low cost. However, such deployment requires quality-of service (QoS) techniques to assure reliable performance. Furthermore, provision of QoS in WSNs is a challenging task due to hardware limitations. A cross-layer approach is a promising option where information from different layers can be used to make QoS decisions. In this paper, we present a routing protocol where information from the application layer is used to make differentiated routing decisions based on data packets classifications. In our case, data packets are classified into: normal, urgent, and critical. Based on this classification each data packet class is treated differently by storing each data packet class in a designated buffer. Different buffers will have different routing priority decided by the protocol designer.

Schedule Modification for Shorter Transmission Delay in Intermittent Wireless Sensor Networks

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Abstract: Intermittent wireless communication is well known and widely available method to reduce the battery power consumption in wireless sensor networks for achieving longer lifetime of the system and reduction of the maintenances overhead. However, it usually results in longer transmission delay of data messages, especially longer end-to-end transmission delay in wireless multihop transmission of data messages. Better tradeoffs are required to be realized and IRDT-GEDIR has been proposed. It is combination of IRDT intermittent wireless communication protocol and GEDIR location based hop-by-hop ad-hoc routing protocol with one of the solutions of the secretary problem for achieving shorter end-to-end transmission delay. However, the wide distribution of transmission delay affects the performance of applications constructed on the wireless networks which depends on the wake-up schedules of all the neighbor wireless sensor nodes. For achieving predictable performance of the system, i.e., to provide the predictable end-to-end transmission delay of data messages in such wireless sensor networks, this paper proposes extension of IRDT-GEDIR based on the control message overhearing and forwarding. We design a data message transmission protocol and evaluated the performance in comparison with the conventional IRDT-GEDIR.

Unmanned Vehicles: Infrastructure and Power Consumption Measurements

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Abstract: A general approach for the design and construction of Unmanned Vehicles (UV) is presented in this paper, along with experimental data of a ground UV power consumption. We will focus on monitoring or sensing UV for distant geographical areas, inaccessible or with temporary hazardous conditions (e.g. under fire or flood). Since UV must be autonomous in situations and in periods of times not necessarily predictable, we have considered the control of power supply as an essential subsystem. We have built a very low cost prototype with emphasis on autonomy and we have measured the power supply costs of the different subsystems. Measurements will be important for the in-production UV as well as for reference values in future designs, including specific improvements. The complete system is built with two UV for increasing the total area coverage of the system. One of the UV is specifically dedicated to monitorization/sensing, and in this particular example it includes a camera. The remaining vehicle is dedicated to the retransmission of control and data (mostly pictures, in this example) to the system base. The current prototype of the complete system then consists of a base of operations and two UV (small cars).

Evaluation of LTE Unlicensed Solutions using ns-3

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Abstract: As the frequency spectrum becomes more and more occupied, discussions about technologies sharing the same band grow stronger. However, there are frequency bands reserved for the use of industrial, scientific, and medical applications, the so called ISM bands. For using this frequency range, it is required to adopt some coexistence technique.With the intention of providing higher speeds to users while keeping them connected to the same network, LTE in unlicensed spectrum (LTE-U) is devised. This work analyses two coexistence techniques proposed as LTE-U: LTE-LBT (Listen-Before-Talk), and LTE-DC (Duty Cycle). Our performance analysis focuses on 3GPP indoor scenario, providing results for FTP and UDP traffic patterns.

Conceptual Mechanism Software Defined Network Topology in Multiprotocol Label Switching Netwok Domain

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Abstract: Multiprotocol Label Switching (MPLS) offers a data-transportation mechanism with a wide-range of alternatives towards the varying, complicated networking procedures and serves as a reliable broadband technique. While it enhanced the performance of packet forwarding by the use of fast label-switching, however; among the issues that come with the inherited connection-oriented architecture of MPLS are reliability and fault-tolerance. Failure management is one of the fundamental instruments that allow network operators to provide communication services that are much more reliable than the individual network components (nodes and links). In this study, we present a multi-objective, fault tolerant model for MPLS network design problems utilizing a Software Defined Networks (SDN) paradigm by introducing a Bicriteria Direct Algorithm known as Maximum Flow under Minimum Cost algorithm model. This paradigm uses the OpenFlow control management plane to design a survivable model in MPLS that will reroute traffic along optimal paths in the case of link failures. This implementation maintains and ensures a continuous network functionality that aims to resolve the shortcomings of the typical inherited connection-oriented design of MPLS networks. This approach achieves faster recovery time compared to traditional MPLS networks, while attaining optimal Fast Re-Routing technique following link or node failure scenarios.

Performance Analysis of Handover Strategies in the 3GPP Small Cell Scenario

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Abstract: The deployment of small cells is a possible solution to improve the performance of voice and data services at indoor hotspots. However, despite helping the distribution of transmission resources, they might work at the same macrocell frequency, possibly increasing the system interference. Furthermore, a large number of handovers among small and macrocells might be triggered due to the overlaid coverage between these two types of cell. This article analyzes the impact that the presence of blocks of these short-ranged cells will have, not only on the number of handovers, but also on the throughput of an LTE system.

Cloud Based Mobile Services in Academic Environment

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STC Research Center, Mid Sweden University, Sweden

Abstract: Wireless technology progress in combination with widespread use of mobile devices, has facilitated to provide effective and efficient services in many domains such as health, transport, commerce, government, education, etc. However, the efficiency of existing infrastructure remains low due to miss-understanding of the user needs and resources. The goal of this paper is to identify and categories mobile services in educational environment taking into consideration the use of shared services as cloud computing and cellular communication technologies. Interaction and integration of existing technologies and exploitation of intelligent methods provide mobile services to satisfy the requirements of faculties, administrators, staffs, students and other users in academic environment properly. In this paper, the primary focus is on services for students' needs; then capabilities of cloud computing or wireless technologies that could be used for implementing of these services were denoted. Finally, the challenges of cloud computing usage for academic areas were denoted.

OFDM over Underwater Acoustic Channel with Large and Small Scale Fading

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Abstract: About 70% of earth surface is covered with sea water, an area that is few explored in communication. Investigating submarine communications can be strategic and a competitive advantage to countries with long coast. This work aims at evaluating through software prototypes the performance of a communication over underwater acoustic channel (UAC) subject to large and small scale fading. The submarine channel modeling follows Bellhop algorithm along with small scale fading. OFDM over submarine channel is compared to frequency selective time-varying classical wireless channel in order to investigate the effects concerning temporal and frequency scattering. Thus, the analysis is based on OFDM system, in which, besides data rate increase by subcarrier multiplexing, it can mitigate the traditional wireless multipath fading. After presenting the submarine channel models and the related works to this paper proposal, we provides the evidences of the difference between the models presented and the similarities of BER performance for the channels analyzed.

Selective IoT Access with Scalable CP-ABE Revocation and Delegation

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Abstract: With the evolution and advancement of IoT devices, privacy and security of data have become a critical concern. Ciphertext Policy Attribute Based Encryption (CP-ABE) is a selective access control scheme that provides fine-grained confidentiality and privacy of data. Proxy-based Immediate Revocation of Attribute Based Encryption (PIRATTE), a variant of CP-ABE scheme provides revocation without the need of re-encrypting and issuing new keys to the non-revoked users which CP-ABE fails to address. Scalable Proxy-based Immediate Revocation (SPIRC) scheme overcomes the limitations of PIRATTE as it does not require maintaining a prior revocation list, re-encryption and re-distribution of keys. We present an extension of SPIRC that supports scalable user and attribute revocation along with delegation. Attribute revocation allows the system to revoke specific attributes of a user instead of revoking the user entirely. In our construction, each attribute of a user registering with a trusted server is associated with constant random parameters. These set of parameters associated with each attribute of a user are independent of the ciphertext. If server modifies the parameters associated with the user.s decryption key, decryption by the user will not be permitted. Performance analysis of SPIRC with attribute revocation and its comparison with PIRATTE scheme is demonstrated.

Approach for Quality of Service Provisioning in Cognitive Radio Networks

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Abstract: Advances in technology with unprecedented increase in its demand, stringent regulation of an invaluable natural resource, as well as the misuse of this resource, has given rise to the need for and the advent of cognitive radio technology. With dynamic spectrum access (DSA), secondary users can opportunistically use the frequency spectrum of legal primary owners at idle time, as long as these primary users are not disrupted by interference. This ensures increased efficiency in wireless communication. However, cognitive radio (CR) is not without some significant attendant challenges such as in spectrum sensing, spectrum sharing, quality of service (QoS) provisioning, network topology flexibility etc. This research work is targeted at provisioning QoS in CR. We employ a Medium Access Control wireless standard, the ZigBee protocol in achieving this goal. This IEEE 802.15.4 is confirmed by simulation to be QoS-enabled, with inherent properties in favour of the cognitive radio network environment.

An Intelligent Mobile Application for Maximizing Credit Card Rewards

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Abstract: Credit Cards are not only convenient to use but also save your money. You can have partial of your payment back as cash if you use the right card in grocery stores, take free flights to anywhere, enjoy free nights at hotels and get free giftcards for your favorite stores. Almost everyone has more than one credit cards but sometimes they may be hesitated to swipe the card. The question comes up is which card should I use to get the most rewards for this payment. This paper presents an Android mobile application to help users to choose the best credit card for every purchase in different categories. User chooses what kind of credit cards to be added and names the store where the payment goes to. The result is a ranking of all the credit card rewards in that category and the credit card with the highest reward will be ranked first.

Evaluating Enterprise Mobility Strategy

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Abstract: Enterprises are developing mobile solutions for variety of use cases. In all the use cases, the enterprise should consider developing a mobility strategy. Like any corporate strategy, mobility strategy should be evaluated. Models and tools are needed to evaluate the different mobility strategy options and help with decision making. Complexity with evaluating the mobility strategy is mainly due to (1) all different business lines might have different views on the mobility strategy, (2) different layers in the management see the mobility strategy differently, and (3) mobility strategy requires several steps in defining and implementing. A holistic approach is essential for evaluating a mobility strategy taking the whole enterprise into account and throughout the entire process of realizing the mobility strategy. In this paper, we present a generic model for evaluating the mobility strategy.

An ANN Based Mobile Malware Detection for Android Systems

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Computer Engineering, Ishik University, Erbil, Iraq

Abstract: Due to the wide interact of mobiles and their applications with many important activities of our lifestyle, every day the number of mobile users and their interest on downloading mobile applications are increasing. Such increase stimulates the interest and the trend of attackers to penetrate and attack mobiles more than the other type of devices. Researchers are now focusing more on building effective models to detect and classify mobile applications into normal and malware. Most works studied different features of Android based malwares as the Android Operating system (OS) is the most vulnerable against attackers. This work is focusing on combining two different type of features; the first feature is related to the physical status of some hardware of the mobile devices. The second feature is related to the tracking the malicious system calling and misusing permission.s behaviors by some mobile applications. This work collated 1360 applications (975 malware and 385 normal). The work extracted the mentioned features form those applications. Based on that, the work built an Artificial Neural Network (ANN) to train it on discriminating normal from malware. Later, the network has been tested with all samples without detecting any false positive or negative alarms. And, at the end an accuracy of 100% of classification has been obtained.

Estimating Cost of Enterprise Mobility Strategy

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NetApp, USA

Abstract: Enterprises develop mobile solutions for variety of use cases. In all the use cases, the enterprise should consider developing a mobility strategy. Enterprises need to measure the cost and benefits of the mobile solutions and their returns on investment. One question is how to estimate the cost of various strategic options while developing the enterprise mobility strategy. The cost estimation is challenging due to inherent uncertainties and many dynamics involved. The objective of this paper is to examine several relevant dynamics in estimating the total cost of executing the mobility strategy over a period and develop a generic model that can be used to estimate the costs under various conditions and scenarios.

Wireless Sensor Network for Rainfall Measurement using a Tipping Bucket Rain Gauge Mechanism

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Department of Electrical and Electronic Engineering, Ambrose Alli University, Edo State, Nigeria

Abstract: Distributed wireless sensor networks are a new technology that can provide processed real-time field data from sensors that are physically distributed in the field. The wireless sensor gives a precision rainfall detection and measurement. Rain fall measurements are sent to a collector point or central unit where the measured values from the tipping bucket are received, displayed and stored. The objective of this project is to create a wireless distributed sensor network that provides real-time detection and measurement of rainfall in several rain gauges placed in different location in a field. The sensor nodes consist of water level sensors and a wireless transceiver which transmits the measured data from the rain gauge to the receiver or the collector point attached to a computer system. Data retrieved is then displayed by the means of a GUI created customarily for it at the central station. The result of the research work shows a significant accuracy in the rain fall measurement recorded.

Short Research Papers:
Symposium on Mobile Computing, Wireless Networks, & Security (CSCI-ISMC)

Comparing Simultaneous vs. Serial Acquisitions in Smartphone Investigations

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Abstract: Law Enforcement is constrained by lower budgets but is still challenged to do more with fewer resources. This paper discusses the importance of multiprocessing and the performance evaluation for simultaneously extracting all the evidence from four completely different phones versus extracting the evidence from each phone serially. The professor / author is conducting research to compare the results of four cell phone / smart phone investigations on a modern laptop versus performing the investigations in a serial fashion on. People from law enforcement, the legal industry, and academia will discuss their viewpoint on the performance in a full research paper next year.

Tarsier: A Light-Weight Mobile Framework for Visualizing Gravitational-Wave Transients

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Abstract: The direct observation of gravitational-wave (GW) signals has become one of the most exciting events in this century. However, data analysis for finding signals of gravitational-waves from huge collected data is still a challenge for researchers. In addition, we also found that the researchers cannot easily view and manipulate collected data with mobile devices, such as mobile tablets. Since there is a need to access GW data on a mobile platform, we propose a new mobile framework, Tarsier, that consists of a mobile client as a front-end for data visualization and a flexible web architecture (RESTful APIs, Node.JS and MongoDB) as a back-end to provide data services. This is an ongoing project of undergraduate research, but the current design and results demonstrate a promising direction of applying computer science technologies to the Astro-Physics domain.

Machine Learning Approach Using ANN on the Design of Flexible Wireless Sensor for UWB Applications

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Department of Computer Science, University of Arkansas at Little Rock, Arkansas, USA;
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Abstract: This paper presents the design of UWB flexible wireless sensor for WLAN, 5G, and WiMAX applications. The design is a pentagonal shaped radiating element placed on a top of flexible polyimide substrate and it is simulated using the well-known 3-D electromagnetic (EM) simulator HFSS, v.18.1. As the EM simulator required large computing cluster to solve the design under consideration in addition to the time consumed, Artificial Neural Network (ANN) is used to implement the design and eliminate the factor of time for the aforementioned structure. ANN with 15 hidden layers based on Levenberg-Marquardt algorithm is presented. An error of less 1% is produced during the leaning, validation, and testing processes. The implemented ANN is a good candidate to represent the design and eliminate the factor of simulation time in addition to the cost of large computing cluster.

Regular Research Papers:
Symposium on Artificial Intelligence (CSCI-ISAI)

Artificial Intelligent Agent for Autonomous Prediction and Dynamic Feedback for High Performance Athletes

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Abstract: We present an autonomous artificial intelligent agent to dynamically communicate to a high performance athlete how much time remains for that athlete to sustain his current effort in watts, and then, if the result is incorrect, to autonomously recalibrate its algorithms to not make that same mistake again, it takes a series of experiments to ascertain what algorithms are most suited for this goal. The field of measuring elite athletes.s abilities is based upon measurements such as maximal O2 consumption (V O2max), Heart beats per minute (bpm), Watts of energy (watts and kilojoules) and peak power output ((Ppeak)) to name a few. Because there is an element of uncertainty and imprecision in measuring human performance, this field of art suits the likes of Rough Set Theory. The aim of this paper is to demonstrate that Rough Set Theory is remarkably adept at yielding accurate predictions of performance limits at a particular time. The aforementioned leads one to the hypothesis that a Rough Set engine may, in the future, select the best Knowledge Discovery in Database (KDD) tool form a plurality of KDD, fuzzy, neural and machine learning tools - to eventually become intelligent in predicting the performance limits of high performance athletes. This paper first reviews lactate and blood issues in delivering O2 to muscles, then it presents the rough set hypothesis, experimentations and experiment results.

Determination of Linear Force-Free Magnetic Field Constant alpha Using Deep Learning

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Center for Space Plasma and Aeronomic Research, The University of Alabama in Huntsville, Alabama, USA

Abstract: Modeling the coronal magnetic field of the Sun is an important objective in heliophysics. In this study, we illustrate how to use deep learning to estimate the parameter for a magnetic field model. A linear force-free magnetic field configuration is employed to model, as an initial illustration, an active region by using two magnetic dipoles and to determine the associated linear force-free field (LFFF) Alpha parameter from a set of pseudo-coronal loop images which serve as training and validation sets to existing deep learning algorithms. Our results show very high accuracy of determining the LFFF parameter Alpha from pseudo-coronal loop images.

A New k-NN-Centroid-Inspired Density-Based Clustering Algorithm

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School of Information Engineering, Changan University, Xi'an, China

Abstract: Density-based clustering algorithms are well known for identifying clusters possessing very different local densities and existing in different regions of data space. However, the parameters required by most popular density-based clustering algorithms, such as DBSCAN, are hard to determine but have significant impacts on the clustering results. In this paper, we present a new density-based clustering algorithm in which the selection of appropriate parameters is less difficult but more meaningful. Experiments performed on several datasets show the effectiveness of our approach.

Autonomous Causally-Driven Explanation of Actions

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Abstract: We propose a cause-effect reasoning mechanism with which an autonomous system can justify planned actions to a human end user. The mechanism is based on a structure we call a "causal plan graph," which encodes the causal relationships between the actions, intentions, and goals of the autonomous system. Causal chains within this graph can potentially serve as intuitive, human-friendly justifications for the autonomous system's planned actions. A prototype of this mechanism is tested in simulation on a set of planning problems from an autonomous maintenance scenario. We demonstrate empirically that shortest path algorithms can effectively reduce a very large number of possible causal chains to a small, intelligible subset that might reasonably be inspected and ranked by a human. Consequently this work can serve as the basis for an experimental platform for future end user studies with human participants.

Cerebral Vasospasm Decision Support System for Neurosurgeons

Rory Lewis, Michael Bihn
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Abstract: This paper explores the formulation of an epistemic approach to Decision Support System (DSS) that have a plurality of various experts affecting said system. In fact, the authors have a DSS computational neuroscience DSS system for neurosurgeons to predict cerebral vasospasms. The problem is that various neurosurgeons will input diametrically opposed indices to the DSS. We propose combining argument theory, with logic to sit on top of our cerebral vasospasm DSS based on rough set theory. We start with integrating the patient.s features into each argument to provide an epistemic approach to an ensemble of decision trees. The goal is to provide neurosurgeons an opportunity to examine their own patient recommendations while countering their DSS responses to the group of neurosurgeons. We propose implementing principles of predicate calculus and formal argument definitions to identify consistency and other measures on the arguments, their associated models and the ontology encompassing them. Once the decision process has been captured, we hope to minimize the decision tree for ease of use.

Fuzziness based Random Vector Functional-link Network for Semi-supervised Learning

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School of Engineering and Computer Science,University of the Pacific, California, USA;
Department of Information Resources, State Information Centre, Beijing, China

Abstract: To improve the generalization performance of random vector functional link networks (RVFL), we propose a novel fuzziness based RVFL algorithm (F-RVFL) from the perspective of fuzzy theory for semi-supervised learning. Compared with the RVFL algorithm, the proposed F-RVFL algorithm shows better generalization performance on classification problems. In addition, we studied the relationship between the samples' output fuzziness and the classifier performance and obtained some useful conclusions, which gives a new direction for RVFL performance optimization.

Reinforcement Learning for All: An Implementation using Unreal Engine Blueprint

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Abstract: Game engines, like Unreal, Unity, and Cryengine, provide cutting edge graphics, sophisticated physics modeling, and integrated audio, greatly simplifying game development. These advanced features are often accessible through visual scripting interfaces used in rapid prototyping and by non-programmers. The goal of this research was to demonstrate that these tools can support implementation of artificial intelligence techniques, such as reinforcement learning, that have the potential to yield dynamic characters that are not pre-programmed, but rather learn their behavior via algorithms. Its novelties are the implementation of a Q-Learning bot, created in Unreal Engine's visual scripting tool, known as Blueprint.

Sentiment Analysis of Tweets Including Emoji Data

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Abstract: Sentiment analysis of text is a valuable tool used to identify and classify bodies of text for various purposes, including public sentiment detection in political campaigns, spam detection and threat assessment. In this paper, we examine the effectiveness of incorporating Emoji data for Twitter data emotion classification. We conducted experiments using Multinomial Naive Bayes (MNB) and Support Vector Machine (SVM) classification methods, with automatically labeled Twitter We compare the accuracy of these classification methods with and without the Emoji data included over varying vocabulary sizes. We find that MNB outperforms SVM on the data for large vocabulary sizes, and both classifiers perform slightly better with the Emoji data included.

Machine Learning Grey Model for Prediction

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Abstract: Grey model GM(1,1) which implies first-order derivative and one independent variable is considered to predict results producing better accuracy. Solving the grey model GM(n,m) for prediction is still being a challenge due to erroneous results of higher order derivatives, where n is the derivative order and m, number of independent variables. In this paper, we solve this challenge through reduction method and recursive computation. Thereupon, we propose a new method called GM(n,m,k) which is generalized using Machine Learning, where k is a set of constraints belonging to m dependent or independent variables of a given system. We have applied and tested the proposed grey model to applications in airlines industry and it is proved to give results with much better accuracy than the traditional grey model.

Learning Motion Policy for Mobile Robots using Deep Q-Learning

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Abstract: We present a deep Q-network (DQN) that learns motion policy for multiple mobile robots. Although DQNs have shown huge successes in several domains, there are few applications to learning for multiple robots. We propose the several advantages of deep Q-learning for multi-robots and present our implementation on a physics-based simulator. We show that the robots learned by the proposed DQN can successfully navigate an unseen environment and escape a dead-lock situation.

Non-Intrusive Distraction Pattern Detection Using Behavior Triangulation Method

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Abstract: Driver distraction is the primary reason of car accidents. Predicting distractive driver behaviour and adapting the car systems accordingly is one solution for this problem. We use neural network to find a correlation between driver-related patterns and car system variables. We conducted an experiment to induce distractive task sets to drivers and collected corresponding data patterns, then use both data sets to train the network. With our triangulation algorithm, we reused the trained network to predict driver behaviour using the data patterns from part 1. Our neural network accurately predicted driver related variables when fed with system variables alone.

Cloud-Based Intelligent Vehicle Navigation and Control

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Abstract: A framework to integrate different artificial intelligence and machine learning algorithms is combined with an execution framework to create a powerful cloud computing system development platform for developing cloud-based intelligent vehicle navigation and control. Using real-time kinematics, a ground vehicle prototype has been created that achieve centimeter-level positional accuracy. This research paper provides the results of the ground vehicle prototype currently in development and used in a mobility-as-a-service application.

Rule Based Modelling of Knowledge Bases

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Abstract: It is critical to have a knowledge base model for efficient storage of extracted knowledge. This ensures that the knowledge is stored in a meaningful way to be used for different applications. The efficiency of the knowledge base model depends largely on the rules of construction. Knowledge represented using logico-linguistic techniques and semantic networks lack a consistent rule based knowledge model. The current paper deals with the analysis of text from the knowledge extraction, representation and semantic network phase to formulate rules which would lay foundations of a knowledge model. The developed rules seem to be promising providing a comprehensive coverage of different scenarios. The extensive coverage is an indication that the knowledge model will cater to the entire domain knowledge, thereby laying the foundations of automatic construction of efficient knowledge bases.

Short Research Papers:
Symposium on Artificial Intelligence (CSCI-ISAI)

An Efficient Training Procedure for Viola-Jones Face Detector

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Abstract: During the past decades, face detection has attracted significant attention. Many papers have been published utilizing various methods for face detection. One of the most popular face detectors used in many practical applications is Viola-Jones method. Despite of being a real-time and robust face detector, it suffers from not well explained parts at the training procedure. Such as, .not clear how to select few features in the first cascades. or .not clear how many samples are needed and how to gather a good train set for training a cascade.. In this paper, a train set selection method based on histograms generated from AdaBoost and also, a simple method to select few features in beginning cascades are proposed. The training procedure is then compared to a baseline training presented in the previous works.

Influence of Deep Learning on Precision Improvement in Predictive Models of Wind Power Generation

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Abstract: This paper, proposes the use of Deep Learning in predictive nonparametric models that use artificial intelligence tools to approximate power curves of wind farms. Three different tools are evaluated: artificial neural networks, fuzzy inference systems and Auto Encoders, an initial model of deep learning networks. The tools are inserted in a non-parametric model of power prediction, where they are compared. The results show that the autoencoder-based power curve performs well above other proposed tools. This significantly improves the performance of the predictive power model.

DeCUVE: Deep Learning Cloud Unified Virtual Environment

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Abstract: Recently, with advancement in deep learning technology in CCTV, drone and other various fields, large scale image processing environment becomes crucial and essential for fast real-time processing. In this paper, we shall present a distributed processing environment DeCUVE (Deep Learning Cloud Unified Virtual Environment) which provides scalability and provisioning for the deep learning inference. We shall show that deep learning training inference can be executed fast on our environment.

Regular Research Papers:
Symposium on Social Network Analysis, Social Media, & Mining (CSCI-ISNA)

A Web-based Social Network Analysis System for Guiding Behavioral Interventions Delivery in Medically Underserved Communities

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Abstract: Social network analysis has been adopted in multiple research fields. In healthcare, previous research showed that social network analysis results can be used to guide healthcare professionals to provide health interventions to a selected population but achieve bigger scale impact in the population. In this work, a web-based social network platform was developed to support social workers to conduct social network data collection in medically underserved communities. The collected data can be analyzed and the obtained results can be used to guide the selection of participants of behavioral interventions. A usability study was conducted with social workers to evaluate this web-based social network platform. A social network analysis was also performed on the data collected from residents in one selected street block. The study results indicate that the web-based social network platform makes it efficient to collect social network data and convenient to perform the social network analysis. The social network analysis results are also evaluated empirically, which indicates that the results are accurate and may be used to guide the delivery of behavioral interventions.

SICS: A Social Network based Information System for the Inclusive Community

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Abstract: In this paper, we present an information system based on a social network architecture for the Inclusive Community, called SICS. The scope of proposing such a system is to promote social and health care integration, strengthen territorial networks, and facilitate communication among social workers, fragile people and resources (i.e., volunteers, etc.). The paper outlines the methodological considerations with regard to information management, modelling and design of data related to the SICS, and describes the related underlying data model. The implemented system is composed of a web based back-end and three Apps for, respectively, the assisted person, community social workers and volunteers, and messaging. SICS is designed and developed within the INSPIRE project and is used to achieve its required goals.

The Current State of Interoperability in Decentralized Online Social Networking Services

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Abstract: Online Social Networks (OSN) are mostly closed, proprietary services that disallow interoperability with other OSN services. In the area of decentralized OSN services, several protocols and services have been proposed that attempt to implement interoperability for distinct aspects of OSN services in heterogeneous federations of OSN services. In this work, we analyze existing protocols and implementations of interoperable OSN services. While existing protocols aim to provide interoperability between OSN services, their scope is limited to certain aspects of OSN functionality, for example dissemination of status updates or creating follower relationships. In practice, OSN services implementing such protocols show a limited support for interoperability, where most functionality cannot be used and accessed between different OSN services. This emphasizes the need for a standard implementing interoperability in the social web.

A System for Visualizing the Relationships between Pages and Involved Factors Across the Gap of Local Area and the Web

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Division of Natural Science, Tokyo Gakugei University, Tokyo, Japan

Abstract: Web exploration with trial and error have widely been conducted in intellectual activities such as research work and PBL. In such exploration, users should positively review the results of own searches to discover new valuable pages. However, such review imposes the burden on users since viewpoint of the exploration is variable and the involved information increases more and more with progress of the work. Therefore, it is particularly important but difficult for users to detect the search direction while examining the relationships between obtained pages and unknown pages on the Web. In this research, we were aiming at developing a novel system for visualizing pages and the involved factors across the gap between local area and the Web. This paper mainly describes the overview of our support method along with some snapshots of the prototype.

Local Edge Betweenness based Label Propagation for Community Detection in Complex Networks

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Abstract: Nowadays, identification and detection community structures in complex networks is an important factor in extracting useful information from networks. Label propagation algorithm with near linear-time complexity is one of the most popular methods for detecting community structures, yet its uncertainty and randomness is a defective factor. Merging LPA with other community detection metrics would improve its accuracy and reduce instability of LPA. Considering this point, in this paper we tried to use edge betweenness centrality to improve LPA performance. On the other hand, calculating edge betweenness centrality is expensive, so as an alternative metric, we try to use local edge betweenness and present LPA-LEB (Label Propagation Algorithm Local Edge Betweenness). Experimental results on both real-world and benchmark networks show that LPA-LEB possesses higher accuracy and stability than LPA when detecting community structures in networks.

Tension Detection in Online Social Communities using Sentiment Analysis

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Abstract: With the increase in usage of Internet and ground-breaking change in the Smartphone, importance of Online Social Networks, e.g., Facebook, Twitter, Google+, and Instagram, etc., has been amplified in last decades. An online virtual world is taking shape very fast. Today, these online platforms are not only limited up to a channel of communication but also emerging as most influential tools for individual and collective expression. Usages of these platforms vary from user to user. Because of less restriction and monitoring on these platforms, miscreants and hatemonger are also using these platforms to satisfy their goal. The information related to some tension shared online can influence large section of society in very short time period. To detect whether there is tension or not at any point of time in online social networking platform, there is a need of continuous sentiment analysis, which is a challenging task because of finding the right person who is creating more tension is very difficult in a pool of users where no one is available physically. In this paper, a tension detection system has been proposed to detect tension at any point of time in Twitter feeds. Tweets (user's micro blog) related to a particular incident has been collected. After some data cleansing and preprocessing, we have carried out an analysis to divide the stream into three category viz., containing tension, neutral or positive. Every Individual has its own impact on other fellows in

virtual world also. In this paper we also have proposed an impact factor formula, which will calculate individual user's impact deciding the discourse.

Identifying Personal Messages: A Step Towards Product/Service Review and Opinion Mining

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Abstract: Twitter is one of the most popular micro-blogging services, with millions of users exchanging information. Twitter.s popularity and low barriers has led many commercial entities to start using the service. As a result, the Twitter stream has a combination of personal and professional tweets. These professional tweets are marketing messages and do not provide insight into individual people.s experiences. Thus, filtering personal tweets from commercial or professional ones is a crucial, though often overlooked, first step in mining micro-blogging data. Identifying personal messages is essential for opinion mining or product/service review in every domain, and it is specifically crucial in the healthcare domain. In this research study, we propose a method of classifying tweets as either personal or professional tweets using a novel feature set. Here we collected and analyzed three datasets from the Twitter stream related to the healthcare domain. Using a large number of hand-labeled tweets as input, we trained several classifiers on our proposed set of features and compared classifiers. accuracy, precision, and recall using 10-fold cross validation technique. On a combination of three health-related datasets, random forest classifier provided the maximum accuracy of 91.5%. This result shows that our approach can significantly increase the accuracy of data mining on the Twitter stream.

A Novel Approach for Studying Privacy Behavior in Social Media

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Abstract: Social Networking Sites achieved a breakthrough over the past few years since they allow individuals to be in touch with family and friends, but also raised privacy concerns when it comes to disclosing personal information with others. This study investigates users' behavior in terms of how they choose their privacy settings on Facebook. It examines the impact of faces and tags existence on user's privacy. Moreover, we extend the work on YourPrivacyProtector, a system for monitoring and recommending privacy settings in Facebook, and enhance the recommendation system by examining photos with faces and tags. We use machine learning techniques to understand privacy settings of different users and recommend them a stronger setting. We also evaluate our algorithms with a case study.

Dynamic Identity Classification on Real-Time Randomized Social Networks

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Abstract: Social Network analysis is a critical topic in the world of data mining and active security and privacy threats. In particular, the capabilities of social networks to undermine a user's privacy or information security is of major concern. A user's information can often contain sensitive or identifying content, thereby creating a threat of abuse if inadvertently disclosed or obtained. Through social network analysis, one can obtain an association between a user.s behaviors and identity. Such an association compromises the privacy of users in a social network, particularly in real-time, hence the need arises for a remedy. Without a real-time solution, the security and privacy of users becomes delegated to a single point of failure in access control (AC) mechanisms. If the AC is subverted, vulnerabilities in social networks can be exploited to obtain the user.s identity. This paper utilizes Artificial Neural Networks (ANN), in the context of dynamic social networks, to identify actors. Obtained results demonstrate a high average user identification rate on an arbitrary subset of the network.

Meta-path based Anchor Link Inference in Multiple Partially Aligned Social Networks

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Abstract: To enjoy fantastic services or fulfill their multifarious needs, people usually get involved in multiple online social networks at the same time. Due to the protection of privacy and the separation of different networks, the multiple accounts of the same user in different social networks are generally isolated. Finding the correspondence between users can benefit a variety of applications, such as cross-network recommendation and cold start. In this paper, we focus on inferring the correspondence between user pairs across partially aligned networks where some common users are shared, which is formally defined as multi-network anchor link inference problem. To solve the problem, an integrated anchor link inference framework, MALI (multi-network anchor link inference) is proposed, which consists of two parts: firstly, building structure-rich probabilistic networks with PU link prediction model to against noises. Secondly, taking advantage of cross-network social meta path as a powerful tool to extract useful features to train a classifier. Then by incorporating username with the ranking list which is based on the output probability of the classifier, an improved stable match model is designed to infer anchor links which are restricted to one-to-one relationships. Extensive experiments on two real-world partially aligned heterogeneous networks show that our proposed MALI can solve the multi-network anchor link inference problem very well.

Tag Ranking Multi-Agent Semantic Social Networks

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Abstract: Social Media has become one of the most popular platforms to allow users to communicate, and share their interests without being at the same geographical location. With the rapid growth of Social Media sites such as Facebook, LinkedIn, and Twitter, etc. There is vast amount of user-generated content. Thus, the improvement in the information quality has become a great Challenge to all social media sites, which allows users to get the desired Content or be linked to the best link relation using improved search / link technique. So introducing semantics to media networks will widen up the representation of the social media networks. Semantic Social Networks representation of social links will be extended by the semantic relationships found in the vocabularies which are known as (tags) in most of social media networks. This paper proposes a new model of semantic social media networks from the perspective of multi-agent systems. The multi-agent system is composed of two main functionalities: semantic indexing and tag ranking.

Regular Research Papers:
Symposium on Software Engineering (CSCI-ISSE)

A Preliminary Study on the Relationship among Software Metrics and Specific Vulnerability Types

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Abstract: Several studies have highlighted the ability of software metrics to predict vulnerabilities. However, limited attention has been given on the capacity of software metrics to discriminate between different types of vulnerabilities, while the existence of potential interdependencies among different vulnerability types has not been studied yet. For this purpose, an empirical study was conducted based on 100 widely-used Java libraries. A wide range of software metrics were calculated for each project of the code base, along with the densities of a carefully selected set of vulnerability categories, which were quantified through static analysis. Correlation analysis was employed in order to find statistically significant relationships. The preliminary results suggest that: (i) software metrics may not be sufficient indicators of specific vulnerability types, (ii) software metrics are more capable of discriminating between security-specific and quality-specific weaknesses, than between specific vulnerability types, (iii) previously uninvestigated metrics may be good indicators of security issues, and (iv) important interdependencies may exist among security-specific issues. To the best of our knowledge, this is the largest study in terms of code base size, while it is the first attempt for finding interdependencies among different vulnerability types.

A Fractal Geometry Approach to Quantifying Aesthetic Values in Scientific Codes

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Abstract: Although the literature on programming style is large, sensori-emotional or aesthetic expression in code remains poorly understood empirically. In this paper, we study "beauty"—the measure of programming style—in code using the beauty factor, a simple, relativistic model of source beauty based on fractal geometry. What is new is we study beauty in eight popular scientific libraries of approximately two million lines of code which, individually or as a composite, have never been analyzed previously for programming style. What is furthermore new is we use these libraries as independent tests of the beauty hypothesis, namely, the viability of beauty factors as quantifiable code aesthetic. Using the eight libraries and 11 different semantic-preserving transformations, i.e., 88 experiments of 5,600 trials, the data indicates statistically significant patterns ($P<10^{-9}$) consistent with previous studies of beauty factors on non-scientific, system codes. The data furthermore suggests evidence of statistically significant patterns ($P<10^{-32}$) in which the beauty model also serves as a novel metric for estimating the mnemonicity of code. These conclusions have potential to inform certain long-held, deeply felt, and passionately argued beliefs and convictions about style that have guided both pedagogy and industry best practices.

An Aspect-Oriented Framework For F#

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Abstract: This paper presents the research, design and development of an aspect-oriented framework for F#, a functional programming language developed by Microsoft on the .NET platform. Our framework allows one to insert advice *before*, *after*, or *around* the call to a particular function. We provide two distinct approaches to weaving the advice to the source code: using a *monad-based* weaver, and using a weaver built on *meta- programming* technologies.

A Standardized Procedure to Conceptualizing and Completing User Stories

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Abstract: Agile Software Development incorporates an approach called user stories to document user driven features. A user story is a form of requirements written from the perspective of the user role that the feature will be most inclined towards. Every scrum team has its own definition of completion for a user story based on knowledge of the domain and technology the solution is being developed to satisfy. Within an organizational setting, this often results in a difference in the definition of complete for a user story as team members move across different teams. This paper will outline a generic set of steps aimed at standardizing the procedure utilized in documenting a user story. We will demonstrate that this procedure assists development teams in arriving at a consensus on when a user story is deemed complete.

A Unit Testing Framework for Scientific Legacy Code

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Abstract: Large-scale scientific applications play important roles in supporting research. However, it is often very expensive and time-consuming to make changes to, maintain and evolve the scientific code due to its complexity and poor programming skills of researchers. Therefore, in order to visualize scientific code architecture to optimize software design, understand undocumented source code, and analyze software flow and functionality, we first introduce a unit testing framework (UTF). Then, because such infrastructure's performance is very crucial in practical use since the scientific legacy applications simulate instances in a long period of time, we improve the UTF by applying Message Passing based Parallelization and parallel I/O operations. Furthermore, due to the scientific code has enormous state data and the I/O capacity on the server is limited, we apply in situ data analysis method to encounter fewer resource limitations, and adopt signal processing to greatly reduce data transfer. Last, we demonstrated the correctness and high-efficiency of our framework for legacy Earth model on Titan supercomputer.

An Ambiguity Minimization Technique During Requirements Elicitation Phase

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Abstract: The ability to achieve valid requirements and subsequently delay in software projects is caused by ambiguity among other factors. This paper proposes an ambiguity minimization technique during requirements, this technique is premised on the view that wrong system objectives and business requirements results in problems characterizing the entire software. Since these objectives are defined during the elicitation phase, we used data from 3 companies in industry to relate the system objective to the business need so as to provide a desired product. We use set theory from a calculus perspective, to design a mapping technique to achieve clear requirement.

Competitive Usability Testing of Student Information Systems with Eye Tracking Method

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Abstract: We present the usability evaluation of a student information system with eye tracking method and the competitive usability tests that we performed. After the initial evaluation process, we defined some usability improvements and a new system is developed which includes these improvements. The comparison results show that the design of the second system is more usable than the first system in terms of task completion time, time to first fixation on target, number of fixations, and

fixation duration. With these results, it is shown that the usability in the student information systems can be systematically enhanced with the improvements at the interface.

Enumerative Variability in Software Product Families

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Abstract: In Software Product Line Engineering (SPLE), in the problem space, variability in a product family is specified in an enumerative manner (by a feature model), i.e. all valid variants are enumerated. However, in the solution space, current SPLE approaches use parametric variability (variability parameterised on features occurring in a single product variant) instead. In this paper, we take a closer look at enumerative variability, show how it can also be used in the solution space, and briefly discuss why it may be advantageous to do so.

Evaluation of Performance Robustness of Mobile Networked Applications

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Abstract: In this paper, we propose a model-based methodology to evaluate the impact of the wireless network conditions on the robustness of performance of adaptive and non-adaptive networked mobile applications (apps). The methodology consists of three steps and it requires three different artefacts as inputs: the network model, the app behaviour model, and the performance model. To quantify robustness, two metrics (static and dynamic robustness) are proposed. The main challenge in evaluating robustness is the combinatorial growth of network-app interactions that need to be evaluated. To mitigate this issue, we propose an algorithm to limit the number of interactions, utilizing the monotonicity property of the performance model. To evaluate the dynamic robustness metric, the ability of the adaptive app to tolerate degraded network conditions has to be evaluated. This problem is formulated as a minimization problem. The methodology is used to evaluate the performance robustness of a mobile multimedia streaming app. The effectiveness of the proposed methodology is evaluated. The obtained results show three to five times reduction in total cost compared to the naive approach in which all combinations are exhaustively evaluated.

Profiling Web Components Quality Using User-Centered Assessment

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Abstract: Despite a huge innovation in technologies and services, the adoption of software engineering practices in web development is slow. Recently, encapsulation and interoperability have been pushed forward by a new paradigm: web components. However, there are still no universally accepted or even systematically applied quality metrics for web development. In this paper, we propose a set of metrics featuring product (intrinsic and extrinsic) quality. Our approach is validated according to a user-centered framework where we ask users to rate the quality of several web components within different scenarios or mashups which is quantified separately using metrics. Our results show that the metrics and user quality evaluation are highly correlated, which is promising. Therefore, we can conclude that: 1) the metrics should be part of an evaluation framework to assess the quality of web components automatically on the scale of public repositories, 2) this process provides a systematic methodology to identify which metrics might be suitable for new categories of web components, and 3) the approach can be set up to identify a mathematical function to provide a single value for quality based on metrics.

Semantic Design for Unstructured Health Data: A Review

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Abstract: The healthcare sector today is largely driven by data; as such the need for information exchange between the various stakeholders is on the rise. To date various software applications have been developed to facilitate this exchange. However, there are emerging challenges preventing direct exchanges (interoperability) among healthcare software applications current in use in most developing countries. A large proportion of healthcare data is still in unstructured formats that are either not captured, or is poorly captured in structured data. Exchanging this type of data between hospitals and different healthcare applications is currently problematic since a clear well-defined method is yet to be put in place. This work therefore seeks to understand the most plausible method(s) that can be adopted to not only improve the exchange and retrieval of unstructured health data but also extract meaningful health knowledge from the largely fragmented and distributed unstructured health data without affecting the free text.

Success and Failure Factors in Agile Development

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Abstract: Agile software development approach has a prodigious importance in the domain of software development. Many software firms these days aim to produce valuable software in short time, minimal cost and within stable changing requirement. Our research focuses on the factors that identify the success and failure in project delivery using agile methodology as follows, culture, customer involvement, stakeholder involvement, breaking the traditions. To reconcile the desired target and objectives, we shall use qualitative methodology that will be collected via questionnaires, interviews of project managers and websites while analyzing the business processes of different organizations.

Evolution of Handling Web Applications Up to the Current DevOps Tools

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Abstract: In this paper, we show the way in which many standard web applications have evolved from a complete independence among software development and its architecture, deployment and infrastructure design to the current usage of DevOps (for Development and Operations) emerging tools. We use a specific example and its own evolution to show how increased usage and users forced to change most of the development cycle, application architecture and creating new environments for development, testing, and QA (Quality Assurance). From 2006 to date, we have taken advantage of many new technologies as soon as they were available, and we try to define a preliminary characterization for web applications evolution in order to analyze pros and cons of the current DevOps methodologies.

Difficulties of Newcomers Joining Software Projects Already in Execution

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Abstract: It is not uncommon that, in software projects, it is necessary to incorporate new developers at an advanced stage of project execution. These "newcomers" face various difficulties and challenges to find their place in the project that prevents them from starting to contribute quickly to the progress of the project. This article reports the results of an exploratory-descriptive study aimed at identifying the difficulties faced by new team members when they join a project later, as well as

identifying actions that are often adopted to mitigate these difficulties. The study reveals that scarse or null documentation and the need to know the product under construction are the main difficulties, while the assignment of a referent and the provision of training are mentioned as the main actions organizations usually take to mitigate those problems.

Problems in Current Approaches for Risk Identifcation and Risk Analysis

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Abstract: Software development projects cannot be a success without effective project management. Risk management has been recognized as an integral part of project management as well as of software engineering process models. Risk management comprises of a number of processes and there are various techniques or approaches available in literature and in practice to carry out those processes. This paper reviews a few of these commonly used techniques for two of these processes namely risk identification and risk analysis. Risk analysis can be further categorized as qualitative and quantitative and we have reviewed techniques for both of these categories. After the review, we identify the problems that need to be resolved in the techniques presented in this paper. These problems become more profound in large software development projects. It is expected that this paper will motivate researchers to find solutions to these problems so that the area of risk management can become more effective especially for large projects.

Service-oriented Architecture for the Internet of Things

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Abstract: The Internet of Things has recently gained extraordinary popularity. This popularity is only expected to grow in the coming years. Being able to receive services and information from Things anywhere in the world will bring big changes in every facet of people's daily lives. Things are considered service providers themselves. A user should be able to find a Thing and request the services provided by Things. But what happens when the number of Things become so large? How will the user be able to find and select a Things? How will users select the most appropriate and beneficial Thing to carry out a requested task? All of these are some of challenges that are rising from the popularity of the Internet of Things. This paper will investigate the above questions and try to solve them using two well established software engineering concepts: service-oriented architecture and context-awareness. The main contribution of this paper is a Service-oriented Context-aware Architecture for the publication, discovery and provision of services in the Internet of Things.

Using Petri Nets to Verify Design Model: A Survey

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Abstract: Petri nets are a powerful tool for graphical representation and analyzing software processes, so it was used in early stages of the software development process. Formal verification is a method for proving the correctness of system specification when they are described in a mathematically rigorous framework. The behavior of the system must be modeled accurately for verification purposes. The aim of this paper is to prove that software development processes modeled with the application of Petri nets can be easily modeled processes before implementation to satisfy the customer needs. To increase the reliability and quality of the system, the specification processes is formally verified design model.

Integrating Automated Fingerprint-based Attendance into a University Portal System

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Abstract: Student learning and academic performance hinge largely on frequency of class attendance and participation. The fingerprint recognition system aims at providing an accurate and efficient attendance management service to staff and students within an existing portal system. The integration of a unique and accurate identification system into the existing portal system offers at least, two advantages: accurate and efficient analysis and reporting of student attendance on a continuous basis; and also facilitating the provision of personalized services, enhancing user experience altogether. An integrated portal system was developed to automate attendance management and tested for fifty students in five attempts. The 98% accuracy achieved by the system points to the feasibility of large scale deployment and interoperability of multiple devices using existing technology infrastructure.

Should Six Sigma be Incorporated into Software Development and Project Management?

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Abstract: Employing Six Sigma and other quality methodologies have proved to be very effective in the manufacturing sector for the past three decades. However, for the software, due to the nature of it, this has not been the case. We believe one of vital elements of incorporating the Six Sigma methodology into improving any process is to critically analyze all possible root cause for why the number of defects and variation in the current process is driving those undesirable end results. In this paper, we elaborate on this and examine the major issues of Six Sigma application to software development and management. More specifically, we explore the root cause analysis as part of the software project planning methodology. We also give an overview of the Six Sigma Methodology and confer what makes Six Sigma better than traditional quality improvements methodologies along with potential struggles that software practitioners have to deal with.

Short Research Papers: Symposium on Software Engineering (CSCI-ISSE)

A Fairness-Oriented Performance Metric for Use on Electronic Trading Venues

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Abstract: Electronic trading venues (ETVs) must simultaneously exhibit high degrees of both fairness and performance, yet in diverse contexts it is recognized trade-offs often exists between these two things. Introduced in this paper is a metric that captures the minimum extent to which an ETV's performance must be inhibited by buffering so as to rectify the temporal unfairness it would otherwise exhibit. In light of 'tail latency', and so as to minimize the value it takes, a refinement of the metric is further described using a finding from queue theory pertaining to skips and slips. The metric and its associated buffering mechanism have recently been put into actual use on a major ETV: Thomson Reuters Matching.

Formalizing Data Management Systems: a Case Study of Syndicate Protocol

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Abstract: The large volume of data delivers valuable insights to many fields. A variety of big data database options have emerged for the purpose of data management. Many legacy data management systems, however, are written without formalization. Syndicate is served as a distributed file system that builds a coherent storage abstraction from already-deployed commodity components, including cloud storage and dataset providers. Through Syndicate, users can define their own provider-agnostic storage functionality to access different databases. Syndicate that fully decouples applications from underlying components generalizes the use of data management systems. It is also driving the need for further specification to guarantee the consistency and the correctness, such as functional requirements, data consistency, access control, and fault tolerance. In this paper, we take initial steps to formalize the Syndicate protocols with the goal of providing a general solution by using formal methods to improve the quality of data management systems.

Learning More from Crossing Levels: Investigating Agility at Three Levels of the Organization

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Abstract: Scholars have tried to explain how organizations can build agile teams by only looking at one level of analysis. We argue in this short paper that lessons can be learned from organizational science results explaining variance on three different abstraction levels of organizations. We suggest agility needs to be explained from organizational (macro), the team (meso), and individual (micro) levels to provide useful and actionable guidelines to practitioners. We are currently designing such studies and hope that they will eventually result in validated measurements that can be used to prevent companies from investing in the wrong areas when trying to move towards more agility.

Productivity Model for Software Development Factories under an Agile Methodological Approach

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Abstract: Software development companies face the challenge of generating greater value to the business of its customers, understanding and prioritizing their problems, and providing high impact solutions at reasonable costs. This objective requires the use of methodologies that improve productivity through the implementation of new development practices, innovation and motivation of its staff. The application of Agile methods adopt a set of principles with the aim of generating profits as adaptation, productivity increase, and therefore improved competitiveness. This paper proposes a model for measuring and improving productivity applicable to Ecuadorian software companies. With this objective, a set of metrics with measurement and interpretation strategies is proposed that provide results in an applicable and practical model which enables progressively improvement of the productivity of the company.

Software Framework for Evaluating and Optimizing Data Acquisition Efficiency

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Abstract: Industry Automation Systems such as Power Grid Control System typically acquire various measurement data and environmental information, validate the acquired dataset, and process the dataset. There are three representative data acquisition schemes; pulling, pushing, and notify-n-fetch. Pulling is the most common, however, pulling could result in acquiring unchanged measurements and missing new measurements. Pushing can result in transmitting unnecessary measurements. In this paper, we propose a design of a software platform which can apply quantitatively evaluate the efficiencies of data acquisition schemes and automatically generate the efficiency optimization methods using the evaluation. Using the platform, the runtime efficiency of acquiring contexts is increased while the resource consumption such as energy consumption and network traffic is greatly reduced.

Agile Evaluation of the Complexity of User Stories using the Bloom's Taxonomy

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Abstract: Agile methodologies are increasingly adopted by companies, these follow software engineering methods based on iterative and incremental development. Among the most popular is the framework of SCRUM (1986), which is characterized by iterations, where in each iteration it is necessary to make a planning, analysis of requirements, design, coding, tests and documentation. The requirements specification in SCRUM is based on the concept of user stories, which are the description of a requirement written in one or two sentences using the user.s natural language. An important feature of user stories is that they must be estimable, that is to say, it must be possible to determine the time it will take to complete it. This allows to determine the total time of the project. However in practice this task still has problems due to the complexity of the requirements and affecting the agreement of user stories in each iteration. In this paper we propose a strategy to classify the user stories following the taxonomy of Bloom, to determine the degree of its complexity and with this to be able to make an agile estimation of the approximate time that each one requires for its realization. We show the results obtained after the user stories have been classified from two projects and based on them, we propose a time strategy to estimate them.

Regular Research Papers: Symposium on Education (CSCI-ISED)

Abstracting Learning Methods for Stack and Queue Data Structures in Video Games

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Abstract: Computer Science students will often mention the steep learning curve when first starting to learn computing topics. It is apparent, albeit, necessary, and consequentially results in a high attrition rate of students pursuing a Computer Science related education. Learning computing concepts, particularly for students who have had little to no experience prior, can be very difficult. The workload is heavy and often very tedious, which leads to a corresponding lack of motivation to

learn. Beyond the initial difficulties, students must take numbers of courses centered mostly on complex, conceptual topics. Courses that teach data structures and algorithms are required in most schools early on in a Computer Science student's college career, and much like the introduction courses, these can be tedious and difficult to grasp. Our goal is to provide an interesting, effective, and measurable tool for learning these concepts, which we have developed in the form of a video game. This paper is focused on the implementation of stack and queue data structures within our game. A random sample of students have play-tested our game and provided comments on their experience with the playthrough. The feedback we received provides some important insights on the teaching and learning methods used in the classroom.

A Learning Module of the 0/1 Knapsack Problem using Dynamic Programming KLA Modeling

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Abstract: Kinesthetic learning is an innovative teaching method that involves the physical interaction among students in a dynamic setting. Unlike traditional methods of teaching, kinesthetic learning engages participation outside the norm of a classroom solely with an instructor lecturing and students taking notes. Previous studies have shown promising results in terms of the material absorbed by the students. Our research continues to explore the Kinesthetic Learning Activities (KLA) approach as a viable alternative to teaching Computer Science (CS). In this study, we developed a KLA teaching module on the canonical 0/1 Knapsack Problem using Dynamic Programming. We experimented this KLA approach on a group of students from an undergraduate level CS algorithms course. The participants were divided into two groups. Each group was alternatively taught using KLA and traditional methods, allowing us to precisely gauge the effectiveness of our proposed module. The students. knowledge gain was measured through a series of pre/post-test questions. We hypothesized that the KLA approach would be as efficient as the traditional lectures if not more efficient. The experimental data collected from these tests support our hypothesis with an estimated 13.37% improvement over the traditional method.

A MultiChain-Based Homework Submission System

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Abstract: Blockchain technology is becoming widely used in various areas. While we wanted to gain experience with blockchain technology, we felt that the best way to do that would be to redevelop a project that we were familiar with. A project of this nature needed to be something we had developed that would use the interesting capabilities of blockchain technology and yet would be small enough to be accomplished fairly easily. To this end we chose a homework submission system that we routinely use for our classes. While this project was perhaps not the best fit for the blockchain technology, it none-the-less exercised all the capabilities that we found interesting in a way that made sense from a blockchain point of view. Our experiences have expanded the list of potential problems for which blockchain might be appropriate.

An Assessment Scheme for Short-Term Placements

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Abstract: Industry placements have been lauded as providing benefits to students, industry and academia. While semester-long placements that require a break from study are reported as the most effective, not all students want to extend their course. Shortterm placements can also have positive outcomes for both the student and industry and enhance a curriculum. Assessment of student performance though is challenging, as their focus during the placement needs to be on completing tasks for a sponsor. This paper is a case study of a successful short-term placement program used to identify the important factors and components of an assessment scheme for a short-term placement.

CS for ALL: Introducing Computational Thinking With Hands-on Experience in College

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Abstract: "CS for ALL" is a new education initiative launched in 2016 to empower a generation of American students with the computer science skills they need to thrive in a digital economy. In order to keep up with trends in the growing technology-driven world, students should have the ability to analyze and consider the consequences of computing problems critically. However, introducing CS and computational thinking skills to the first year students in college is a difficult task because the nature of the subject tends to be dry and conceptual. Thus, we introduce a computer science course that helps all undergraduate students to prepare for digital life as well as enhance their critical thinking skills through hands-on learning experiences. The course contents introduce the general concept of computer science such as computing system, basic networking, algorithms and programming with Scratch and mBot robot exercises. Our student feedback shows a high level of enthusiasm and engagement among the students. The strong hands-on learning nature of the course helped our students to have more engaging and interactive classroom experiences.

Development of a Laboratory Rules Description Grammar Accommodating a Variety of Research Activities

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Abstract: When students conduct research in a university laboratory, university laboratory rules typically require that all students independently (1) plan their research, (2) record their research information, and (3) reflect on the outcomes of their research. Our goal is to develop a research activity support system that will comprehensively integrate these three important points for a wide variety of research activities. In this paper, we define research activities as a set of four tasks: planning, execution, information recording, and reflection. Then, as a step towards developing a research activity support system to organically support these four tasks, we develop a formal description method for research activities and a corresponding description grammar. Furthermore, we develop a source code generator that outputs a research activities support system, customized on specific laboratories, with the description as input.

Impact of Student Engagement on First Year ICT Performance

Nicole Herbert
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Abstract: A lack of engagement by students has been found to be a factor in the high attrition rates in Information and Communication Technology (ICT) courses. This paper explores whether using a flipped-classroom approach and continuous assessment can increase student engagement in first year in their learning of ICT professional skills and ethics - a topic that previous research has identified as a low interest topic. A case study research methodology is used to demonstrate that increasing student engagement could impact positively on both attrition and academic performance.

Selection of Parallel Runtime Systems for Tasking Models

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Abstract: The ubiquity of multi- and many-core processors means that many general purpose programmers are beginning to face the difficult task of using runtime systems designed for large-scale parallelism. Not only do they have to deal with finding and exploiting irregular parallelism through Tasking, but they have to deal with runtime systems that require an expert tuning of task granularity and scheduling for performance. This paper provides hands-on experiences to help programmers to select an appropriate tasking model and design programs. It investigates the scheduling strategies of three different runtime tasking models: Cilk, OpenMP and High Performance ParalleX (HPX-5). Six different simple benchmarks are used to expose how well each runtime performs when provided untuned implementations of irregular code fragments. The benchmarks, which have irregular and dynamic structures, provide information about the pros and cons of each system's runtime model, particularly the differences to the programmer between help-first and work-first scheduling.

The Barriers to Using Video Games in Classrooms

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Abstract: The purpose of this quantitative study was to identify significant factors that prevented teachers in Saudi Arabia from using video games in their classroom; and found differences in hindering factors between gender and level of teaching and teaching experience. The results showed that there were five factors that prevented Saudi teachers from using video games in their classroom among 25 categories of reasons. These five factors were "The impact of education video games on student and learning process", "Required times, cost, training, and technical issues of applying educational video games", "Characteristics of educational video games", "Harmonization between the educational video games and teaching", "Unawareness of educational video games".

Educational Data Mining and Learning Analytics: Overview of Benefits and Challenges

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Abstract: We present a Virtual Ant Laboratory agent-based model, an interactive and prediction tool to simulate the ants. environment and their decisions making and foraging behaviors. The proposed simulation model provides the ability to generate customized complex ant environments and to explore the interaction between the environment features and ants. behavior. As expected, the results showed that the quality of the food and the distance between food sources and the nest have a significant impact on the ants. decisions. The model was partially validated via live-ants laboratory experiments and can easily be generalized to other environments/agents.

Free Talk Zone: Inclusive Pedagogy to Encourage Women in Computer Science

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Abstract: This study, strives to understand the low retention and facilitate mechanisms to encourage the retention of women in the department of computer science at the University of Minnesota, Duluth. Two interventions attempt to address the concern for the reason why women quit CS field - one, women are more inclined to solve real world problems either in the scientific or social field that can benefit humanity; and two, women are dependent on social networking and more inclined to

share their feelings with others when compared to men. We verified both hypotheses by creating a Facebook discussion group among consented students in the introductory courses and replacing the traditional assignments with the ones that are designed closer to real-life problem in Fall 2015. By the end of the semester, we surveyed our participants to examine the effect of the two interventions. According to the results we got from our research, we can conclude that both building the online discussion platform and using more practical examples will help increase women's interest in studying computer science. A feedback mechanism was developed to help us continue our research in the future following these interventions, and improve our approach by implementing the feedback.

Estimating Grades from Students' Behaviors in Programming Exercises using Deep Learning

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Abstract: Programming exercises are time-consuming activities for many students. Therefore, many classes provide meticulous support for students through teaching assistants (TAs). However, individual students' programming behaviors are quite different from each other's, even when they are solving the same problem. It can be hard for TAs to understand the unique features of each student's programming behavior. We have used data mining to analyze students' programming behaviors in order to identify their various features. The purpose of this study is to present such behavioral features to TAs to improve the effectiveness of the assistance they can provide. In order to grasp the timing of guidance, we estimated the grades from the history of programming behavior.

Retrieving Good Practices through Reviewing Past e-learning Projects of Local Schools in Hong Kong

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Abstract: Since 1998, many e-learning projects initiated by Hong Kong local schools have been granted by the Hong Kong Quality Education Fund (QEF) with the aim of promoting IT in education in Hong Kong. They have generated successful experiences and various quality deliverables. Although all of these valuable good practices are already in place for dissemination to benefit larger audience, there is no easy way to access to them due to the lack of a structural organization amongst different projects. This paper describes some of the good practices extracted from the results of a research framework for evaluating and consolidating good practices from these e-learning projects. We have studied 79 e-learning projects, and suggested 7 good practices that can be reused for e-learning projects. Amongst them, 6 good practices have been compiled as teaching templates as a resource package which is disseminated to local schools.

A Case Study for Collaborative Project in Computer Science through the STEMPact Program

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Abstract: How to encourage students in community college to purse a STEM degree at a four year college, especially in computer science major is challenging. Many students do not have opportunity to experience computer programming in high school because the districts do not have budget to hire qualified teachers or there are not enough resources to offer the courses. As a result the students might not pick computer science or related majors when they study in community college. The .STEMpact. project, a cooperative arrangement by Union County College (UCC) and Kean University, aims to promote

the success of Hispanic and low-income students in completing post-secondary degrees and to address the need for a diverse 21st century STEM trained workforce. In this paper, a collaborative project in Computer Science is discussed for a student from UCC who knew nothing about programming working with Kean Computer Science students. The student was motivated by the project and became interested in learning more about computer science.

Using Decision Trees for Predicting Academic Performance Based on Socio-Economic Factors

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Abstract: The main objective of this research study is to determine how socio-economic factors affect the educational attainments of high-school students. For our study, we considered the socio-economic and academic data corresponding to more than ten years of records obtained from the leading university of an Andean country. Then, we used classification algorithms and machine learning techniques to determine which factors are the more influential on academic performance. We found that academic scholarship, age, county and high school degree influences academic performance of students. The results of this study constitute important information for academic directors and social workers involved in the task of improving the conditions of students and providing all of them the means to success.

Implementing Recommendations of Accessibility Technology Guidelines: The Quantitative Effects and Benefits it Offers to Non-Disabled Students

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Abstract: In the world of information technology today, education is closely coupled with multimedia resources. A growing number of students are shifting from traditional lectures to video, audio, or virtual platforms. These revolutionary instruction methods include Code.org and Khan Academy which provides wide-scale deployments and evaluations of new curricula at grade levels. This is no exception in higher education setting including the California State University (CSU). To ensure equally effective access outcomes to all student despite of disability, CSU has in place policies such as the Accessible Technology Initiative (ATI) to emphasize campus responsibilities to address accessibility strategy for online education. Our research involves the implementation accessibility standards on an Online/Hybrid graduate-level Computer Science course at California State Polytechnic University, Pomona (CPP). We hypothesized that with the implementation of these accessibility technology guidelines online learning environments, students will benefit regardless of disability; hence, the CSU ATI is ideal compliance measure that can be widely adopted. Our results show an increase in both learning effectiveness and student preference.

Using Data Dependence Analysis and Loop Transformations to Teach Vectorization

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Abstract: Parallel computing has been around for more than 5 decades, and is nowadays present in virtually every modern architecture. However, we identified that computer science students are often times introduced to parallelism from a completely theoretical standpoint without any practical instruction nor expected outcome. In this paper, we introduce students to data dependence analysis and loop transformations as a component of parallel computing. Then, using a repository of 2000+ loops, the students apply the transformations to gain understanding of how compilers take advantage of parallelism via vectorization. Our methodology is highly adaptable and was implemented with freshmen and graduate students. The only prerequisite is experience in C programming, but it can be extended to other compiled languages.

Developing Secure Privacy Preserving and Causal Genetic Alteration Research in Building an Innovative Systematic Pedagogy for Integrated Research and Education - The INSPIRE Model

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Abstract: As the current buzz about Big Data and its challenges gets louder, the demand for those equipped with skills and expertise in Big Data analytics becomes greater. The INSPIRE model that we offer is built around two great challenges: Transforming multidisciplinary STEM training so that it enhances emerging problem-solving capacity and Training STEM graduate students how to have a bigger hand in performing large-scale scientific work. To help strengthen the problem-solving skills and leadership abilities of STEM MS/Ph.D graduates, we reform current STEM research training in bioinformatics so that it helps us reach our goals. Our main research hypothesis is improvements in the way data scientists are trained comes not solely from data mining but, in addition, comes from developing useful machine learning and artificial intelligence techniques that automate intelligent learning derived from big data.

Adapting to New Student Outcomes to Meet New ABET Criteria for Computing Programs

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Abstract: The ABET Computing Accreditation Commission (CAC) has recently reviewed the criteria for accrediting computing programs. The proposed changes have been made public and if approved, the new criteria would be applicable starting from academic year 2018-19. Many schools that have their assessment cycle in progress might be concerned to adapt to the new requirements and about extra time and effort required for this change. This paper presents a detailed comparison of old and new general criterion 3 that deals with student outcomes. It also demonstrates how existing performance indicators can be easily adapted to meet the new requirements. This paper shows that the new ABET CAC criterion 3 requires significantly less effort in assessment activities than that required for existing criterion. It is expected that the schools applying for ABET accreditation find this paper very helpful in simplifying their assessment activities while meeting the new requirements.

Reviving Computer Science Education through Adaptive, Interest-based Learning

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Abstract: Computing Education has become a widely popular research field at top universities with much attention aimed at improving and expanding K-12 computer science education. Though numerous efforts are being made by institutions, industries, and the community, many challenges still prevent widespread K-12 CS education. Our research aims to alleviate these challenges with a new adaptive learning system to teach introductory programming in a unique and interesting way. Adaptive Learning is the idea that software and material should adapt to an individual students needs and is suggested to be the future of educational technology. Adaptive learning strategies normally adapt based on a students previous knowledge, pace, or learning style. Our research takes a new approach to adapt the content, practice problems, and examples based on a students interests. Interest-based learning has been shown to improve a students intrinsic motivation, leading to better

learning and achievements. As computer science touches nearly every part of our daily lives, adapting the way it is taught based on a students other interests could help attract and retain a larger and more diverse population of computer scientists. This paper outlines how SAIL-CS (System for Adaptive Interestbased Learning for Computer Science), a web-based learning system that aims to improve instruction in many STEM fields, could impact introductory CS education and alleviate many of the challenges for widespread CS education.

Hybrid Recommender System for College Courses

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Abstract: Recommender Systems find application in a large number of software given its effectiveness in guiding users to better content, thus making their decision process easier. A similar recommender system can be designed for helping students to choose the right college courses. Based on the ratings given by a student to a few courses, the course recommender application will predict a user's preferences and will further recommend courses that a student might want to enroll in. These recommendations will be made both on the basis of the user's interests and on the basis of the interests of the users similar to the student. The course recommender application can be integrated with the college registration system so that students can take better academic decisions while registering. The recommender engine will be demonstrated using an iOS-based mobile application.

Short Research Papers: Symposium on Education (CSCI-ISED)

A Survey of Digital Literacy in General Education Degree Requirements at Southern Utah University Peer Institutions

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Abstract: Digital literacy does not have the long-standing tradition in academics that other curriculum topics have, e.g. Mathematics. This lack of long-standing tradition surrounding computing, and the current breadth of possible digital literacies, has given rise to many varied curriculum approaches at higher education institutions. Faculty, and other curriculum creators at Southern Utah University (SUU), are currently creating digital literacy curriculum that is both integrative, and focuses on just in time learning, but these curriculum creators struggle with determining proper digital literacy requirements that should be required of all students in a General Education (GE) curriculum. This paper records the approaches towards digital literacy found at SUU, its peer institutions, and other Higher Education Institutions in the State of Utah.

An Active Learning Approach to Transcript Coding for Education Research

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Abstract: Educational research relies on a labor intensive analysis of qualitative data. Many times, data takes the form of transcribed conversations between students and teachers. These transcripts are analyzed, annotated, and coded to help uncover patterns and ideas. An education researcher will comb through the documents, line by line, classifying each line or

paragraph into a pre-described category. This paper presents the framework of a new tool that has the potential to greatly aid education researchers as they analyze qualitative data. By utilizing statistical machine intelligence tech- niques for Natural Language Processing (NLP), and leveraging existing Deep Learning language models, the tool completes much of the grunt work of transcript coding, letting the researcher focus his or her attention on the areas that are important.

An Integrated Framework of Online Peer Assessment Module Embedded in Moodle

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Shanghai Audio-video Education Center, Shanghai Distance Education Group, Shanghai, China

Abstract: An external module is designed to embed into Moodle, an open source online learning management system. This external module can assign students to engage in online peer assessment in learning programming course. A framework is proposed to characterize students. online peer assessment behavior, and a set of patterns interacting with the Moodle platform. This framework will contribute to develop external module connecting with online leaning platform. The experimental results show that this method is feasible and practical value.

Experiential and Simulated Learning: An Interdisciplinary Approach

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Department of Law, University of Greenwich, London, United Kingdom

Abstract: This paper describes a collaborative initiative of lecturing staff in a Computing and Information Systems Department working together with lecturing staff from a Law Department in the same university. It involved their combined efforts to construct an experiential and simulated learning experience for students from both departments in which both sets could use their different discipline-based skills practically in a simulated real-life scenario of professional interest to both sets of students. Educators must provide reflective real-life practice to facilitate the transition from university to the work place, producing graduates with the skills that employer value requiring minimal further training.

Lesson Learned in Teaching Pre-College Students Cybersecurity

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Abstract: This paper will describe some personalities encountered during a summer pre-college cybersecurity class. The goal was to give high school students a sneak preview of college life along with what courses are being offered by the college. The students learned not only the terminology but also the methodology used in conducting a forensic examination of digital devices like hard drives, cell phones, GPS devices, and even emails. They also were introduced to some of the various tools available to complete the examinations.

Student-Instructor Collaboration In Online Courses

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Abstract: A positive collaboration between students and their professors in any course regardless of the offering mode, i.e., online or in-class setting, can play a significant role for students. success in the course. Thus, any model of teaching/learning should include a noteworthy component of human interaction (i.e., interaction between instructors and students) to make such

models appropriate for implementation. The nature of online courses (no physical interaction between the instructors and their students) makes the development and implementation of these courses, with constructive collaboration between students and instructors in mind, more challenging for the instructors. In this paper, we examine issues related to the partnership among students and their instructors in online courses, and propose steps that can be taken to effectively making this collaboration not only feasible but also effectively persuading students to actively take part in the partnership throughout the semester.

Teaching Undergraduate Computer Graphics: Game Design and Implementation Utilizing the OpenGL Library and the Windows API

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Abstract: The purpose of this study was to explore computer graphics rendering and drawing techniques involved in teaching undergraduate programming of a simple windows-based video game application. The project included the creation of windows; use of a graphical library to draw, display, animate, texture, transform, and rotate graphical primitives; collision detection algorithms; and various other elements of commercial video game design and creation, which included menus, scoring algorithms, and input from the keyboard. The design was an object-oriented/procedural hybrid, utilizing C++, the OpenGL graphical library, and Microsoft's Visual C++ standard for coding and debugging.

E-learning: A Teaching Alternative for the Brazilian Prison System

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Universidade de Uberaba - UNIUBE, Uberaba, Brazil

Abstract: This article aims to present the problem of providing education for those people who are deprived of freedom. These people live in prison systems in precarious situations of survival. Brazil currently has a vertiginous increase in the number of imprisonment and it is verified that the number of prisoners involved in school activities is very low and this reality has not undergone change over the years. The development of this paper was based on published articles on the proposed theme, and will present some bibliographies of studies based on the use of e-learning in the prison system, since conventional education has proved to be inefficient due to costs and lack of security for professionals, teachers, and others involved. In the end the results obtained with the research and analysis of the data are presented. It was verified, with this study, that Brazil urgently needs to use public policies to solve its serious social problems and e-learning appears as a highly feasible proposal in the composition of this paper.

ImmersiFLY: Merged Reality Pilot Training System

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Abstract: Even after a considerable amount of simulation-based training, pilots are often met with a sense of nervousness and tension during their first flight. Much of this can be traced back to the lack of realism in virtual simulators. Such simulators are meant to allow the trainee to get acquainted with the aircraft's instrumentation and to get a sense of real flight, but do not provide a fully immersive experience of an actual flight. In this paper, we propose a flight simulation system that is immersive and that bridges the gap between flight training through a virtual simulator and real-world flight. Through our system, pilots will achieve more realistic flight training and be able to feel more comfortable on their first flight.

Temachtil: Learning System for the Preservation of Indigenous Languages in Mexico

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Abstract: Mexico is a rich country if we talk about heritage. Linguistic variety, fusion of cultures, stories, myths, legends, traditions and customs are part of what today Mexico is. It is important to create a system to promote, protect and foment respect for the diversity of native languages of our country because at present, there are twelve languages that are in danger of extinction just in Mexico. The goal: To create a system that serves the preservation of indigenous languages in order to promote these languages and also, to strengthen cultural and linguistic diversity, promoting respect for what our linguistic heritage. The Temachtil system will have a first stage which focuses on applying the system in the Henry Wallon Institute with the Nahuatl language to measure learning in children from 10 to 13 years and young people from 13 to 15 years to measure learning outcomes, plan improvements. For a second stage it arises implement Ayapaneco language which has only two speakers.

EFunBlocks: A Component Based Function Block Intepreter for the Microchip PIC24F Family

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Abstract: EFunBlocks is a complete standalone component based function block kernel implemented for the PIC24FV32KA302 microcontroller to facilitate the development of rapidly prototyped embedded applications for Computer Organization Computer Science Education course at Clayton State Uni- versity. The implementation is specifically designed to be available to diverse student owned devices using limited software on the students device.

Regular Research Papers:
Symposium on Computational Biology (CSCI-ISCB)

A Robust Principal Component Analysis via Alternating Direction Method of Multipliers to Gene-Expression Prediction

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Abstract: Gene expression is the main process responsible for the function of every living cell; many diseases are the result of altered gene expression. For example cancer can be the result of altered gene expression, gene mutations, or changes in gene regulation. Thousands of genes are expressed in every living cell. Gene expression values can be measured by measuring the amount of messenger RNA (mRNA) molecules found in cells. There are biological experimental methods to measure gene expression in biological samples and they have given researchers new opportunities to study the relationships between genes and diseases so they can find the genes responsible for specific diseases. Some example methods are Reporter gene, Microarray, and RNA sequencing. These methods however are very costly and time consuming. Computational methods have the potential to help these studies, by identifying reliable directions using prediction techniques on incomplete data; so novel and efficient techniques and algorithms to predict gene expressions are in high demand. In this paper, we

describe a method to recover gene expression dataset based on robust principal component analysis (RPCA). We treat the differentially expressed genes as sparse noise S and nondifferentially expressed genes as low-rank matrix Y. We show how S and Y can be recovered from gene expression data using RPCA. We also used existing implementations of three other iterative optimization based matrix completion methods to provide a comparative analysis of their performances. We show that this approach consistently outperforms the other methods with reaching improvement factors beyond 7.9 in measured mean squared error.

Algorithm Optimization of Minimum Free Energy-based Amino Acid Sequence Permutation Using OpenCL

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Abstract: Computationally complex algorithms are very useful when attempting to accurately predict the secondary structure of RNA. This paper seeks to use rule-based permutation with OpenCL to output every possible RNA sequence that fits a particular protein amino acid sequence (rule).In previous research, two algorithms were explored along with their possible application in the field of bioinformatics and biochemical engineering. One of these two algorithms is further optimized using OpenCL, a cross platform programming language known for its parallel computing potential and its ability to leverage processing power of GPU's and like devices. We propose that improving RNA secondary structure prediction accuracy can be achieved by extensive analysis of natural occurring RNA folds in comparison to others like them that belong to the same Amino acid sequence.

Comparative Analysis of Sequence Variability of Dengue Virus Serotypes Using Second Generation Wavelets

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Abstract: There are four serotypes of dengue virus (DENV) circulating worldwide and each serotype being different in infectivity and virulence. This study compares all four serotypes of DENV using second generation wavelet transforms. Statistical measures of energy, entropy, first order variation, mean and maximum values of different DENV serotype sequences were analyzed to compare genetic variability patterns and correlate them to the epidemic potentials. Higher epidemic potentials were exhibited by serotypes with higher average measures of energy, rms value of first order variation, maximum and mean values. High epidemic potentials were also related to lower entropy measures. The results of this study can help enhance traditional diagnostic methods to aid epidemiologic investigations especially during epidemics.

Deterministic Convection-Diffusion Approach for Modeling Cell Motion and Spatial Organization: experimentation on avascular tumor growth

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Abstract: To investigate cell spatial organization in complex biological dynamics, an individual-based model that represents cell motion in a deterministic way is proposed and then experimented on avascular tumor growth case. Cell motion remains a fundamental process in many complex biological dynamics such as morphogenesis or cell aggregation. Mathematical models are often used to represent cellular motility and spatial dynamics. However, the variability and the interactions between individuals, which are crucial to build accurate predictive models, are difficult to represent using differential equations. We propose, in this paper, an individual-based approach that allows describing cell motion at deterministic way with diffusion

and convection processes. Such approach is built using Smoothed Particle Hy- drodynamics (SPH) method and allows representing spatially each cell and its basic biological primitives. The relevance of this approach is illustrated on avascular tumor growth to study the effects of microenvironment (nutrients) and cell individual motion in tumor development. The results shown that the model can qualitatively predict a number of cellular behaviors that have been observed in experiments.

Neural Biclustering in Gene Expression Analysis

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Abstract: Clustering in high dimensional spaces is a very difficult task. Dealing with DNA microarrays is even more difficult because gene subsets are co-regulated and co-expressed only under specific conditions. Biclusterng addresses the problem of finding such sub-manifolds by exploiting both gene and condition (tissue) clustering. The paper proposes a self-organizing neural network, GH EXIN, which builds a hierarchical tree by adapting its architecture to data. It is integrated in a framework in which gene and tissue clustering are alternated and controlled by the quality of the bicluster. Examples of the approach and a biological validation of results are also given.

Secure Privacy Preserving Across Personal Health Data and Single Cell Genomics Research INSPIRE Academic Pedagogy – Merging Big Data Multiplatform with Deep Learning

Mary Qu Yang, Shucheng Yu, Carolina Cruz-Neira, William Yang, M. Eduard Tudoreanu, Dan Li, Yifan Zhang, Qingfang He, Renchu Guan, Richard Y. Wang, Wenbing Zhao
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Abstract: Enhancing student academic performance is challenging, but the time and effort put into accomplishing this ambitious feat is priceless. In this paper, we develop secure privacy preserving across Personal Health Data (PHD) repository and single-cell genomics research for building a novel and insightful framework based on classical and popular machine learning approaches to help us meet the educational challenge. Our framework focuses on using integrative research technologies to help solve "Education's Performance Prediction Data Mining Crisis" (EPPDMC), by putting to rest issues associated with mining and making best use of big data for educational enhancement, such as multi-source education acquisition, data fusion, and unstructured data analysis. We exploit the uses of deep learning, text classification, and semi-supervised learning models to solve challenging problems educators face when analyzing multiplatform big data involved in research and training students.

Visual Simulations Correlate Plant Functional Trait Distribution with Elevation and Temperature in the Cairngorm Mountains of Scotland

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Abstract: This work demonstrates the utilization of R and the interactive Shiny application in RStudio to visualize and simulate changes in alpine plant and functional trait distribution in correlation with temperature data. In the RAPT (Researching Alpine Plant Traits) project, we collected field data on species and trait distribution along an elevational gradient of Sgoran Dubh Mor in Scotland's Cairngorm Mountains. Visualization of the data were plotted onto Google Maps

in Shiny to represent plant trait data evaluated with temperature data. Visual and interactive R Shiny models are valuable in illustrating and predicting the effects of temperature change on alpine plants.

Microarray Data Analysis of Yeast Data using Sparse Non-Negative Matrix Factorization

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Abstract: Microarray expression data contains observations from thousands of genes across hundreds of samples. To extract meaningful information from these large datasets, the dimensionality reduction technique known as non-negative matrix factorization, or NMF, is introduced. This tool transforms the data and makes it more amenable to clustering. NMF was applied to a yeast microarray dataset. Three main clusters were discovered, corresponding to three distinct metabolic cycles. The data were also clustered using the k-means algorithm, and the clustering result was highly similar to that obtained by NMF.

Autogating in Flow Cytometry Data using SVM Classifiers for Bacterioplankton Identification

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Departamento Eng. de Computacao e Automacao - DCA - CT - UFRN, Natal, Brazil

Abstract: This paper shows the results of a methodology proposal for bacterioplankton identification using a machine learning approach named SVM. Samples used were taken from 19 high elevated lakes located at Pyrenees Mountains. Samples generated 74 databases after been analyzed by a specialist to serve as input to the algorithm. We observed the viability of this method with 3.35% of error in identification. Furthermore, there is no isolated direct correlation between robustness of the prediction models and high complexity of the input data but, indeed, the algorithm settings, function cost and variables choice have an important role in the performance as well.

Regular Research Papers:
Symposium on Internet of Things & Internet of Everything (CSCI-ISOT)

Improved Up-link Repetition Procedure for Narrow Band Internet of Things

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Abstract: Supported by all major manufacturers of mobile equipment, communication modules and chip sets, Narrow Band-Internet of Things can co-exist with GSM/GPRS, 3G, and LTE mobile networks. It also benefits from all the security and privacy mobile network features, such as support for user identity confidentiality, entity authentication, data integrity, confidentiality and mobile equipment identification. Optimized for applications that need to communicate small amounts of data over long periods of time, NB-IoT is expected to connect many more devices to the Internet of Things and enable realization of many new applications focused on low speed, robust data transfer, and an appropriate level of reliability. As

such, NB-IoT is a step toward building the fifth-generation (5G) radio access technology intended for enabling new use cases like machine type communications. This paper presents an iterative algorithm for improvement of the up-link procedure for Narrow Band-Internet of Things using concatenated error correcting codes or a concatenation of cryptographic redundancy and error correcting code. Based on additional correction of low reliable bits, a significant correction of messages damaged by a noisy transmission can be achieved, which is presented by simulation results.

Improving the Reliability of CPS with Hierarchical-decentralized Decision Solution

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LIMOS, University Clermont Auvergne, Aubiere CEDEX, France

Abstract: Cyber Physical System (CPS) is a smart, safety-critical, self-adapting system. Decision processing plays an important role in closed-loop adaptation. The traditional control flow of decision process is centralized, which is unfit for large scale feedback control. In this paper, we present a hierarchical framework with self-similar interface to reduce the feedback time and simplify the decentralized processing. Base on this framework, we propose a one-order feedback decentralized solution to improve the reliability of decision processing. The simulation results show that one-order feedback decentralized solution can improve the reliability and stability of processing significantly. A case study is introduced to evaluate the hierarchical-decentralized decision solution.

A Secure MQTT Framework from PUF-based Key Establishment

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Abstract: In this paper, we first propose a PUF-based key establishment (KE1+) protocol because PUFs (Physically Unclonable Functions) can be an alternative to perfect tamper-resistant modules, and a better solution to provide security against side-channel attacks. The KE1+ protocol (an improved version of KE1) additionally provides mutual authentication and efficiency optimization for client side. Then, we propose a secure MQTT framework (for short, S-MQTT) where the KE1+ protocol is executed for key establishment whenever needed between publishers/subscribers and a broker. This S-MQTT does not require any certificate validation/revocation checks on both publishers/subscribers and broker sides which can simplify the initial setup of publishers/subscribers. Also, we explain implementation details and performance overhead of S-MQTT that makes use of MQTT open source project Mosquitto 1.4.10. With average processing times of S-MQTT publisher, we show that S-MQTT publisher is much more efficient than the previous work.

Autonomic Methods for Mitigating Threats to the Internet of Things

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Capella University, Minneapolis, USA

Abstract: Increasing improvements to wireless technology, coupled with enhancements to device miniaturization, have fueled the advancement of a networking infrastructure referred to as the Internet of Things (IoT). In the IoT devices and software within these devices are designed to interact directly with each other. As these IoT systems are ostensibly designed to require minimal human intervention it seems reasonable to suggest automated methods for securing these systems would be highly appropriate. This paper seeks to evaluate significant developments in network security protection mechanisms as they apply to our current understanding of the Internet of Things and seeks to uncover as well as possibly suggest new areas of network security development in the IoT arena. Additionally, this paper will analyze information from scholarly sources and evaluate different methods, strategies and frameworks related to IoT security.

Industrial IoT and Advanced Analytics Framework: An Approach for the Mining Industry

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Abstract: After the supercycle of the mining industry, companies need to reinvent themselves and find new methods to reduce costs and improve productivity. The Industrial Internet of Things (IIoT) and Advanced Analytics present opportunities to make mining companies more digital and smart; consequently, more productive. There is a wide range of IIoT-related technologies applicable at different scenarios, including remote locations and different time data processing, making their adoption complex. The objective of this study is to produce an IIoT and Advanced Analytics framework to be used as a guide and facilitator for the adoption of IIoT in the mining industry.

Investigation of Access Control for Internet of Things: Service-Level Role-Based Access Control

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Abstract: Internet of Things (IoT) is basically a system of inter-related computing devices on a network which perform data collection and exchange of real world properties. The major developments witnessed in IoT are mainly within companies, industries, a home environment etc. To increase the scalability of IoT, various security concerns need to be overcome. IoT devices are mostly resource constrained. Complicated network produces potential vulnerabilities referred to heterogeneous devices, sensors and backend systems. So, to realize the dream of internet of things, security is to be ensured for device to device communication. Though IoT has security mechanisms at the network and device level through identification management, it is safer to have a per-service level specific access control based on the "Roles of Things" to attribute for confidentiality and Integrity. This paper presents the current security practices and puts forth the future scope of improvement in fine tuning service level access control.

IoT Application in Construction and Civil Engineering Works

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LR Construction Technologies Ltd., Hong Kong

Abstract: Internet of Things (IoT) technologies have gained widespread popularity in recent years. However, the application of IoT technologies in construction and civil engineering is relatively unexplored. This paper describes an IoT monitoring system for the purpose of improving safety in these fields. Validation tests for the system have been conducted in actual construction and civil engineering sites. It is expected that its adoption in the construction and civil engineering industries can greatly enhance safety in the long run.

Middleware Design for Application Integration in IoT Networks

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IoT PUCP Group, Department of Engineering, Pontificia Universidad Catolica del Peru (PUCP), Peru

Abstract: The Internet of Things (IoT) is an increasingly developed field because of how it is affecting virtually all aspects of society. In this context, the amount of data and objects that integrate into this new internet is exploding and will continue to do so in the foreseeable future. One of the main challenges that the IoT is still facing is the ease of integration between applications and the general infrastructure underneath: namely a simple way of allowing horizontal integration. This paper

proposes the use of a framework that allows for a direct horizontal integration between the different IoT elements that could be present within any system.

Smart Services Supporting Drivers in Effective Cars Parking

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Faculty of Electronics, Telecommunication and Informatics, University of Technology, Poland

Abstract: The paper shows how to design and implement intelligent, service oriented systems for management of free places in distributed car parks. The idea of SOA technology is widely used. It is assumed that a state of every car park is automatically determined by a special electronic infrastructure including IoT solutions. The information received from such an infrastructure is sent to the main management system, which processes it and, on the basis of current knowledge, offers a set of smart services for drivers. In consequence, they can find a free place in the car park which is situated at the shortest distance from their destination. Dependability of smart services depends on basic information coming from such car park infrastructures. The most important decision is the one as to whether a place in a car park is free or occupied. Therefore, in the paper some experiments were carried out to evaluate the correctness of determining the occupancy of a particular car park lot. Moreover, the flexibility of the presented solution is also emphasized.

Towards Real-time Drink-drive and Over-speed Monitoring and Detection in South Africa

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Abstract: This paper proposes an effective approach for real-time monitoring and detection of drink-driving and over-speeding on South Africa (SA) roads using technologies of vehicular networks (VANET) and Internet of Things (IoT). This is because drink-driving and over-speeding have been known as the major causes of injuries and deaths on roads globally and SA is not an exception. As a viable solution, our proposed approach is based on real-time measure to provide quick responses by traffic personnel aim at saving lives before the actual accident occurs. To this end a theoretical framework of the system was designed and an application prototype developed to monitor the detected traffic offenders with respect to drink-driving and over-speeding. Moreover, we presented and discussed the system's operations and its functionalities. A novel application simulation performed shows that the system is feasible and can accomplish the task of road safety more effective than the existing approaches.

The Study in Edge IOT Era: A Software Framework Based on the Knowledge

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Abstract: In order to solve the inadaptability of traditional software and utilize the computing resources of edge nodes in the future Edge IOT Era, the paper analyzes the characteristics of IoT software and puts forward a new distributed knowledge framework. In this study, we introduce knowledge base into the normal wireless node and translate Wireless Sensor and Actor Network (WSAN) topology along with the software logic into knowledge for it. Moreover, seven heuristic rules are proposed in the process of design, based on experience, including node selection criterion and node collaboration mechanism. Finally, the proposed framework is illustrated and evaluated with a small greenhouse scenario.

Distributed Algorithms on IoT Devices: Bully Leader Election

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Department of Computer Science, Facultad de Ingenieria, Universidad de Buenos Aires, CABA, Argentina

Abstract: We present in this paper the implementation of a well-known coordination algorithm on specific and lowperformance IoT (Internet of Thing) devices. The implementation of the bully algorithm for leader election is achieved in a twostage process: a) an IoT independent implementation, made in a high level progamming language (Java, in particular), and b) the implementation on the IoT devices, where several limitations and characteristics have to be taken into account. We have used this algorithm for coordination of a set of small cars. Beyond the specific implementation, this work has two main underlying contributions: a) show that it is possible to take advantage of many algorithms and results already proven to be useful in the area of distributed computing, and b) show that IoT devices limitations (e.g. in computing power and storage) do not necessarily imply that useful algorithms cannot be used.

Comparing Different Types of Flexibility when Solving the RSA Problem in EONs

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Abstract: Elastic Optical Networks (EON) are seen as an essential technology to implement the backhaul of Future Internet allowing the deployment of emerging paradigms like the Internet of Things (IoT), Tactile Internet, or Industry 4.0. When designing those Elastic Optical Networks (EONs), the Routing and Spectrum Assignment (RSA) problem has to be solved. In this paper, we analyse the effect of using two types of flexibility in a well-known RSA method. A simulation study will be presented with the main results of this comparison.

Implementing IoT for Development of a Low-Cost Environmental Monitoring System

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Abstract: This paper presents a proposal for the development of a web system based on the Internet of Things (IoT) concepts, focused on the environmental monitoring and low cost. The need to carry out such a study is solidified by accelerated technological advancement and widespread concern with the alarming environmental conditions that the world presents today. In this system, groups of sensors are responsible for, through embedded systems, send the data to a server that stores them and also provides graphical interface models on a web page. The implementation of such a procedure allows for a better understanding of relevant environmental characteristics of certain locations, as well as the research for better solutions to environmental issues.

ROSmotic: a Scalable Smart Home for Blind People Controlled with an App

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Abstract: In this paper we present ROSmotic, a system for building smart homes operated by a smartphone app. The app is accessible for people with visual disabilities, and controlled by touch or voice commands. We provide a scalable and open source hardware and software solution by incorporating microcontrollers, cameras, laptops, and lights. We show an easy way to connect an iOS app with Robotics Operating System (ROS). We incorporate other open source libraries, cloud services,

and image processing frameworks. The whole system is made in Swift and Python. Finally, we deliver the diagrams (logical and electronic), software code, and materials for its easy replication.

A Framework for a Smart Campus: A Case of Covenant University

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Department of Finance, Covenant University, Nigeria

Abstract: Energy conservation encourages economic growth by redirecting wasteful spending to more productive activities. Energy savings can be used to increase consumption in the broader economy. A more efficient use of energy resources not only conserves this vital resource towards future consumption but also inhibits the excessive exploitation of non-renewable energy resources. The objective of this paper is to develop a suitable framework for an IoT-enabled energy conservation system for an emerging smart community such as Covenant University. A strategic interconnection of sensor networks and energy management systems integrated with the campus IT infrastructure was considered. This energy conservation cyber-physical system is expected to significantly improve energy efficiency in the University and increase energy savings. The scalability of this model will improve energy management in larger communities and cities in Nigeria, a country currently swamped with energy challenges.

Reinforcement Learning Strategies for Energy Management in Low Power IoT

Yohann Rioual, Johann Laurent, Eric Senn, Jean-Philippe Diguet
CNRS, Lab-STICC, University of South-Brittany, UBS, Lorient, France

Abstract: Energy management in low power IoT is a difficult problem. Modeling the consumption of a sensor node is complicated, they operate in a stochastic environment. They harvest energy in their environment but energy sources present time-varying behavior. It becomes hazardous to predict in advance the energy behavior of our system. In this paper we propose a new approach using both neural networks to estimate the harvesting energy and reinforcement learning algorithms to find the operating parameters to maximize the node's performance while preserving its energy resources.

Short Research Papers:
Symposium on Internet of Things & Internet of Everything (CSCI-ISOT)

Designing Low-cost, Low-power Circuits to Support Real-time, Remote Distributed Environmental Sensing using GSM Networks

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Abstract: Internet of Things enables real time monitoring of environmental data. There is an opportunity to collect data in remote areas where real time data was previously unavailable. Ideally we would like to both collect and communicate that data in real time. However, communication over GSM networks relies upon power-intensive cell radios, which severely limits the ability to deploy sensors for periods of time greater than one week. In this paper, we discuss an approach to unattended long-term deployment of an environmental sensor using GSM networks to communicate data in real time. We propose a custom power circuit that reduces power consumption rather than depends upon the low power modes of MCUs.

This approach greatly extends the time a sensor can be deployed with a commodity battery without manual intervention. We present both the circuit design and its evaluation.

Systems Engineering a Low Cost Digital Beam Formed Phased Array for IoT Connectivity

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Abstract: This work describes the systems engineering and advanced prototype hardware of a digital beam steering receive phased array for IoT device connectivity. It uses low cost software defined radios (SDRs). IoT devices require connectivity for the transfer of data from the point information is gathered to the cloud and user community. In locations where multiband base stations provide connectivity, concerns over interference require the use 'Smart Base Stations' which are able to minimize interference and maintain connectivity to IoT devices. Phased arrays can also prolong battery life of IoT devices, increase bit rate (more link budget), provide location services where GPS connectivity does not exist (inside locations), and improve jamming immunity. However, the cost of the hardware can be prohibitive for some applications. A trade study is performed to determine the optimum SDR for the demonstration and a prototype system is constructed and measured to show the feasibility of the approach. The work concludes with suggestion for further work which includes the use of a field programmable gate array to interface between the SDRs and the host system.

SparkSys: A Framework for Smart Parking Systems

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Abstract: This paper discusses the implementations of smart parking systems used in cities and university settings. In high density cities, parking can become time consuming and result in increased traffic congestions as drivers try to find parking spots. Currently, most drivers in these situations attempt to find parking without aid. Knowing in advance if parking is available would be a valuable feature in a Smart City. While smart parking solutions have already been researched, this paper discusses current implementations and current sensor technologies used. Knowing which spots are available and a framework to map an entire parking lot is also presented in this paper. Finally, we will discuss the details of a Smart Parking System - SParkSys.

Regular Research Papers:
Symposium on Big Data and Data Science (CSCI-ISBD)

A Methodology for Real-Time Spatiotemporal Data-Intensive Computation

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School of Computing and Information, University of Pittsbiurgh, Pittsburgh, PA, USA

Abstract: We propose a methodology for real-time spatiotemporal data-intensive computation. The proposed methodology allows researchers to implement spatiotemporal data-intensive tasks on any platform, including mobile, laptop, desktop, and high performance computing. The methodology comprises of three major components: efficient analytics, predictive analytics, and meta-analytics. One of the main features of the proposed methodology is that by taking into account the unique characteristics of any spatiotemporal dataset, the available computing platform, and the required response time, it can provide optimal, near-optimal, or at a minimum, an acceptable solution for computing the task with least compromise on accuracy. Experimental results on real data show that the methodology is able to compute within available time constraint and computing platform.

Faster Querying for Database Integration and Virtualization with Distributed Semi-Joins

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Abstract: Data integration and virtualization is commonly used to combine data for data analytics and reporting. A major challenge is handling large data sizes as moving data across a network is extremely expensive and limits query processing. Business intelligence and data visualization software require rapid response times for users, and data virtualization is often limited for use cases involving joins across systems. The contribution of this work is a semi-join based approach to data virtualization joins that minimizes data movement and utilizes the extensive resources available in the database systems rather than performing query processing in the virtualization engine. The result is significantly less data movement which translates into faster query times and higher performance. Experimental results demonstrate that performance can be increased by an order of magnitude. A unique feature of the approach is that it does not require any special software installed above the database servers such as mediators and works directly using SQL queries.

A Centroid-based Outlier Detection Method

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Abstract: Outlier detection refers to detecting patterns that do not conform to an established normal behavior in a given data set and has found immense use in a wide variety of practical domains, such as intrusion detection for cyber-security, fraud detection, fault detection in sensor networks, and so on. Due to its important applications, many techniques have been developed for outlier detection, including distribution-based outlier detection methods, distance-based outlier detection methods, density-based outlier detection methods and clustering-based outlier detection methods, etc. However, no methods is completely satisfactory. Motivated by the centroid concept of Kmeans clustering algorithms, in this paper, we propose a kNN centroid-based outlier detection method that is based on a global outlier factor and a local outlier factor and can provide competing performances with existing solutions. Experiments performed on both synthetic and real datasets demonstrate the efficacy of our method.

An Improved Metadata Model for Big Data Processing in Cloud Data Centers

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Abstract: Data centers require advanced models to study confrontation of big data. We have developed an improved consistent model that processes the incoming tasks in minimal time and in an efficient manner considering two problem statements for this paper: 1) Portfolio pricing and 2) Counting words in dictionary. The exclusiveness of the idea is not to submit the task data with the task. We keep all data separately in a data grid (GD) domain. The main component in our study for this task, job dispatcher (JD), divides the input job in an efficient manner and distributes them to computing grid (CG) nodes, which are responsible for processing the tasks, and sending the result status back to JD and putting the results in the data grid. The job dispatcher aggregates these results.

Applying Machine Learning Algorithms to Highway Safety EEPDO

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Abstract: Estimating expected equivalent property damage only (EEPDO) is crucial to highway crash hotspot identification (HSID), which is a key component of a highway safety improvement program. During the past 60 years, HSID methodologies advanced steadily from traditional scan based methods to statistical model based methods and have reached the sophistication of encompassing advanced statistical models with many variations and refinements while there still exist a number of theoretical issues unsolved. Consequently, these advanced models are not widely used in the practice of transportation engineering. This paper investigated the performance of an easy to use alternative to estimate the EEPDO -- using machine learning techniques of K nearest neighbor (KNN) algorithm and compared it against the prevalent statistical model -- Negative Binomial (NB). NB assumes that the raw data follow a certain Gamma distribution which is not ubiquitously hold for crash data. Comparatively, being a nonparametric predictor, KNN is expected to produce better estimation on crash data in that it requires no assumption on the raw data. For experiment, a case study was conducted on highway US 49 in Harrison County of Mississippi. The results indicated that KNN outperformed NB.

Applying the Kasai to Weather Prediction

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Abstract: The Kasai is an algorithm for processing data series. In this analysis, we apply the Kasai to weather prediction to determine its ability to produce prediction within certain accuracy ranges.

Functional Heterogenous Processor Affinity Characterization to Big Data: Towards Machine Learning Approach

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Abstract: Heterogeneous processors based on functionally diverse devices (GPP, GPU, FPGA, ASIC and DSP) may provide affinity for different types of big data processing. In this paper, we developed affinity characterization of such functionally diverse device based heterogeneous systems. But, extracting such characterization is computationally intensive and rather slow for large set of nodes. We first developed general affinity mapping approach which showed 2 to 15 speed up and

reduction of energy from 30-35%. We investigated the machine approach to the characterization by evaluating predictive performance using training data from disparate heterogeneous computing systems and achieve an improvement in affinity matching. We can extend this machine learning approach to develop comprehensive affinity between big data applications across several domains to heterogeneous computing using functionally diversified processors.

R-tree Node-splitting Algorithm using Combined Quality Factors and Weights

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Abstract: In this work we introduce a new approach to calculate splitting quality factors using the distribution of objects inside overflown nodes. Finding most proper splits for overflown R-tree nodes leads to better performance, since it determines index final shape; its tree height, nodes count, and overlap percentage between nodes. A linear cost scan of overflown node's objects identifies the distribution of objects' locations in relative to its node's bounding rectangle, then using objects' locations to calculate the quality factors. Each factor value is normalized and is given a weight, and then all are combined to select the best axis to split the node along it.

Modified K-means Algorithm for Big Data Clustering

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Abstract: Clustering of Big data is a highly demanding research issue and efficient clustering, particularly for growing data, attracts further attention to the researchers as it is a very common phenomenon for social networks. Clustering algorithms in general deal with static data and various algorithms do exist with their respective pros and cons and are applicable to various types of data. We consider K-means algorithm with one dimensional data and modify it to handle frequent addition of data without re-clustering the entire set. We further improve volume of distance matrix calculation for additional data elements. Theoretical calculation along with case study is placed for establishing the benefits gained by the proposed modified algorithm.

Analysing the Sentiment Expressed by Political Audiences on Twitter: The case of the 2017 UK general election

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Abstract: A significant amount of research on the intersection of sentiment analysis and social media platforms has been published in the past few years. While previous studies have focused on methods to identify the polarity of online posts, little has been done in terms of using the impact of such posts to enhance the discovery and description of trends in real time. Here, we present a tool for the retrieval and analysis of microblogging posts in real time. We have gathered a large sample of tweets related to the 2017 UK General Election. We introduce a novel classification of the polarity of sentiments, considering the correlation between words, events and sentiments.

Exploring the Application of Big Data Analysis in Healthcare Sector

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Abstract: Big Data Analytics (BDA) is a new revolution of information technology. The healthcare sector is one of the most unexplored fields in terms of the data analysis. BDA provides systematic information based on vast amount of healthcare data to develop better healthcare system. With the help of the analyzed patterns, valuable information can be extracted and used by the policy makers to build a protective environment for better healthcare system. In this study, the behavior of unstructured healthcare data is examined to find out the related patterns from them with the help of BDA. The inferences will help in establishing the relationship between the healthcare organizations and patients' challenges.

Analyzing the Mutation Frequencies and Correlation of Genetic Diseases in Worldwide Populations Using Big Data Processing, Clustering, and Predictive Analytics

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Northwestern University, USA

Abstract: In this paper, we utilize Big Data Processing and develop Predictive Analytics Models to examine and analyze mutations associated with osteoporosis and cardiovascular disease. The dataset consists of the genomic information of over 2,500 individuals. The genomic data was collected from all around the world. The data visualization allowed us to see geographical/regional clustering patterns in the above mentioned specific mutations. The visualized data clearly shows a high correlation between a person's regional background and the occurrence of the 35 single nucleotide polymorphisms (SNPs). The 35 SNPs are specifically associated with osteoporosis and/or cardiovascular disease (CVD). A predictive analytics model was developed based on machine learning algorithms to predict the risk of an individual manifesting osteoporosis in later life. The results of this predictive model confirmed the links between osteoporosis and Cardiovascular related parameters such as High Density Lipoprotein (HDL) and Systolic Blood Pressure (SBP), as determined by the preceding studies.

Is There a Link Between Air Pollution and Economic Growth?

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Abstract: As the reality of global warming becomes more severe on our environment, policy responses to reduce carbon emission have been created, debated and even deployed in some areas. Although Africans are not directly responsible for the severity of the climate change today, it has become necessary for the continent to join the campaign to save the planet from global warming. It has been debated that these new environmental policies may slowdown economic prosperity in developing nations. However, there is insufficient empirical evidence to back this assertion. The objective of this study is to investigate the relationship between air pollution and economic growth in Nigeria. Secondary data was obtained predominantly from World Bank World Development Indicators. An IBM Watson Analytics approach was used in analyzing the data. The result showed that air pollution variables had both negative and positive influence on the economy. A smart city framework was developed to guide measurement and analysis of air pollution data for informed decision making. The paper recommends that air quality sensors be deployed to all possible pollution generation machineries for real time data generation, analysis and policy response to control pollution.

Evaluation of Gradient Descent Optimization: Using Android Applications in Neural Networks

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Abstract: Artificial neural networks have gained prominence by being used in different aspects such as medical diagnosis and detecting malware applications. However, neural network models could have an error rate that indicates their performance. Thus, optimization algorithms can minimize the error rate by updating the neural network parameters to reach an optimal solution. This paper explores the use of permissions and underlying Linux system information features in Android platform to evaluate gradient descent optimization algorithms in neural networks. Those optimizers are evaluated by running them on a set of Android applications to find the optimum one. Furthermore, each optimizer is assessed based on its default and adjusted parameters values. This evaluation shows that the best accuracy score is 92.21% collected by Adam optimizer.

TF: A Novel Filtering Approach to Find Temporal Frequent Itemsets in Recommender Systems

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Abstract: In recent years, information overload has become a serious problem. There are many recommender system algorithms which help people make decisions about what they want. However, many traditional recommender system algorithms ignore temporal information. In order to utilize temporal information, we propose a new method to find Temporal Frequent Itemsets and improve traditional recommender system algorithms. Our method can combine well with other algorithms. In addition, our method is intended to recommend newly-risen items and avoid to recommend out-of-date items for users. We use our method in two real-world datasets. The results show that the performance of our algorithm is more excellent than the performance of state-of-the-art algorithms.

Improved Model by Combining K-mean Clustering Algorithm within Map Reduce Model

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School of Media Arts and Technology, Southampton Solent University, United Kingdom;
School of Computing, University of Portsmouth, United Kingdom

Abstract: In today's digital scenario, the two broad fields of computer science are Data Mining and High Computing performance. Over a broad spectrum, the k-means clustering algorithm and its application are very simple and popular related to Data Mining field. In the distributed computing environment, Map Reduce programming is used for handling the high volume of data. Traditional, the k-means clustering algorithm assigns n data objects with a random initial center with the k clusters as starting centers. This paper focuses on the k-means clustering technique that uses Map Reduce paradigm by using improved initial centers to increase the efficiency of the k-means clustering implementation. In the experimental analysis, we have clearly discussed our model effectiveness and compared it with the traditional algorithm. The results conclude that the improved Map Reduce model of the k-means clustering algorithm performs more efficiently.

Short Research Papers:
Symposium on Big Data and Data Science (CSCI-ISBD)

The Corpus Replication Task

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Abstract: In the field of Natural Language Processing (NLP), we revisit the well-known word embedding algorithm word2vec. Word embeddings identify words by vectors such that the words. distributional similarity is captured. Unexpectedly, besides semantic similarity even relational similarity has been shown to be captured in word embeddings generated by word2vec, whence two questions arise. Firstly, which kind of relations are representable in continuous space and secondly, how are relations built. In order to tackle these questions we propose a bottom-up point of view. We call generating input text for which word2vec outputs target relations solving the Corpus Replication Task. Deeming generalizations of this approach to any set of relations possible, we expect solving of the Corpus Replication Task to provide partial answers to the questions.

Differential Private-Hilbert: Data Publication using Hilbert Curve Spatial Mapping

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Abstract: A high demand exists in publishing data that preserves privacy. A common method that ensures privacy is Differential Privacy which perturbs the data based on the Laplace distribution prior to disseminating the data. Proposed techniques suffer from data having many attributes or high dimensional data known as the curse of dimensionality. A problem exists with both, accuracy and processing resources when handling large amounts of high dimensional data. The method, Differential Private-Hilbert, being presented is an initial study whose goal is to achieve Ɛ-differential privacy. An algorithm is proposed for answering range queries over high dimensional data. The data is mapped into 1-dimensional tuples using Hilbert curves and partitioned into groups. The data are stored in a tree structure whose leaf nodes are abstracted to a histogram and calibrated noise is then injected. The clustering property of Hilbert curves is exploited to improve the accuracy of the published data. The tree structure lends itself for efficient access to store and process range-count queries. DP-Hilbert requires minimal computing resources. An accuracy and run-time performance study is done on multi-dimensional data by measuring the Mean Squared Error (MSE) and CPU processing time. Large synthetic datasets having between 3 to 8 dimensions are evaluated.

Piecewise Aggregate Approximation and Quantile Regression for Wind Speed Analysis

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University of Bath, Bath, United Kingdom;
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Abstract: The high cost of energy production, coupled with the advantages of wind power as renewable and widely available source of energy, has led several countries to establish incentives to regulate and promote wind power generation. This work proposes the implementation and comparison of two time series analysis methods: Piecewise Aggregate Approximation (PAA) and a PAA plus quantile regression process. The aim is to estimate the minimum amount of extreme cut-in and cut-

out events of the wind speed in the power generation process. Brazil has an enormous wind power potential. The diversification of its energy matrix is becoming a necessary challenge nowadays in the commitment of using renewable energy sources. The performance of the two PAA based proposals is tested for to the wind farms of the south and northeast regions. These locations belong to Brazil.s regions of different geographic and wind characteristics. This endows to also check the proposals robustness under divergent scenarios. The results indicate that the PAA/QR method performed better than the PAA method because it identified a greater amount of extreme values.

Practical Difficulties and Anomalies in Running Hadoop

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Abstract: Currently, Hadoop is dominantly used framework for processing large data. It has also been noted that Hadoop is one of the most popular implementation of MapReduce which is predominantly used by Facebook and Yahoo for large data parallel distributed computing. A typical Hadoop cluster comprises of single name node and many data nodes, with an assumption that all the nodes in a cluster are homogeneous meaning that all nodes are expected to finish computing a job at the same time. But in a heterogeneous cluster, data nodes have a varying range of computation capabilities. Many researches have come up with different algorithms to overcome the challenges in Hadoop to improve service time of jobs and resource utilization. This paper addresses the practical difficulties and anomalies in running Hadoop system built in LINUX CENT OS 6.6. Up to six data nodes are configured in our Hadoop architecture. Different RAM sizes showed unexpected result and MapReduce process showed some anomalies which have not addressed in documentation.

Regular Research Papers:
Symposium on Cloud Computing and Data Centers (CSCI-ISCC)

Performance-aware Refactoring of Cloud-based Big Data Applications

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Abstract: The problem of optimizing performance of cloudbased Big Data applications is critical in the cloud computing domain. In this paper, we propose a performance-aware approach that not only considers the cost of the cloud resources but also focuses on the dependency constraints among the deployed components to help dynamically refactoring the application. Furthermore, our approach closes the gap between design time models and runtime models. The feedback can be provided to application designers to iteratively enhance the application design and improve the application deployment. We have experimented our approach on the Wikistats application and the results show that the proposed approach effectively refactors the deployment based on different QoS metrics (e.g., utilization, cost, availability) of the cloud resources and dependency constraints.

An Agile Process for Developing Cloud Computing Applications

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Abstract: Development of cloud computing applications has increased as the cloud has become more popular over the last few years. A software development methodology that is created specifically for cloud application development is an area of increasing interest for researchers and developers. This paper will investigate how the Agile methodology can be applied to cloud computing with a focus on what basic principles of Agile are best suited for cloud applications. Using the twelve Agile principles as a guideline, a case study will be performed to develop a cloud application that uses Dropbox API to create an application with cloud storage. The results concluded that of the twelve principles, seven were found to be successful with positive outcomes from using them during development and the remaining five were unsuccessful.

Resources Management and Performance Analysis in Datacenter Networks

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Abstract: Datacenters are core computational engines in cloud computing. They are de facto platforms to run computationally intensive applications and execute big data workload. They are expected to provide reliable and cost-effective cloud services. The exponential growth in cloud applications, the demand for more computational and communicative resources, and the need for energy and cost-efficient resource management have motivated researchers to introduce an array of resources management techniques to efficiently manage datacenters' resources. To address these challenges and facilitate future advancements in datacenters, it is important to synthesize, classify and assess the proposed resources management techniques for datacenter clusters. This article investigates how different architectural designs could affect the operational effectiveness of a datacenter. It presents key contributions and a taxonomy of resource management techniques that would guide future design and developmental efforts. It will help researchers and developers to design the most appropriate resource management framework for their datacenters and optimize certain design goals under different workloads.

Design and Implementation of Virtual Topology Management for Multi-tenant OpenFlow Hypervisor

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Abstract: Multi-tenancy is an important feature for data centers and cloud infrastructures. In the early stage of those infrastructures, only a host or virtual server is rented to customers. Recently, companies, governments, and universities have located their servers on virtualized local networks defined by the provider or users. OpenFlow, a core technology of software-defined networking (SDN), is useful to centrally manage and control those virtualized networks; however, SDN technology is used only at the management level, not at the user level. In this paper, we propose a verification-based virtualization system for multiple tenants' OpenFlow networks. It enables virtual network users that are administrators of the tenant's network to use OpenFlow technologies to control their network traffic. Our system provides a practical scheme to create virtual network topology that is the target of control for the tenant's OpenFlow controller. It manages the collisions of each tenant's address space and isolates them by resolving the conflicts of flow entries that came from the tenant's OpenFlow controller.

Job Migration Policy in a Structured Cloud Framework

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Abstract: Migration of jobs from one CSP to other is a routine requirement for making accommodation for new jobs in a cloud environment. In a cloud environment where several jobs are proceeding with different level of completion, it is always a critical issue to identify the right source CSP for possible migration. At the same time, it is equally challenging to identify a destination CSP considering the heterogeneity of the application as well as the present load of the destination CSP. In our work, we propose a simple migration logic on a structured cloud framework for smooth migration. First we identify possible source and destination CSPs in two phases. Check the new available load after each phase for accommodating the new job and accordingly take the decision. The logic of migration has also been explained with suitable examples for further clarification.

Trust Assessment for Cloud Identity Providers Using Analytical Hierarchy Process

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Abstract: The trust assessment is a key function that should be performed in advance of any cloud customers. decision making. A complete methodology for security, risk, and reputation assessment of cloud identity providers is a gap in the current literature and system architectures. In this paper multiple criteria decision-making (MCDM) is introduced to prioritize the attributes for a cloud identity trust framework. The overall trust assessment is decomposed into two parts: the trust analysis of the federated identity management systems, and the quantification of trust. The MCDM approach delivers the inputs to an analytic hierarchy process (AHP) to complete the trust assessment. This paper innovates a theoretical solution to the trust gap between cloud identity providers and the cloud identity customers in the current literature.

An Overview of Cloud Networks and Datacenters Centralization

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Abstract: Cloud networks are kept evaluating and evolving in recent times due to their performance and efficiency, deployment critics, and costs. Recent progress has been quested for more efficiency and high scalability of cloud networks. The improvement over geographic distribution of cloud facilities in performance and resilience has already been supported and produced in the cloud network overlay protocols and advanced IaaS services, which are more reliable and high-performance. This paper gives an overview of cloud networks and distributed services as well as a summary of some cloud network overlay protocols and datacenter distribution features, such as virtual network segmentation, incremental deployment, multipath and load balancing, and multicast.

Verifying Integrity of Big Data in Cloud Databases

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Department of Computer Science & Computer Engineering, University of Arkansas, Fayetteville, Arkansas, USA

Abstract: While the user-base of cloud computing is growing rapidly, data owners worry about security of the data they store on clouds. Lack of appropriate control over the data might cause security violations. Therefore, all sensitive data stored in cloud databases must be protected at all times. This research paper outlines how data owners can keep their data secure and trustworthy, and how they can verify integrity of data in a cloud computing environment. The proposed model uses data partitioning to reach this goal. We have carried out performance analyses of the model through simulation and the results demonstrate the effectiveness of the model.

Fusion-based Resource Allocation Algorithms for Cloud Computing

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Abstract: One of the main challenges in cloud computing is limited availability of resources. As the number of requests for cloud services increases, it becomes necessary for the system to balance the load and serve user requests at stipulated times. Load Balancing is a well-known NP-Complete Problem. This work proposes two variants of fusion-based task scheduling algorithm, both the approaches exploit two existing load balancing algorithms.the traditional round-robin algorithm (RRA) and the priority-based genetic algorithm (PGA), to improve the performance of the system in terms of the completion time. The idea of fusion lies in considering the variable amount of user requests to the cloud system. The first variant i.e. fusionbased load-aware resource allocation algorithm (FLA) uses PGA when there is relatively light load and RRA when the system encounters heavy load. The algorithm determines the intensity of the current load on the system, whether it is light or heavy. In the second variant i.e. fusion-based priority-aware resource allocation algorithm (FPA), the tasks are divided based on priority. PGA is used for scheduling the high-priority tasks whereas RRA is used for scheduling the remaining low-priority tasks. The simulations are conducted using CloudSim 3.0 by varying cloud resources such as data centers, hosts, VMs and various cloudlets for performance analysis. Simulation results demonstrate that the FLA performs better than that of existing basic genetic algorithm (BGA) and PGA only under heavy load, whereas the FPA performs better regardless of any load.

Resource Utilization-aware Scheduling Technique based on Dynamic Cache Refresh Scheme in Large-Scale Cloud Data Centers

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Abstract: In recent years, as researches on big data processing have become active, the frequency of use of HPC and large-scale data center is increasing for data processing. In addition, in the cloud computing environments, a large-scale environment consisting of huge nodes is being built, and additional problems arise due to the large-scale node configuration. In this paper, we analyze the overhead of gathering status information of large-scale nodes each time a virtual machine (VM) is migrated in a cloud environment composed of large-scale nodes. Then, we present a dynamic cache refresh (DCR) scheme to mitigate the unnecessary time of gathering status information of large-scale nodes. Our DCR scheme is able to obtain up-to-date information when necessary and reduce communication overhead without frequent cache refreshes. Based on experimental performance evaluations, we prove that our dynamic cache refresh (DCR) scheme achieves a significant reduction of the network bottleneck and the unnecessary delay time compared to existing cloud scheduler.

Virtual Machine Migration and Task Mapping Architecture for Energy Optimization in Cloud

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Abstract: Growth of information technology led to the increasing need of computing and storage. Cloud services is one such technology with high demand and hence requires more computing resources. Cloud data centers consume huge amount of energy and there by emitting carbon dioxide to the environment. This work proposes an approach for energy efficient resource management. Earlier approaches do not focus on the variations of workloads and lack in examining the effect of algorithms on performance. Virtual machine configuration also plays a vital role for reducing energy consumption and resource wastage, but is not given much importance. To address these weaknesses, this work proposes a novel approach to map groups of tasks to customized virtual machine types. Mapping of the tasks is based on task usage patterns.length, file size, bandwidth etc. Data is clustered in to group of tasks and is mapped to the suitable virtual machine based on the configuration. Virtual machine migration is employed to balance the load by calculating the load using MIPS, RAM and Bandwidth. Complete end-end

architecture is proposed in this work with clustering of tasks, allocation of tasks to virtual machines and virtual machine migration techniques. The results of this work show that the energy consumption is decreased compared to the earlier approaches which uses traditional virtual machine migration techniques.

Short Research Papers:
Symposium on Cloud Computing and Data Centers (CSCI-ISCC)

RPC-based GPU Resource Sharing Technique and Task Scheduling with Performance Isolation Support in Cloud Environments

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Abstract: One of the methods used to accelerate the computation of virtual machines (VMs) in cloud environments is to use GPUs. VMs using GPUs can parallelize large-scale operations with GPGPU technology. In cloud environments where VMs share a limited resource of a single server, sharing of GPU is necessary for many VMs to use the GPU, and need to schedule the work of the VM for all VMs access to resources. In this paper, we propose RPC-based GPU sharing technique for multiple VMs and GPU task scheduling method to support performance isolation of GPU tasks, and then verify the efficiency through experiments.

Regular Research Papers:
Symposium on Parallel & Distributed Computing & Computational Science (CSCI-ISPD)

High Performance IO Tools for Mesh in Numerical Simulations

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Abstract: IO tools in multi-physics simulations often serve multiple purposes, which include to write and read files to restart calculations, to write and process diagnostic files, and to write and read files for connections between different simulations. For diagnostic files and the connection, tools directly working for high-level data structures are desired, such as structured meshes, unstructured meshes, the meshes generated through (block-based, patch-based, and cell-based) adaptive mesh refinement, and association between meshes and variables defined on these meshes. The IO library we developed provides this full capability.

Accelerating High-Dimensional Integration using Lattice Rules on GPUs

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Abstract: Lattice rules for multiple integration yield a powerful method to approximate high-dimensional integrals for various function classes. Using generator vectors obtained from the fast component-by-component (CBC) construction of lattice rules, we incorporated rank-1 lattices for numerical integration on GPU accelerators. We show accuracy and efficiency results for a number of multivariate integrals, and compare with results obtained by Monte Carlo integration for the same functions also on GPU. The lattice rules achieve high accuracy and excellent speedups.

Runtime Power Limiting in GAMESS on Dual-Socket Nodes

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Abstract: Energy efficiency and energy-proportional computing have become a central focus in modern supercomputers. With the exascale computing throughput purported to be bound by the 20 MW power wall, there is an urgent need for strategies that could maximize the performance under a given power budget. In this paper, the quantum chemistry application GAMESS in studied with respect to its behavior under variable power budgets on a dual-socket node. Then, based on the study, a power capping strategy is proposed which dynamically allocates power to various components within a node to maximize performance under a given power budget. Experiments on a 20 core Haswell-EP platform depict that the proposed strategy delivers performance within 2% of the best possible performance for various power budgets in GAMESS.

Crosstalk-Free BPC Semi-Permutation Routing in Optical Multistage Interconnection Networks

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Abstract: A semi-permutation is a partial permutation which meets the requirement of using each switch in the first and last stages of a multistage optical network by only one optical signal at a time. It creates the potential for crosstalk-free routing of the whole permutation but for two cycles of a network. The work is concentrated on semi-permutations received as a result of decomposing BPC (bit-permute-complement) permutations needed in many scientific applications. The given O(NlogN) algorithm makes possible constructing transition matrices for semi-permutations of afore said type basing on periodicity of 1's and 0's in columns of the transition matrix for an initial BPC permutation. For routing in accordance with produced matrices modified sliding windows method is used.

Periodic Steady State of Power Networks using Limit Cycle Extrapolation, Spline Interpolation and Parallel Processing based on GPUs

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Abstract: This paper details a fast and efficient algorithm for the simulation of the steady state response of power networks under non-sinusoidal conditions in the time domain. The algorithm uses the Fourth-Order Runge-Kutta (RK4) to integrate the systems of ordinary differential equations (ODEs), generated by the power system. The Numerical Differentiation method (ND) is used to accelerate the process of convergence of the state variables to the limit cycle. The Cubic Spline Interpolation (CSI) to increase the efficiency of the conventional RK4 method to obtain the time domain waveform using the fewest number of possible time steps, and parallel processing techniques based on Graphic Processing Units (GPUs). It is shown that the

implementation on a GPU-based platform becomes an efficient computational resource to find the steady state solution since floating-point operations and repetitive calculations increase in proportion to the size of the network; related with the computer effort.

A Simulated Annealing Based Algorithm for Detecting Distributed Predicates

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Abstract: Improving the dependability of distributed applications is a challenging task. Distributed predicates detection techniques (runtime verification) can help a lot in this regard by verifying that a given run of a distributed application satisfies certain properties (formally modeled as predicates). In general, these techniques can be exploited in the verification of the correctness of a particular implementation of a distributed system. In any distributed application, several processes are usually running concurrently. Consequently, the number of global states to be considered by the detection techniques is exponential (NP-Complete problem). In this paper, we have investigated the effectiveness of using a meta-heuristic algorithm in solving the problem of detecting distributed predicates. Namely, we have used the simulated annealing (SA) algorithm to develop an algorithm to detect distributed predicates. The results of the experiments demonstrate that the SA-based detection technique outperforms the state enumeration based detection technique.

RTL Level Instruction Profiling for CPU Throttling to Reduce Wasted Dynamic Power

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Abstract: This paper identifies a set of instructions suitable for fine grained CPU throttling to reduce wasted dynamic power in RISCV architecture. An EDA flow was developed to process pipeline trace at an early stage. Instruction profile was generated for each benchmark programs that contains all the instructions executed with their occurrence count and stall count at the pipeline stages. A weight based system was introduced to rank them in the instruction profile. It was observed that higher stall causing instructions are repeating across all the benchmark programs. The weight distribution of each benchmark also shows that there are top 20 instructions that have exponentially higher weights than others. The weight system was further extended across all the benchmark programs in the same test suite to select the top 10 instructions for throttling that identifies probable throttling clock cycles and respective pipeline stages. These results can enable researchers to identify bottleneck in architecture at an early stage.

Distributed Hierarchal Clustering Algorithm Utilizing a Distance Matrix

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City University of New York, Kingsborough Community College, New York, USA

Abstract: Dividing similar objects into a smaller number of clusters is of importance in many applications. These include search engines, monitoring of academic performance, biology and wireless networks. We first discuss a number of clustering methods. We present a parallel algorithm for the efficient clustering of proteins into groups. The input consists of an n by n distance matrix. This matrix would be built differently for different applications. A two simple points in space can have the Euclidean distance in the matrix. As another example, the Root-Mean-Square-Deviations (RMSD) values can be computed for any two 3-D structures and used and the distance between them. The second step is to utilize parallel processors to calculate a hierarchal cluster of these n items based on this matrix. We have implemented our algorithm and have found it to be scalable.

Short Research Papers: Symposium on Parallel & Distributed Computing & Computational Science (CSCI-ISPD)

Reducing Idle Power Consumption in High Performance Systems

Vaibhav Sundriyal, Masha Sosonkina
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Abstract: Although high-performance computing has always been about efficient application execution, both energy and power consumption have become critical concerns owing to their effect on operating costs and failure rates of large-scale computing platforms. Modern processors provide techniques such as Dynamic Voltage and Frequency Scaling (DVFS) and Clock Modulation (Throttling), which modify their performance and power consumption to reduce the dynamic power consumption. Furthermore, with the continual reduction in semiconductor feature size, the idle power consumption will be dominating the dynamic power consumption in the foreseeable future. In this work, a runtime monitoring method is proposed to reduce the idle power consumption of compute nodes in a cluster based on their current utilization. Experiments performed on the clusters tested depict that the proposed method enable energy savings of up to 87%.

Group Mutual Exclusion Algorithm for Intersection Traffic Control of Autonomous Vehicle

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Department of Technology, EcoSystem Co., Korea

Abstract: Intersection Traffic Control_(ITC) has attracted extensive attention with the increase of traffic accidents and congestion that has caused huge social and economic losses. The system currently being studied on ITC needs a lot of computations and is based on ans ICU_(Intersection Control Unit) that is neither flexible nor cost efficient. This paper proposes a token-based group mutual algorithm for ITC for autonomous vehicles. To pass the intersection_(IC) safely without an ICU or traffic lights, there should be perfect coordination among autonomous vehicles based on real-time V2V communications. We use two kinds of tokens: a primary token as a privilege and a sub-token as an auxiliary means to increase the performance of vehicle flow. The rational circulation of tokens is the core subject in this algorithm. VTokenIC decreases message complexity and shows better performance in system throughput than existing traffic signal system.

Regular Research Papers:
Symposium on Health Informatics and Medical Systems (CSCI-ISHI)

Developing Solutions for Healthcare - Deploying Artificial Intelligence to an Evolving Target

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Abstract: The pace of deploying artificial intelligence (AI) techniques to healthcare has been speeding up. Many of the initiatives have been technology driven aiming at finding problems matching the new technology while systematic, demand driven search for solutions has been limited. Here we describe the process of identifying opportunities for deploying artificial intelligence to healthcare and social services on regional and national levels in Finland. The process includes idea generation and elaboration using a design thinking method complemented with architectural design for identifying required AI capabilities for the 34 best use cases. In this paper, we focus on the development of use case "Mobile Solution for Home Care Coordination and Communication" to observe the evolving balance of technology push and demand pull faced in the process.

RetiNet: Feature Extractor for Learning Patterns of Diabetic Retinopathy and Age-Related Macular Degeneration from Publicly Available Datasets

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Abstract: Diabetic Retinopathy (DR) and Age-related Macular Degeneration (AMD) are two common vision threatening eye conditions. In a large-scale screening environment DR and AMD can be assessed by detecting specific retinal findings in fundus images. In this paper, we introduce a new deep learning based feature extractor for automatic classification of DR and AMD from fundus images. We used a small dataset containing 60000 images with four severity levels of DR and two classes of AMD to design and fine-tune a deep learning model called RetiNet. This dataset, which consisted of two publicly available datasets (MESSIDOR and Kaggle), was augmented and employed to evaluate RetiNet. RetiNet can achieve diagnosis performance comparable to retina experts on the MESSIDOR dataset with cross-dataset testing (i.e., the feature extractor was trained on an independent dataset and tested on MESSIDOR). Our algorithm obtained an average accuracy of 88% on the validation set.

3D Inception Convolutional Neural Networks for Automatic Lung Nodule Detection

Chen Zhao, Jungang Han, Yang Jia
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Abstract: Lung cancer is the most common cause of cancer death worldwide. Meanwhile, it is the most common form of cancer with breast cancer. Automatic detection of lung nodules in thoracic computed tomography (CT) scans is one of the hottest area of AI and medical research for the last three decades. In practice, one CT image contains about 200 to 700 slices and this may waste radiologists a lot of time. Computer aided detection (CAD) system will automatically identifying lesions in CT scans, save radiologists a lot of time and save more lives. Recently the success of deep convolutional neural networks on computer vision has lead to new applications in diversified field, including medical image processing. In this paper, we propose two types of deep neural networks to automatically detect lung nodule and help the radiologists read CT images. For the data pretreatment, we use selective search algorithm and set filters to select the most suspicious lung nodules in 2D images. Inspired by Google Inception module, we propose the inception block for 3D convolutional neural networks. The MODEL-Ⅱ acquires the best f1 score at 0.979.

On Drug Dosage Control Using Description Defeasible Logic

Sherin Hijazi, Nadim Obeid, Riad Jabri
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Abstract: Drug-drug and drug-disease interactions are generally harmful. Some of these interactions could result from improper drug doses prescribed for a particular disease or from the unawareness the patient suffers from another disease. We aim in this paper to make a first step towards developing a knowledge based system that supports the decision making process undertaken by the physicians and pharmacists when prescribing drugs and the proper dosages. We need to formally represent knowledge about the drugs (e.g., family to which it belongs, proper doses), diseases and the conditions of the patient (e.g., patient with high cholesterol (LDL) and muscle pain disease). The drug which will employ in our case study is Lipitor. Lipitor is a cholesterol lowering drug from the statin family. The diseases which we will consider are liver and kidney diseases.

SEM Approach for TPB: Application to Digital Health Software and Self-Health Management

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Abstract: The goal of this research is to investigate the feasibility of Structure Equation Modeling approach for developing a quantitative behavior model grounded on the Theory of Planned Behavior. Data collected from an IRB sanctioned pilot consisting of approximately 500 participants were used to develop the model. The validity of the model is evaluated based on Chi-square, p-value, and RMSEA for statistical power and goodness of fit. The utility of the model is studied through correlation analysis related to user engagement for self-health management. Example association pattern discovered from the analysis was illustrated for its use in digital health software development.

Social Participation of Depressed Individuals as an Optimisation Problem

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Abstract: In the USA, 9.5 % of the population of an age from 18 and older exhibit depression symptoms, while the Australian government statistics argue that the whole population will show depressive symptoms at some point in their lives. Depressed individuals often find hard to participate to social activities, either due to loss of interest or bad emotional state. Thus, this has a a major impact on the familiarisation of the patient with the community. In this paper, we address the problem of the participation of depressed individuals to a conversation as an optimisation problem. Specifically, we employ the term information entropy to decide when a depressed individual is suitable for participating in a conversation and we formulate it as a non- convex optimisation problem. In order to stabilise the interacting persons we show that we can utilise a heuristic approach that excludes the depressed individual from the conversation, when their entropy is high. We show results with social participation scenarios of healthy and depressed persons using our approach.

The Design of New Technologies Addressing Independence, Social Participation and Wellness for Older People Domicile in Residentinal Homes

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Abstract: This paper reports on human factors research concerning the development of new assisted living technology enabling older people to lead meaningful and independent lives in a residential home and/or assisted living community. A key goal of the technology is to support a vision of care where older people are socially engaged and have continuity in living experience (i.e. concepts of home and community dwelling). This research adopts a stakeholder evaluation/participatory approach to requirements elicitation and user interface design. The emphasis is on understanding the context and meaning of experience and associated technology need. Specifically, the technology is defined from the perspective of addressing and achieving key stakeholder states/benefits associated with well-being, successful ageing, and relationship centered care. Primarily, the focus of this paper is on reporting field research findings relating to resident need and the proposed technology solution.

Adaption and Implication of Telemedicine in Rural Healthcare Delivery Throughout the United States

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Abstract: Providing healthcare in rural areas introduces a unique set of challenges. One such challenge is the disproportionate allocation of medical professionals. Only ten percent of physicians practice in rural settings despite nearly one fourth of the population living in rural areas. Because of the inconvenience and effort seeking care causes, rural patients often delay receiving the care they need. This lack of consistent care in rural areas actually leads to more complex and costly conditions when simple problems develop into serious complications. Telemedicine was identified as an essential tool to addressing healthcare locality disparities. This paper looks at the correlation of healthcare quality measures and telemedicine implementation rates in an effort to quantify utility gained by implementing these systems. This was done by joining two national data sets; the Centers for Medicare and Medicaid Services (CMS) .Hospital Compare., which provides quality measures by hospital, and Healthcare Information and Management Systems Society (HIMSS) data set which shows various technology implemented in various healthcare settings. From this data, an area of particular growth, cardiac care focused telemedicine, was identified. However, compared to other telemedicine system types (such as radiology or intensive care) that have fairly consistent implementation rates across all hospital types, cardiac care telemedicine systems are far less implemented in critical access hospitals than in general or academic settings. These findings lead us to investigate possible barriers to implementation and the correlation between quality measures and the presence of telemedicine systems at the institution.

Dynamic Patient-Regulated Access Control Framework for Electronic Health Information

Nureni Ayofe Azeez, Charles Van Der Vyver
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Abstract: The easiest and convenient approach to exchange and share medical-based information from one domain to another is through the use of Electronic Health Record (EHR). In advanced countries of the world, there are standard legal framework for ensuring security, confidentiality and privacy of medical information. Specifically, absolute privilege should be given to patient to direct, control and provide permission to anyone authorised to handle his medical details. As important as the issue of security and privacy is in healthcare delivery system, many researchers have suggested and even implemented various techniques. Existing solutions to handle this challenge are however suffering from one problem or the other. For instance, encryption technique that requires the use of smartcard for authentication and authorisation strictly demands the physical presence of a patient. If however, a patient fails to show up for authorisation, a physician will not be able to access basic information regarding the EHR of a patient. Against this backdrop, this paper presents a privacy and security architecture for EHR that gives room for

dynamism and flexibility with absolute assurance for patient-regulated authorisation. The security framework of this work relies heavily on applied cryptographic techniques (digital signatures) with unbridled integration into Electronic Health Record infrastructure. A patient is required to receive authorization from a medical institution through the provision of his identity number via mobile phone or proxy. The choice of a doctor to access patient's EHR details depends solely on his role hierarchy. Finally, the framework provides a feedback mechanism for the patient in form of a report through the Doctor's Feedback Server (DFS).

Methods for Person Recognition and Abnormal Gait Detection Using Tri-axial Accelerometer and Gyroscope

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Department of Biomedical Engineering, National Chiao Tung University, HsinChu, Taiwan

Abstract: This work reports methods to identify a person from gaits as well as identifying anomaly of gaits using "Koala". Koala, that was developed in National Chiao Tung University, Hsinchu, Taiwan, consists of an accelerometer and a gyroscope, and support Bluetooth communication. A gait is segmented from the signals acquired by Koala. Features extracted from the signals were used to identify a person. If a person can be defined by gait, the normal gait of a person should be able to be identified. In this work, we designed a method to detect abnormal gaits. If a practical wearable device available, the presented method can be applied to early detection of diseases, for example, an early stroke.

Towards a Dependable Access Framework for E-Health

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Abstract: Medical information is highly considered sensitive and should therefore be protected from any form of vulnerabilities. In the olden days, medical data were preserved and stored by using traditional methods such as filing system, papers and books. This approach is known with many flaws and weaknesses. The exigency for large amount storage areas and complexities in the retrieval of records are few among the numerous challenges. Against the backdrops of various noted problems with traditional approach, Information Technology (IT) has brought several initiatives aim at finding solutions. Introduction of electronic health (e-Health) is one of the major ideas aims at bringing better alternatives to healthcare sector. Electronic health is considered the best solution to the management of health information across the globe. With this approach, information is neat and tidy, and can be easily stored and retrieved within a very short period of time. Despite numerous benefits noted with this initiative; e-Health is still characterised with various challenges. Few of those challenges are security, scalability and interoperability of the e-Health framework. This research aims at resolving the security challenge in e-Health. In achieving this, we propose a secrecy-protecting data system that will guarantee absolute control of information disclosure to a third party. The architectural model has three phases: the patient service phase, digital watermarking phase and data service phase. Each of the phases has unique functions which it performs within the system. In this context, patient will be able to exercise, express and enforce exclusive obligations and privileges concerning disclosure of his health information to a third party.

Understanding Wheelchair Occupant Posture and Dynamics Prior to Egress from a Wheelchair

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Abstract: In this paper, we present the mathematical analysis of patient dynamics prior to an unattended egress from a wheelchair. This analysis provides the basis to develop an information system that provides remote caregivers real-time status on movement of unattended, unobserved, high fall risk wheelchair occupants. Most falls occur among the elderly, as they attempt to walk without the assistance they need. Fortunately, the unattended elderly in a wheel chair often shift about and reposition

themselves over some period of time before they attempt to leave the chair on their own. Understanding the dynamics and posture changes associated with this repositioning activity is essential if one is to have the latency necessary to mitigate falls from wheelchairs.

Using Multi-Sensor System for Measuring Finger Trembling, and Applied to Neurodegenerative Disease

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Abstract: Finger trembling is a feature for neurodegenerative diseases. Accessing the trembling of fingers can help diagnosis or monitoring of progression of the disease. Currently, tremogram is used in the hospital to measure the trembling of a finger. Tremogram is a single and uniaxial acceleration gauge. Using the tremogram, only the trembling direction of a finger can be measured. The direction and the finger are determined by the physician. This work studied the possibility to employ the Leap Motion and the G-sensor/gyro to access the trembling of the five fingers. Experimental results demonstrated positive answers that a G-sensor/gyro system can access not just only those information obtained from the tremogram, we can derive more information.

A Non-Linear Support Vector Machine Approach to Testing for Migraine With Aura Using Electroencephalography

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Abstract: In this paper a new migraine analysis method is proposed using EEG (electroencephalography) signals to characterize migraine patients with aura (MwA). The objective of this work is to implement a technique for characterizing and extracting significant, robust and informative features from EEG signals which are representative of the interictal migraine brain state. We extract three brain characteristics using brain network analysis of alpha phase synchronization; transient abnormality analysis using wavelet scale; and finally joint time-frequency analysis using AR modeling. Feature selection and reduction techniques were performed on the sub-features of these three mutually independent features, to combat the over-fit problem as well as to maximize the generality of the classifier. Interpretation of the reduced features resembled to previous migraine studies. Furthermore, extracted features were used as inputs to a 10-fold cross validated non-linear support vector machine (SVM) classifier. The results showed a 92.9% classification accuracy for MwA in the interictal stage from the normal control (NC) group. Findings suggest electrical features for the predisposition of migraine which can lead to possible preventative interventions in the future.

A Tele-Triage Application Design for Mobile Health at Mayo Clinic

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Faculty of Medicine, McGill University, Montreal, Canada

Abstract: Ophthalmology requires specialist care that is not available in general clinics. The long time it takes for a patient to see an eye specialist can adversely affect their medical condition. On the other hand, a general physician might transfer a patient to see a specialist based on their initial suspicions, which turns out to be a false alarm once the patient is examined by an ophthalmologist. We investigated the possibility of creating a simple, inexpensive medical device that will allow patients or general physicians to remotely send their medical images of a human eye to be immediately evaluated by an ophthalmologist.

Fast Generation of Clinical Pathways Including Time Intervals in Sequential Pattern Mining on Electronic Medical Record Systems

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School of Computer Science and Communication, KTH Royal Institute of Technology, Stockholm, Sweden;
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Abstract: Machine-based generation of clinical pathways that utilizes sequential pattern mining to extract the pathways from historical electronic medical record (EMR) systems has gained much attention. We previously proposed a method to generate clinical pathways including time intervals that provides rich information to medical workers. However, this method is difficult to use in real applications because of slow clinical pathway generation as a large number of duplicate patterns are included. In this paper, to speed up the clinical pathway generation, we deploy an occurrence check that adds only closed sequential patterns to the results during mining while considering time intervals between events. Experiments on real data sets showed that our proposal can be more than 13 times faster than our earlier method and can significantly improve the decision-making process for medical actions at large hospitals.

Identifying an Mitigating Design Challenges of Ophthalmology Tele-medicine at Mayo Clinic

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Faculty of Medicine, McGill University, Montreal, Canada

Abstract: Given the rapid everyday developments in technology, it will be rewarding for patients and ophthalmologists to use a mobile system in order to perform eye examinations and provide accurate triage or diagnosis of medical conditions. This will increase the delivery of healthcare services such as reducing physician travel during off-hours and decreasing the wait-time for patients. We identified the design challenges to create an easy-to-use, as well as a low-cost medical device and not only considered the portability of the system but also housed the related items such as camera, power supplies and lighting system in a compact case.

An Effective Immune-Inspired Algorithm for Medical Image Segmentation

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Abstract: Noise interference is one of common problems in medical image processing, so an effective filter approach is the foundation of image segmentation. In order to provide an effective approach for medical image segmentation, a novel hybrid algorithm based on windowed Fourier filtering (WFF) and immune genetic algorithm (IGA)(WIGA) had been proposed in this article. Windowed Fourier transform not only can extract the regional frequency information, but also the local information of an image, it is suitable for filtering in modern medical image processing, because it can maintain more local textural feature in the region of interest. After segmentation, the location, size and shape of pulmonary nodules can be seen clearly. Experimental results show that the proposed approach is validity and feasibility in medical image segmentation.

Security Management in Health Care Information Systems

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Abstract: Health care information systems play an important role for communication across the organizational borders of health care services. The electronic health record represents the main entity in the management, exchange and storage of medical information. Health care organizations must adopt strategies for security and privacy risks associated with access to health care information systems, but on the other hand, the information needs to be accessible and readable for authorized health care professionals carrying out patient treatment. This paper presents a literature review on security management in health care information systems. The aim was to analyze descriptions and definitions of information security policy, access control management and the usability of security solutions.

Context Sensitive Health Monitoring Using Fog Computing

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Abstract: Health informatics has become one of the most researched area when it comes to application of Wireless Sensor Networks (WSNs). Wireless and wearable sensors have become prevalent devices to monitor patients at risk for chronic diseases. This helps ascertain that patients comply by the treatment plans and also safeguard them during sudden attacks. The amount of data that is gathered from various sensors are numerous. In this paper we propose to use fog computing to help monitor patients suffering from chronic diseases such that the data is collected and processed in an efficient manner. The main challenge would be to only sort out context sensitive data that is relevant to the health of the patient. Just having a simple sensor-to-cloud architecture is not viable and this is where having a fog computing layer makes a difference. This increases the efficiency of the entire system as it not only reduces the amount of data that is transported back and forth between the cloud and the sensors, but also eliminates the risk that a data center failure bears with it. We also analyse the security and deployment issues of this fog computing layer.

Identifying Subgroups of Type II Diabetes Patients using Cluster Analysis

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Abstract: The objective of the project was to uncover correlations between demographic subgroups of Diabetes type II patients extracted from Howard University's health records, and their co-morbidities. The data was first extracted from SQL, cleaned, and preprocessed. It was then uploaded into R. Four algorithms were chosen to create two, three, four, and five clusters of the data, which were then subject to comparative analysis. It was then determined that DIANA (Divisive ANAlysis) clustered the data best, and from which results were extrapolated. Distinctions of chronic diseases were made by gender and marital status. There were significantly more cases of acquired hypothyroidism cases occurring in women who are black, female, and non-single. There were elevated incidences of prostate cancer (neoplasm, malignant, of the prostate) in men who are black and non-single. Incidences of Tobacco use disorder also had higher occurrences in clusters featuring mostly single men and women. Many of these relationships remain unexplored.

AHP Model for Diagnosis of Tropical Confusable Diseases

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Department of Computer Science, University of Uyo, Uyo, Nigeria;
School of ICT, Southern Alberta Institute of Technology, Calgary, Canada;
Department of Computer Science, Lagos State University, Lagos, Nigeria;
Department of Computer Engineering, Federal University, Oye-Ekiti, Nigeria

Abstract: Access to medical facilities is a huge source of challenge in developing countries, especially of Africa, Asia and the Middle East. Technology has been employed in various spheres of human endeavour, including health care; however, little has been done to harness the power of technology in the diagnosis of tropical (often confusable) diseases. In this study, we mined the experiential knowledge of medical experts to develop an analytic hierarchy process (AHP) model for the diagnosis of seven diseases that are prevalent in tropical (mostly developing) countries. Our system also takes cognizance of some risk factors that could pre-dispose an individual to infection. In addition, it recognizes the semantic causative relationships among symptoms, and can account for comorbidity in the seven diseases under consideration. Our system is implemented in an Android environment, and recognizing the need for a friendly and simple user interface for the medical practitioner.

Registered After Deadline:

Intelligence and Global Health Policies - Knowledge Transfer Partnerships (KTP) in Global Health and Health-Care Strategies from Knowledge Societies to Emerging Countries at Accelerated Growth

Giuseppe Tritto, Andrew Marsh, Matthew Tritto, Giulio Tarro, Alice Karoubi Nordon, Francesco Sicurello, Pal Miletics, Antonella Colonna Vilasi

Executive President WABT - ICET (WWO Network), Paris, France, EU; World Academy of Biomedical Sciences and Technologies - WABT, UNESCO NGOs House, Paris, France; WABT European Institute for Life - WEIL, Budapest, Hungary; HealthLife Creative Enterprise Ltd, London, UK; CEO HoIP Telecom Ltd, London, UK; Secretary-General WABT, Paris, France; Division of Virology, D. Cotugno Hospital, Naples, Italy; Chairman Commission BioTechnologies and VirusSphere, WABT - UNESCO, Paris, France; Temple University, USA; President Foundation Teresa & Luigi De Beaumont Bonelli for Cancer Research, Naples, Italy; Ascott Associes Lawyer Firm, Paris, France, EU; IT & TeleMedicine, Milano, Italy; President IITM - International Institute of Tele-Medicine, University Milano Bicocca, Milano, Italy; President Italian Society of TeleMedicine; President Hungarian Association for Telemedicine and e-Health, Budapest, Hungary; President, Research Centre on Intelligence (U.N.I.), Rome, Italy

Abstract: TBA

Registered After Deadline:

Social Determinants of Human Fertility and Demographic Changes in Global Health Human Reproduction Technomics and Providers for Human Fertility Quality and Control

Giuseppe Tritto, James Goldberg, Sujoy Guha, Giulio Tarro, Matthew Tritto, Koel Chaudury

World Academy of Biomedical Sciences and Technologies - WABT, UNESCO NGOs House, Paris, France; WABT European Institute for Life - WEIL, Budapest, Hungary; HealthLife Creative Enterprise Ltd, London, UK; World of Life, London, UK; CEO HoIP Telecom Ltd, London, UK; Secretary-General WABT, Paris, France; Division of Virology, D. Cotugno Hospital, Naples, Italy; Chairman Commission BioTechnologies and VirusSphere, WABT - UNESCO, Paris, France; Temple University, USA; President Foundation Teresa & Luigi De Beaumont Bonelli for Cancer Research, Naples, Italy; Ascott Associes Lawyer Firm, Paris, France, EU; IT & TeleMedicine, Milano, Italy; President IITM - International Institute of Tele-Medicine, University Milano Bicocca, Milano, Italy; President Italian Society of TeleMedicine; IT & TeleMedicine, Budapest, Hungary; President Hungarian Association for Telemedicine and e-Health, Budapest, Hungary

Abstract: TBA

Short Research Papers:
Symposium on Health Informatics and Medical Systems (CSCI-ISHI)

Deep Learning Features in Atmospheric Chemistry: Prediction of Cancer Morbidity due to Air Pollution

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Department of Mathematics, University of Wisconsin, Madison, Wisconsin, USA

Abstract: Atmospheric Chemistry plays an increasing role in public health. This paper highlights methodology aspects from a computational model for analysis of historical data from atmospheric chemistry in China, its correlation with existing cancer morbidity data, and the future impact on future cancer morbidity rate due to changes in climate.

Evaluation of Simulator-based Exercise Using Mental Workload Monitoring System

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Graduate School of Engineering, University of Hyogo, Himeji, Japan;
AffordSENS Co., Yokohaya, Japan;
Department of Nursing, Kyoto Tachibana University, Kyoto, Japan

Abstract: The evaluation of simulator-based exercise in maritime society depends on specialists who have enough onboard experience like a master and/or a professor of maritime university. That is just subjective evaluation, and the reviewed data is performance of the operated vessel (own ship course, speed, rudder angle, etc.) and their behavior (order, action, etc.). We propose that their inside response (mental workload) is also important data to evaluate their simulator-based exercise using physiological index; moreover, we have found the heart rate variability, facial (nasal) temperature, and saliva are efficient to read their mental workload. However, the evaluation was not real time yet, it is just off-line analysis. The real time data is available that the instructor gives trainee the useful advisements on the spot during the exercise. In this paper, we propose a monitoring system as an evaluation support system for simulatorbased exercise using heart rate variability, and we confirm its possibility.

The Challenges of the IoT Solution in a Home Care Project

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Abstract: In the process of exploring reliable and robust IoT solutions for an ongoing home care project, we have encountered difficulties to build a complete and coherent system due to lacking of standards, ambiguity in regulations and immature development on the market, etc. In this paper, we introduce our home care system, present the challenges of the current solutions and suggest alternative.

Resilient Context-Aware Medical Device Security

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Department of Cardiology, Kepler University Hospital, Linz, Austria

Abstract: Medical devices have become indispensable for millions of patients worldwide. They increasingly depend on software and interoperate with other devices wirelessly and through the Internet. The sensitive nature of health information, the increasing

interoperability of medical devices, and the fact that human well-being and life are at stake puts medical device security at the forefront in healthcare technology. We will suggest a means of resiliently securing medical devices by varying sensitivity, impact, exposure and authentication depending on the devices. security context. We will demonstrate this new context-aware mechanism on cardiac pacemakers.

Telemedicine Follow Up of Chronic Obstructive Pulmonary Disease Integrated into a Patient-centered Health Care Team Setting

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Centre for eHealth, Faculty of Engineering and Science, University of Agder, Norway;
Research Department, Sorlandet hospital HF, Kristiansand, Norway

Abstract: Health care services are facing challenges with a growing ageing population prone to chronic conditions and multi-morbidities. Telemedicine applications have the potential to enhance patient's safety at home by monitoring of chronic diseases, promoting coping and independence. The research project Patients and Professionals in Productive Teams aims to study patient-centered teamwork across organizational borders, supported by technology. This paper describes the research agenda for a study on how telemedicine follow-up impacts on chronic obstructive pulmonary disease patients' quality of life and possible effects on patient empowerment, in the health region of Southern Norway. The outcome is expected to describe how telemedicine can be carried out and implemented in daily routines together with a patient-centred health care team with the aim to increase patient safety.

FirstSteps: A mHealth Tool for Children Registration and Monitoring

Jesuloluwa S. Eyitayo, Joke A. Badejo, Aderemi A. Atayero
Department of Electrical and Information Engineering, Covenant University, Nigeria

Abstract: The right of every child to survive, live healthy, have a voice and be educated begins with being uniquely identified immediately at birth. This paper details the development of a mHealth tool, coined FirstSteps, which incorporates an extensive registration platform for children under age five into a functional mobile child healthcare application. Considering diversity and cultural practices, FirstSteps adopts features (such as schedule setup for vaccination, doctor's appointment, recording child growth at various developmental stages) which can be deployed in sub-Saharan Africa and complements them with child registration records, one of the vital need of the region. It is expected that this will aid in achieving significant birth/child registration thereby providing quality data useful for reduction of high mortality rate in sub-Saharan Africa.

Symposium on Consumer Electronics (CSCI-ISCE)

Multi-party Interactions by Robot Quiz Master in Speech-based Jeopardy!-Like Games

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Kyoto University, Yoshida-Honmachi, Sakyo, Kyoto, Japan;
Waseda University, Shinjku, Tokyo, Japan

Abstract: Robot Audition enables a robot to listen to simultaneous utterances via its own ears by localizing and separating sound sources and recognizing separated sounds. Although several applications are developed as a proof of concept such capabilities of robot audition have not been well shaped in the context of applications, particularly, in multi-parson interactions. This paper focuses on the question "what is the next step when a robot and/or system can listen to several utterances at once?" This paper describes a quizmaster robot for speech-based Jeopardy!-like games with two interaction models, schoolclass- type and auction-type. In the former, participants compete the right of answer by saying "yes" as soon as possible and the fastest one obtains the right to say his/her answer. The quizmaster robot first localizes and separates each utterance and recognizes it and determines the fastest responder. In the latter, they compete to say an answer as soon as possible. The robot should do additional task to judge whether an answer is correct or not. Because participants say when the robot presenting a question or background music is played, that is, barge-in utterances occur, the robot cancels its own utterance and background music to enhance participants. utterance. Empirical evaluation and lessons are discussed.

Flightbot: Towards Improving In-Flight Customer Experience Through The Use Of Robotics

Gilson Dos Santos, Akhil Koothal, Irvin Steve Cadenas, Michael Lovell, Christian Collier, Jong-Hoon Kim
Advanced Tele-robotics Research Laboratory, Department of CS, Kent State University, Kent, Ohio, USA

Abstract: Recent advances in robotics have affected various industries across the world, especially service areas. One of the most challenging areas is in-flight service, which has huge potential in terms of business as well as customer satisfaction. In this paper, we propose a novel robotic system, called the in-Flight Autonomous Customer Care System (iFACCS) that enhances a flight attendant's duties and affords passengers with a more pleasant travel experience. The iFACCS allows passengers to request catering services as well as travel items through a customer application at their seat and flight attendants to deliver the requested services and items to the customers via a semi-autonomous robot, called FlightBot on-board the aircraft. We discuss the state of art of such service systems and their limitations, propose the architecture of the iFACCS, describe our preliminary work, and elaborate on the challenges faced during the development of our the robotic system.

Poster Papers:
Symposium on Computational Science (CSCI-ISCS)

Materialized Graph Index Structure for Fast K-NN Query Based on Distributed Sparse Matrix Multiplication

Jung-Ho Um, Sunggeun Han, Hyunwoo Kim, Kyongseok Park
Scientific Data Technology Lab, Korea Institute of Science and Technology Information (KISTI), Korea

Abstract: Graph data is used in a variety of applications. For example, in location-based services, k-NN queries for finding nearby POIs are very frequently used. Therefore, we design a materialized graph index structure for efficient query processing of graph data. The graph index is constructed by using a sparse matrix multiplication of a parallel array database. To verify the efficiency, we compared the proposed method with those of CombBLAS and Gemini in terms of k-NN query processing time. As a result, despite using disks, our method improves performance 24 and 3.9 times compared to those of CombBLAS and Gemini for k-NN query processing, respectively.

Advanced Testing Tool for .NET Applications

Petr Capek, Erik Kral, Roman Senkerik
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Abstract: This article proposes a tool for testing .NET applications without the need to preconfigure the target application. By using this tool, the user can visualize and control application code in an intuitive and understandable way. The tool also has features to collect statistics from code execution to help understand how the code behaves. All this leads to significantly reduced time spent during the coding and testing phases of software application development, especially for legacy applications in which techniques like TDD (test driven development) or Unit testing are not possible.

Multi-class Agent-based Model of Crowd Dynamics

Raghda Alqurashi, Tom Altman
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Abstract: This paper describes a modified agent-based model (ABM) that simulates crowd behavior within dynamically changing environments. These include network topology changes, or external stimuli such as explosions, fires, earthquakes, just to name a few. In general, crowd dynamics simulation is relatively difficult to carry out because the behavior-influencing factors may come from within as well as outside of the system. The proposed modeling system employs a hybrid centralized approach (to assist the individual agents with their decision-making) that is based on both the local and/or incomplete/indirect global information.

An Overview of the New Interdisciplinary Fields of Public Policy Engineering and Computational Public Policy for the Next Frontier in Public Policy

Ashu M. G. Solo
Maverick Trailblazers Inc., Wilmington, Delaware, USA

Abstract: This extended abstract provides a brief overview of two new interdisciplinary fields defined by Ashu M. G. Solo called public policy engineering and computational public policy. Public policy engineering is the application of engineering, computer science, mathematics, or natural science to solving problems in public policy. Computational public policy is the

application of computer science or mathematics to solving problems in public policy. Public policy engineering and computational public policy include, but are not limited to, principles and methods for public policy formulation, decision making, analysis, modeling, optimization, forecasting, and simulation. The definition of these two new fields will greatly increase the pace of research and development in these important fields.

An Overview of the New Interdisciplinary Fields of Political Engineering and Computational Politics for the Next Frontier in Politics

Ashu M. G. Solo
Maverick Trailblazers Inc., Wilmington, Delaware, USA

Abstract: This extended abstract provides a brief overview of two new interdisciplinary fields defined by Ashu M. G. Solo called political engineering and computational politics. Political engineering is the application of engineering, computer science, mathematics, or natural science to solving problems in politics. Computational politics is the application of computer science or mathematics to solving problems in politics. Political engineering and computational politics include, but are not limited to, principles and methods for political decision making, analysis, modeling, optimization, forecasting, simulation, and expression. The definition of these two new fields will greatly increase the pace of research and development in these important fields.

Poster Papers:
Symposium on Signal & Image Processing, Computer Vision & Pattern Recognition (CSCI-ISPC)

A Computer-Aided Pap Smear Screening System

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Department of Computer Science & Information Engineering, Chung Hua University, Taiwan

Abstract: With the popularization of Pap test, the rank of cervical carcinoma has a declining trend. Pap test is the most effective method for early screening. Subjective view, heavy duty and overworked were causing the mistakes of the screening. Therefore, the automatic computer-aided system for Pap test is a new trend. In this paper, we used the Bethesda system, a system for reporting cervical or vaginal cytological diagnoses, as the basis of screening, and image processing and computer vision method are applied to retrieve the feature of abnormal cells. In this research, we segment the cell of smear image into nucleus and cytoplasm in HSV color space and calculate the global nuclear-cytoplasm ratio. Next, we find the contour of nuclei by morphological methods. The deformation features are also recorded in this step. Finally, area features of the Syncytium-like cell and color characteristics of the Hyperchromasia cell are estimated. Combine all of the above features, we mark the suspected tumor location with color circle and block as a reference for doctors and medical staff.

Development of Motion Analysis and Classification using ELM and Autoencoder

Dong-Hyun Kim, Keun-Chang Kwak
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Abstract: This paper is concerned with a development of motion analysis and motion classification based on ELM (Extreme Learning Machine) and AE (Auto-Encoder) for a Korean pop (K-pop) dance classification. First, we calculate 13 angles representing important motion features from 3D marker information obtained by Kinect camera. The statistical values of these angles are concatenated with feature vectors for all of the frames of each point dance. Second, we perform a dimensionality

reduction based on PCA (Principal Component Analysis) and LDA (Linear Discriminant Analysis). Finally, we design ELM or AE classifiers for dance motion classification. For this, we construct a K-pop dance DB with 800 and 400 dance-movement data points including 200 dance types produced by 4 professional dancers and 40 trainees for training and testing data set, respectively. The experimental results revealed that the presented ELM method showed a good classification performance in comparison with KNN (K-Nearest Neighbor). For further research, we shall perform the experiments based on AE.

Radar-lidar Sensor Fusion Sheme using Occluded Depth Generation for Pedestrian Detection

Seong Kyung Kwon, S. H. Son, Eugin Hyun, Jin-Hee Lee, Jonghun Lee
Department of Information and Communication Engineering, DGIST, Daegu, Korea;
Research Division of Automotive Center, DGIST, Daegu, Korea

Abstract: Despite the development of sensors and their sensor fusion technologies, pedestrian detection technology is a still challenging topic. The pedestrian detection using LIDAR-RADAR fusion method hasn't yet been reported. We propose the occluded depth generation based LIDAR-RADAR sensor fusion scheme. The proposed method consists of object detection, occluded depth generation and then pedestrian detection. Objects within the occluded depth are detected by RADAR and an occluded object is estimated to a pedestrian by means of RADAR human Doppler distribution.

Replication of Objects via Sensors and Computer Vision

Bryson Racoma, Michael Rodrigeuz, David Garmire
Department of Electrical Engineering, University of Hawaii at Manoa, Honolulu, Hawaii, USA

Abstract: This paper presents a device that will implement scanning technology in a new way. The device will utilize techniques used in computer vision algorithms for object scanning and replication. The device uses edge detection, triangulation, and clustering to create a point cloud which will form a precise model for 3D printing. The data organization and file creation will be completed through a developed encoder which converts raw output into a desired file format.

Development of a Recognition Algorithm for Newborn and Infant Fingerprints

Odu Tiwalade Olubukola, Badejo Joke Atinuke
Department of Electrical and Information Engineering, Covenant University, Ota, Nigeria

Abstract: This research seeks to develop a fingerprint recognition algorithm with emphasis on feature extraction for the automatic recognition of newborns and infants. The feature extraction algorithm will extract the salient features required for identification/verification of the identity of newborns and infants from the fingerprint images captured with the ubiquitous 500ppi fingerprint scanners. It is expected to produce a database of fingerprints acquired from newborns and infants and an automated fingerprint recognition system for the identification of newborns and infants with improved speed and accuracy, cost reduction and the least possible vulnerability to spoofing.

Poster Papers:
Symposium on Mobile Computing, Wireless Networks, & Security (CSCI-ISMC)

Mobility and Temperature Aware QoS Routing Protocol in Wireless Body Area Networks

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Department of Informatics, Gyeongsang National University, Korea;
College of Technological Innovation, Zayed University, UAE;
Department of Computer Science and Engineering, Chungnam National University, Korea

Abstract: When it takes unique characteristics of Wireless Body Area Networks (WBAN) into account, both mobility and temperature of sensor nodes should be taken to improve packet delivery ratio and end-to-end delay in energy efficient way. To achieve this goal, we propose new QoS routing protocol to define new routing metric which combines hop count, temperature and link quality. Finally, simulation results are given to demonstrate the superior reliability and delay to previous protocol.

ADC Resolutions of MIMO Systems in Structured Code Schemes on a Discrete Memoryless Symmetric Channel Environment

Woo Yong Lee, Kyeongpyo Kim, Seungeun Hong
5G Project Strategy Section, Electronics and Telecommunications Research Institute (ETRI), Daejeon, South Korea

Abstract: Ultra-wideband mobile communication systems that support hundreds of Gbps data rates require the use of very large bandwidths. To implement such an ultra-wideband communication system, a high-speed ADC is essential. Ultra-wideband (UWB) ADCs have been studied for many years to use very low resolution ADCs to reduce circuit complexity and power consumption. From the viewpoint of encoding theory, we try to solve the problem of low resolution ADC use. The compute-and-forward framework, which has been studied in the field of network information theory recently, uses a technique that allows the receiver to decode a linear combination of transmission messages. In this paper, we analyze the achievable channel capacity of a MIMO system that achieves diversity and multiplexing gain in a low resolution ADC environment using this structured code theory. In particular, the relationship between this achievable channel capacity and the quantization level q. The results of this paper are expected to be used as a theoretical basis for the development of UWB communication systems for highcapacity transmission system applications.

Poster Papers:
Symposium on Artificial Intelligence (CSCI-ISAI)

A Perspective on Reinforcement Learning in Price-based Demand Response for Smart Grid

Renzhi Lu, Seung Ho Hong, Xiongfeng Zhang, Xun Ye, Won Seok Song
Department of Electronic Systems Engineering, Hanyang University, Ansan, Korea;
Nestfield Co., Ltd, Ansan, Korea

Abstract: This paper proposes a price-based demand response (DR) algorithm for energy management in a hierarchical electricity market. The pricing problem is formulated as a reinforcement learning (RL) model. Using RL, the service provider (SP) can adaptively decide the retail electricity price during the on-line learning process.

Convolutional Computation Performance Comparison for High Resolution Images

Sunggeun Han, Jung-Ho Um, Hyunwoo Kim, Kyongseok Park
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Abstract: Extensive research is being conducted on high resolution satellite images in order to develop advanced artificial satellites and remote sensing equipment. When a deep neural network is trained using high resolution images, the training time is long due to the massive size of images and the convolutional computations performed by the filters. This study tested the convolutional performance over varying convolutional methods with filter sizes for global-scale satellite image data. The optimal filter size and convolutional method associated with the shortest training time were identified to apply the deep neural network in examining the concentration of chlorophyll.

Poster Papers:
Symposium on Social Network Analysis, Social Media, & Mining (CSCI-ISNA)

Visualization of the Clues in Web Exploration for Enhancing Unskilled Learner's Meaningful Trial and Error

Takeru Watanabe, Hiroki Nakayama, Ryo Onuma, Hiroaki Kaminaga, Youzou Miyadera, Shoichi Nakamura
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Global Education Center, Waseda University, Tokyo, Japan;
Division of Natural Science, Tokyo Gakugei University, Tokyo, Japan

Abstract: The significance of Web exploration has increased in intellectual activities such as Project-Based-Learning (PBL) and research work. To successfully carry out such intellectual activities, users are needed to precisely grasp results of searches and their circumstances (i.e., search contexts). Such tasks are generally difficult and peculiar skills based on experiences are required. Therefore, it is important for unskilled people to gain experiences of trial and error in Web exploration. However,

novices tend to become immersed only in Web exploration and neglect the groping. Thus, this research was aimed at developing support system for facilitating exploratory experience in Web exploration of novices.

Spam Message Filtering by Using Sen2Vec and Feedforward Neural Network

Hyun-Young Lee, Seung-Shik Kang
School of Software, Kookmin University, Seoul, Republic of Korea

Abstract: Korean word structures or patterns in SMS spam messages for mobile phone users are becoming more intelligent and diverse. We propose an automatic spam filtering method of SMS messages by using a feedforward neural network by constructing a sentence vector from word embedding method. Evaluating the performance of the feedforward neural network, we compared the accuracy of spam message filtering with SVM, which is commonly used for filtering spam messages. About 100,000 SMS messages were used for training the model and 10,000 test data were used for evaluating the accuracy of spam message filtering.

Poster Papers:
Symposiums on Education (CSCI-ISED) & Software Engineering (CSCI-ISSE)

Microdata for Semantic Annotations: Quantitative Analysis of the Deployment of Educational Properties

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Department of Software and Computing Systems, University of Alicante, Alicante, Spain

Abstract: The use of semantic annotations on web content aims to provide information able to be interpreted by search engines and other applications. According to recent publications, Microdata is one of the formats to provide these embedded annotations that has reached a broad adoption in different fields. Concurrently, Schema.org has become the accepted standard for embedded markup and recently has adopted specific vocabulary to describe educational content belonging to the Learning Resource Metadata Initiative (LRMI) specification. In this work, we present a quantitative analysis of the deployment of Microdata with educational LRMI properties conducted on datasets of web pages extracted from large-scale web corpus, obtained from web crawling, of three consecutive years. The results show a low trend of adoption of this technology as well as issues related to the misuse of the vocabulary.

Support Methods for Sustainable Fostering of Learning Strategies Using the Experience Case Sheets in Research Activities

Tsubasa Shimoyama, Ryo Onuma, Hiroki Nakayama, Hiroaki Kaminaga, Youzou Miyadera, Shoichi Nakamura
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Global Education Center, Waseda University, Tokyo, Japan;
Division of Natural Science, Tokyo Gakugei University, Tokyo, Japan

Abstract: The importance of PBL (Problem Based Learning) has increased and there have been various projects on it. However, developmental learning by taking advantage of experience cases has not still been realized although it is particularly important. On the other hand, the suggestion and recall of the experience cases in abstract way such as "You/I should do it like that scene"

between teachers and learners often succeeds but quite limited. In this research, we focus on a fact that examination of the strategies on teaching and learning tends to close by each subject and work. In this paper, we present a novel support framework for organizing the experience cases and their utilization.

Student Support Using Source Code Snippets Sharing and Advanced Integration

Erik Kral, Petr Capek
Faculty of Applied Informatics, Tomas Bata University in Zlin, Czech Republic

Abstract: This paper proposes a new tool and methodology for sharing code snippets or complete projects with students. The tool is based on an industry standard version control system. The proposed tool and methodology is easy to use and does not require any previous knowledge. Experiments will be run with students in programming courses to evaluate this tool.

Poster Papers:
Symposiums on Health Informatics and Medical Systems (CSCI-ISHI) & Internet of Things (CSCI-ISOT)

A Secure and Smart Framework for Monitoring Infants' Safety

Kambiz Ghazinour, Jong-Hoon Kim, Xiang Lian
Department of Computer Science, Kent State University, Kent, Ohio, USA

Abstract: In this paper, we propose an affordable secure and smart framework which utilizes sensors to measure both infants and surrounding conditions, detects abnormal events of *Sudden Unexpected Infant Deaths* (SUID), and triggers to alarm the parents when the infants need special attention. The framework also provides crucial information to the healthcare providers to make more informed decision, and the collected data can be transferred to the cloud for further analysis with anonymized babies' health information, complying with the United States' *Health Information Portability and Accountability Act* (HIPAA) guidelines.

Framework for Integration Testing of IoT Solutions

Miroslav Bures
Research Group STILL, Department of CS, FEE, Czech Technical University in Prague, Czech Republic

Abstract: The Internet of Things (IoT) technology raises specific demands to testing and quality assurance in a number of areas, as security, privacy, reliability, interoperability or integration. In the paper, we focus on the interoperability and integration issues. We present a concept of specialized testing framework, which is based on a hybrid of IoT infrastructure simulation and integration testing approach. The aim of the framework is to decrease IoT testing costs together with increasing of test coverage and potential of the tests to detect relevant defects in the IoT solution.

Poster Papers:
Symposiums on Big Data (CSCI-ISBD) &
Parallel & Distributed Computing (CSCI-ISPD)

A/C Load Forecasting Using Deep Learning

Jin Cho, Zhen Hu, Mina Sartipi
Department of Computer Science & Engineering, University of Tennessee at Chattanooga, Tennessee, USA

Abstract: In the United States, the residential and commercial sectors are responsible for almost half of total energy consumed. Additionally, air conditioning accounts for the majority of energy consumed in residential buildings. In order to reduce the energy consumption of the building, we identify the behavior of A/C energy consumption by estimating the future A/C load. In this paper, we will explore deep learning-based algorithms to estimate A/C energy consumption using the smart meter data and outdoor temperature data. We will utilize data provided by Pecan Street to validate the performance of proposed task. Our results will demonstrate the strength of deep learning algorithms in solving load forecasting problems, and help in further investigations.

Communication Faults in Robot Formation Control: A Reconfigurable Spanning Tree Approach

Alena Kostalova, Tiago T. Ribeiro, Andre G. S. Conceicao
Department of Computer and Communication Systems, Tomas Bata University in Zlin, Czech Republic;
Robotics Lab., Department of Electrical Engineering, Federal University of Bahia, Salvador, Brazil

Abstract: This poster paper proposes to use a spanning tree communication network to control the formation of a large group of robots. The spanning tree structure minimizes the communication traffic. However, should a loss of connection occur, the formation would break up. This may be solved by dynamic reconfiguration of the communication tree.

Poster Papers:
Symposium on Consumer Electronics (CSCI-ISCE)

Registered After Deadline:

A X-Band FMCW Radar for Detection and Tracking of Miniaturized UAVs

Jayol Lee, Min Park, Iksoo Eo, Bontae Koo
High-Speed Signal Processing Group, Electronics & Telecommunications Research Institute (ETRI), Daejeon, Korea

Abstract: This short letter presents an X-band FMCW radar intended to detect and track a small-size UAV with an estimated less than $0.01m^2$ of radar cross section. The manufactured FMCW radar has successfully detected quadrocopters that are flying over the range of between 20m and 500m from it, and also two identical drones with a gap of 20m have been recognized as two beat frequencies of 160 kHz and 200 kHz, respectively. The radar can transmit a maximum output power of 45dBm with achieving 6.2dB noise figure and 66dB receiver gain. An X-band frequency synthesizer is integrated in the radar module that generates chirp signals with 150MHz bandwidth, and PRI times of 250μs as well as 500μs.