IEEE TRANSACTIONS ON

COMPUTATIONAL IMAGING

A PUBLICATION OF
IEEE SIGNAL PROCESSING SOCIETY
IEEE ENGINEERING IN MEDICINE AND BIOLOGY SOCIETY
IEEE CONSUMER ELECTRONICS SOCIETY

TECHNICALLY CO-SPONSORED BY
IEEE GEOSCIENCE AND REMOTE SENSING SOCIETY

2020 VOLUME 6 ITCIAJ (ISSN 2333-9403)

REGULAR PAPERS

A Convex Formulation for Binary Tomography . . . . . *A. Kadu and T. van Leeuwen* 1
Full View Optical Flow Estimation Leveraged From Light Field Superpixel . . . . . *H. Zhu, X. Sun, Q. Zhang, Q. Wang, A. Robles-Kelly, H. Li, and S. You* 12
PI-Line Difference for Alignment and Motion-Correction of Cone-Beam Helical-Trajectory Micro-Tomography Data . . . . . *O. Delgado-Friedrichs, A. M. Kingston, S. J. Latham, G. R. Myers, and A. P. Sheppard* 24
Removing Reflection From a Single Image With Ghosting Effect . . . . . *Y. Huang, Y. Quan, Y. Xu, R. Xu, and H. Ji* 34
Embedding Deep Learning in Inverse Scattering Problems . . . . . *Y. Sanghvi, Y. Kalepu, and U. K. Khankhoje* 46
Multimodal Image Super-Resolution via Joint Sparse Representations Induced by Coupled Dictionaries . . . . . *P. Song, X. Deng, J. F. C. Mota, N. Deligiannis, P. L. Dragotti, and M. R. D. Rodrigues* 57
Coded Aperture Optimization in X-Ray Tomography via Sparse Principal Component Analysis . . . . . *T. Mao, A. P. Cuadros, X. Ma, W. He, Q. Chen, and G. R. Arce* 73
Synthetic Aperture Imaging With Intensity-Only Data . . . . . *M. Moscoso, A. Novikov, G. Papanicolaou, and C. Tsogka* 87
Inverse Scattering via Transmission Matrices: Broadband Illumination and Fast Phase Retrieval Algorithms . . . . . *M. K. Sharma, C. A. Metzler, S. Nagesh, R. G. Baraniuk, O. Cossairt, and A. Veeraraghavan* 95
Four-Dimensional Anisotropic Diffusion Framework With PDEs for Light Field Regularization and Inverse Problems . . . . . *P. Allain, L. Guillo, and C. Guillemot* 109
Photon Allocation Strategy in Region-of-Interest Tomographic Imaging . . . . . *Z. Zhu, H.-H. Huang, and S. Pang* 125
Robust Restoration of Sparse Multidimensional Single-Photon LiDAR Images . . . . . *A. Halimi, R. Tobin, A. McCarthy, J. Bioucas-Dias, S. McLaughlin, and G. S. Buller* 138
Online Adaptive Image Reconstruction (OnAIR) Using Dictionary Models . . . . . *B. E. Moore, S. Ravishankar, R. R. Nadakuditi, and J. A. Fessler* 153

(Contents Continued on Page i)

(Contents Continued from Front Cover)

Microwave Breast Imaging Using a Dry Setup . . . . . *J. M. Felício, J. M. Bioucas-Dias, J. R. Costa, and C. A. Fernandes* 167
Fast Enhanced CT Metal Artifact Reduction Using Data Domain Deep Learning . . . . . *M. U. Ghani and W. C. Karl* 181
Low-Rank Tensor Models for Improved Multidimensional MRI: Application to Dynamic Cardiac T_1 Mapping . . . . . *B. Yaman, S. Weingärtner, N. Kargas, N. D. Sidiropoulos, and M. Akçakaya* 194
Bayesian 3D Reconstruction of Subsampled Multispectral Single-Photon Lidar Signals . . . . . *J. Tachella, Y. Altmann, M. Márquez, H. Arguello-Fuentes, J.-Y. Tourneret, and S. McLaughlin* 208
Through the Wall Scene Reconstruction Using Low Rank and Total Variation . . . . . *F. H. C. Tivive and A. Bouzerdoum* 221
Gauss–Newton Optimization for Phase Recovery From the Bispectrum . . . . . *J. L. Herring, J. Nagy, and L. Ruthotto* 235
Multi-Frame RGB/NIR Imaging for Low-Light Color Image Super-Resolution . . . . . *T. Honda, D. Sugimura, and T. Hamamoto* 248
Tensor Representation for Three-Dimensional Radar Target Imaging With Sparsely Sampled Data . . . . . *W. Qiu, J. Zhou, and Q. Fu* 263
Fast Retinomorphic Event-Driven Representations for Video Gameplay and Action Recognition . . . . . *H. Chen, W. Liu, R. Goel, R. C. Lua, S. Mittal, Y. Huang, A. Veeraraghavan, and A. B. Patel* 276
Generalized Phase Gradient Autofocus Using Semidefinite Relaxation Phase Estimation . . . . . *A. Evers and J. A. Jackson* 291
A Unified Learning-Based Framework for Light Field Reconstruction From Coded Projections . . . . . *A. K. Vadathya, S. Girish, and K. Mitra* 304
Computational Oblique Illumination Microscopy With Isotropic High Resolution . . . . . *X. Ma, M. Yao, Z. Zhang, J. Peng, S. Li, and J. Zhong* 317
Neumann Networks for Linear Inverse Problems in Imaging . . . . . *D. Gilton, G. Ongie, and R. Willett* 328
Sample Efficient Fourier Ptychography for Structured Data . . . . . *G. Jagatap, Z. Chen, S. Nayer, C. Hegde, and N. Vaswani* 344
Coding Mask Design for Single Sensor Ultrasound Imaging . . . . . *P. van der Meulen, P. Kruizinga, J. G. Bosch, and G. Leus* 358
Deep Generative Endmember Modeling: An Application to Unsupervised Spectral Unmixing . . . . . *R. A. Borsoi, T. Imbiriba, and J. C. M. Bermudez* 374
Reconstruction of Image Sequences From Ungated and Scanning-Aberrated Laser Scanning Microscopy Images of the Beating Heart . . . . . *O. Mariani, A. Ernst, N. Mercader, and M. Liebling* 385
DAViS Camera Optical Flow . . . . . *M. Almatrafi and K. Hirakawa* 396
Adaptive Near-Infrared and Visible Fusion for Fast Image Enhancement . . . . . *M. Awad, A. Elliethy, and H. A. Aly* 408
InversionNet: An Efficient and Accurate Data-Driven Full Waveform Inversion . . . . . *Y. Wu and Y. Lin* 419
IFR-Net: Iterative Feature Refinement Network for Compressed Sensing MRI . . . . . *Y. Liu, Q. Liu, M. Zhang, Q. Yang, S. Wang, and D. Liang* 434
CNF+CT: Context Network Fusion of Cascade-Trained Convolutional Neural Networks for Image Super-Resolution . . . . . *H. Ren, M. El-Khamy, and J. Lee* 447
High-Speed Imaging Using CMOS Image Sensor With Quasi Pixel-Wise Exposure . . . . . *M. Yoshida, T. Sonoda, H. Nagahara, K. Endo, Y. Sugiyama, and R.-ichiro Taniguchi* 463
SISTER: Spectral-Image Similarity-Based Tensor With Enhanced-Sparsity Reconstruction for Sparse-View Multi-Energy CT . . . . . *D. Hu, W. Wu, M. Xu, Y. Zhang, J. Liu, R. J. Ge, Y. Chen, L. Luo, and G. Coatrieux* 477
Low Rank Plus Sparse Decomposition of Synthetic Aperture Radar Data for Target Imaging . . . . . *M. Leibovich, G. Papanicolaou, and C. Tsogka* 491
Adaptive Quantile Sparse Image (AQuaSI) Prior for Inverse Imaging Problems . . . . . *F. Schirrmacher, C. Riess, and T. Köhler* 503
Super-Resolution PET Imaging Using Convolutional Neural Networks . . . . . *T.-A. Song, S. R. Chowdhury, F. Yang, and J. Dutta* 518
Design and Calibration of a Fast Flying-Dot Projector for Dynamic Light Transport Acquisition . . . . . *K. Henderson, X. Liu, J. Folden, B. Tilmon, S. Jayasuriya, and S. Koppal* 529
Computational Efficient Refocusing and Estimation Method for Radar Moving Target With Unknown Time Information . . . . . *X. Li, Z. Sun, and T. S. Yeo* 544
WARF: A Weighted-Sum Approach to Radial MRI Image Reconstruction With a Rotating RF Coil . . . . . *A. Phair, M. Brideson, J. Jin, M. Li, S. Crozier, and L. K. Forbes* 558
Frequency Domain Based Virtual Detector for Heterogeneous Media in Photoacoustic Imaging . . . . . *H. Jin, S. Liu, R. Zhang, S. Liu, and Y. Zheng* 569
MRI Super-Resolution With Ensemble Learning and Complementary Priors . . . . . *Q. Lyu, H. Shan, and G. Wang* 615

(Contents Continued on Page ii)

(Contents Continued from Page i)

A Time-Domain Multigrid Solver With Higher-Order Born Approximation for Full-Wave Radar Tomography of a Complex-Shaped Target . . . . . *L.-I. Sorsa, M. Takala, C. Eyraud, and S. Pursiainen* 579
Microlens Array Grid Estimation, Light Field Decoding, and Calibration . . . . . *M. Schambach and F. P. León* 591
Truncation Correction for X-ray Phase-Contrast Region-of-Interest Tomography . . . . . *L. Felsner, S. Kaeppler, A. Maier, and C. Riess* 625
Robust Motion Compensation for Event Cameras With Smooth Constraint . . . . . *J. Xu, M. Jiang, L. Yu, W. Yang, and W. Wang* 604
VIF-Net: An Unsupervised Framework for Infrared and Visible Image Fusion . . . . . *R. Hou, D. Zhou, R. Nie, D. Liu, L. Xiong, Y. Guo, and C. Yu* 640
Color Filter Arrays for Quanta Image Sensors . . . . . *O. A. Elgendy and S. H. Chan* 652
Efficient and Interpretable Deep Blind Image Deblurring Via Algorithm Unrolling . . . . . *Y. Li, M. Tofighi, J. Geng, V. Monga, and Y. C. Eldar* 666
Zero-Shot Depth Estimation From Light Field Using A Convolutional Neural Network . . . . . *J. Peng, Z. Xiong, Y. Wang, Y. Zhang, and D. Liu* 682
Resolution Analysis in a Lens-Free On-Chip Digital Holographic Microscope . . . . . *J. Zhang, J. Sun, Q. Chen, and C. Zuo* 697
Exact Multistatic Interferometric Imaging via Generalized Wirtinger Flow . . . . . *B. Yonel, I.-Y. Son, and B. Yazici* 711
Three-Dimensional Optical Diffraction Tomography With Lippmann-Schwinger Model . . . . . *T.-an Pham, E. Soubies, A. Ayoub, J. Lim, D. Psaltis, and M. Unser* 727
Automated FDK-Filter Selection for Cone-Beam CT in Research Environments . . . . . *M. J. Lagerwerf, W. J. Palenstijn, H. Kohr, and K. J. Batenburg* 739
Compressive Spectral Imaging Based on Hexagonal Blue Noise Coded Apertures . . . . . *H. Zhang, X. Ma, D. L. Lau, J. Zhu, and G. R. Arce* 749
Coded Aperture Optimization in Spatial Spectral Compressive Spectral Imagers . . . . . *E. Salazar and G. R. Arce* 764
Collaborative Deep Learning for Super-Resolving Blurry Text Images . . . . . *Y. Quan, J. Yang, Y. Chen, Y. Xu, and H. Ji* 778
Scene Flow Estimation From Sparse Light Fields Using a Local 4D Affine Model . . . . . *P. David, M. Le Pendu, and C. Guillemot* 791
S2DNet: Depth Estimation From Single Image and Sparse Samples . . . . . *P. Hambarde and S. Murala* 806
Joint Learning of Measurement Matrix and Signal Reconstruction via Deep Learning . . . . . *R. Mdrafi and A. C. Gurbuz* 818
High-fidelity View Synthesis for Light Field Imaging With Extended Pseudo 4DCNN . . . . . *Y. Wang, F. Liu, K. Zhang, Z. Wang, Z. Sun, and T. Tan* 830
Multi-Scale Learned Iterative Reconstruction . . . . . *A. Hauptmann, J. Adler, S. Arridge, and O. Öktem* 843
Compressive Holography From Poisson Noise Plagued Holograms Using Expectation-Maximization . . . . . *S. Kumar, M. Mahadevappa, and P. K. Dutta* 857
OSRanP: A Novel Way for Radar Imaging Utilizing Joint Sparsity and Low-Rankness . . . . . *W. Pu and J. Wu* 868
Blind Binocular Visual Quality Predictor Using Deep Fusion Network . . . . . *W. Zhou, J. Lei, Q. Jiang, L. Yu, and T. Luo* 883
Dynamic Analysis of Spin Satellites Through the Quadratic Phase Estimation in Multiple-Station Radar Images . . . . . *Y. Zhou, L. Zhang, S. Wei, and Y. Cao* 894
Block Coordinate Regularization by Denoising . . . . . *Y. Sun, J. Liu, and U. S. Kamilov* 908
Fast Joint Multiband Reconstruction From Wideband Images Based on Low-Rank Approximation . . . . . *M. A. Hadj-Youcef, F. Orieux, A. Abergel, and A. Fraysse* 922
Fast Target Detection via Template Matching in Compressive Phase Retrieval . . . . . *A. Jerez, S. Pinilla, and H. Arguello* 934
Learned Full-Sampling Reconstruction From Incomplete Data . . . . . *W. Cheng, Y. Wang, H. Li, and Y. Duan* 945
Analytic Inversion of a Radon Transform on Double Circular Arcs With Applications in Compton Scattering Tomography . . . . . *C. Tarpau, J. Cebeiro, M. K. Nguyen, G. Rollet, and M. A. Morvidone* 958
Joint Demosaicing and Super-Resolution (JDSR): Network Design and Perceptual Optimization . . . . . *X. Xu, Y. Ye, and X. Li* 968
Fast Pixelated Lithographic Source and Mask Joint Optimization Based on Compressive Sensing . . . . . *Z. Wang, X. Ma, R. Chen, S. Zhang, and G. R. Arce* 981
Autoregressive Model-Based Reconstruction of Quantitative Acoustic Maps From RF Signals Sampled at Innovation Rate . . . . . *J.-H. Kim, J. Mamou, D. Kouamé, A. Achim, and A. Basarab* 993
High-Speed Phase-Shifting 3D Profilometry on Human Face Assisted by Statistical Model . . . . . *Y. Yu, F. Da, Y. Guo, and Z. Zhang* 1007
3D Localization for Light-Field Microscopy via Convolutional Sparse Coding on Epipolar Images . . . . . *P. Song, H. V. Jadan, C. L. Howe, P. Quicke, A. J. Foust, and P. L. Dragotti* 1017

(Contents Continued on Page iii)

(Contents Continued from Page ii)

Expectation-Maximization Based Approach to 3D Reconstruction From Single-Waveform Multispectral Lidar Data . . . . *Q. Legros, S. Meignen, S. McLaughlin, and Y. Altmann* 1033
Learning Stereo High Dynamic Range Imaging From A Pair of Cameras With Different Exposure Parameters . . . . . *Y. Chen, G. Jiang, M. Yu, Y. Yang, and Y.-S. Ho* 1044
SPRITE: 3-D SParse Radar Imaging TEchnique . . . . . *T. Benoudiba-Campanini, J.-F. Giovannelli, and P. Minvielle* 1059
Reconstruction of Hyperspectral Data From RGB Images With Prior Category Information . . . . . *L. Yan, X. Wang, M. Zhao, M. Kaloorazi, J. Chen, and S. Rahardja* 1070
Learning Spatial-Spectral Prior for Super-Resolution of Hyperspectral Imagery . . . . . *J. Jiang, H. Sun, X. Liu, and J. Ma* 1082
Pre-migration: A General Extension for Photoacoustic Imaging Reconstruction . . . . . *H. Jin, Z. Zheng, S. Liu, R. Zhang, X. Liao, S. Liu, and Y. Zheng* 1097
Solving Phaseless Highly Nonlinear Inverse Scattering Problems With Contraction Integral Equation for Inversion . . . . . *L. Zhang, K. Xu, Y. Zhong, and K. Agarwal* 1106
Robust Low-Rank Tensor Ring Completion . . . . . *H. Huang, Y. Liu, Z. Long, and C. Zhu* 1117
CycleGAN With a Blur Kernel for Deconvolution Microscopy: Optimal Transport Geometry . . . . . *S. Lim, H. Park, S.-E. Lee, S. Chang, B. Sim, and J. C. Ye* 1127
Deep-Learning-Based Optimization of the Under-Sampling Pattern in MRI . . . . . *C. D. Bahadir, A. Q. Wang, A. V. Dalca, and M. R. Sabuncu* 1139
Distributed Iterative CT Reconstruction Using Multi-Agent Consensus Equilibrium . . . . . *V. Sridhar, X. Wang, G. T. Buzzard, and C. A. Bouman* 1153
Joint Image and Depth Estimation With Mask-Based Lensless Cameras . . . . . *Y. Zheng and M. Salman Asif* 1167
360 Panorama Synthesis from a Sparse Set of Images on a Low-Power Device . . . . . *J. S. Sumantri and I. K. Park* 1179
Improved Tumor Detection via Quantitative Microwave Breast Imaging Using Eigenfunction-Based Prior . . . . . *N. Abdollahi, I. Jeffrey, and J. LoVetri* 1194
CaGAN: A Cycle-Consistent Generative Adversarial Network With Attention for Low-Dose CT Imaging . . . . . *Z. Huang, Z. Chen, Q. Zhang, G. Quan, M. Ji, C. Zhang, Y. Yang, X. Liu, D. Liang, H. Zheng, and Z. Hu* 1203
Unbalanced Optimal Transport Regularization for Imaging Problems . . . . . *J. Lee, N. P. Bertrand, and C. J. Rozell* 1219
Deep Recursive Network for Hyperspectral Image Super-Resolution . . . . . *W. Wei, J. Nie, Y. Li, L. Zhang, and Y. Zhang* 1233
Soft Autoencoder and Its Wavelet Adaptation Interpretation . . . . . *F. Fan, M. Li, Y. Teng, and G. Wang* 1245
Sharp Computational Images From Diffuse Beams: Factorization of the Discrete Delta Function . . . . . *I. D. Svalbe, D. M. Paganin, and T. C. Petersen* 1258
Fast Multi-Focus Ultrasound Image Recovery Using Generative Adversarial Networks . . . . . *S. Goudarzi, A. Asif, and H. Rivaz* 1272
Unpaired Deep Learning for Accelerated MRI Using Optimal Transport Driven CycleGAN . . . . . *G. Oh, B. Sim, H. J. Chung, L. Sunwoo, and J. C. Ye* 1285
Computational Implementation and Asymptotic Statistical Performance Analysis of Range Frequency Autocorrelation Function for Radar High-Speed Target Detection . . . . . *Y. Li, J. Zhang, J. Niu, Y. Zhou, and L. Wang* 1297
Automated Regularization Parameter Selection Using Continuation Based Proximal Method for Compressed Sensing MRI . . . . . *R. S. Mathew and J. S. Paul* 1309
Noise2Inverse: Self-Supervised Deep Convolutional Denoising for Tomography . . . . . *A. A. Hendriksen, D. M. Pelt, and K. J. Batenburg* 1320
A Point Constrained Boundary Reconstruction Framework for Ultrasound Guided Electrical Impedance Tomography . . . . . *S. Ren, G. Liang, and F. Dong* 1336
Estimation of Moisture Content Distribution in Porous Foam Using Microwave Tomography With Neural Networks . . . . . *T. Lähivaara, R. Yadav, G. Link, and M. Vauhkonen* 1351
Hyperspectral and Multispectral Image Fusion Under Spectrally Varying Spatial Blurs – Application to High Dimensional Infrared Astronomical Imaging . . . . . *C. Guilloteau, T. Oberlin, O. Berné, and N. Dobigeon* 1362
Contrast-Medium Anisotropy-Aware Tensor Total Variation Model for Robust Cerebral Perfusion CT Reconstruction With Low-Dose Scans . . . . . *Y. Zhang, J. Peng, D. Zeng, Q. Xie, S. Li, Z. Bian, Y. Wang, Y. Zhang, Q. Zhao, H. Zhang, Z. Liang, H. Lu, D. Meng, and J. Ma* 1375
Using Low-Rank Tensors for the Recovery of MPI System Matrices . . . . . *M. Grosser, M. Möddel, and T. Knopp* 1389
Memory-Efficient Learning for Large-Scale Computational Imaging . . . . . *M. Kellman, K. Zhang, E. Markley, J. Tamir, E. Bostan, M. Lustig, and L. Waller* 1403
Image Reconstruction of Static and Dynamic Scenes Through Anisoplanatic Turbulence . . . . . *Z. Mao, N. Chimitt, and S. H. Chan* 1415

(Contents Continued on Page iv)

(Contents Continued from Page iii)

Speckle Suppression in Multi-Channel Coherent Imaging: A Tractable Bayesian Approach ..... *D. Tucker and L. C. Potter* 1429
Dynamic Image Sampling Using a Novel Variance Based Probability Mass Function ..... *S. Grosche, M. Koller, J. Seiler, and A. Kaup* 1440
Efficient Regularized Field Map Estimation in 3D MRI ..... *C. Y. Lin and J. A. Fessler* 1451
Boosting One-Shot Spectral Super-Resolution Using Transfer Learning ..... *W. Wei, Y. Sun, L. Zhang, J. Nie, and Y. Zhang* 1459
The Practicality of Stochastic Optimization in Imaging Inverse Problems ..... *J. Tang, K. Egiazarian, M. Golbabaee, and M. Davies* 1471
Application of Subspace-Based Distorted-Born Iteration Method in Imaging Biaxial Anisotropic Scatterer ..... *X. Ye, N. Zhang, K. Xu, K. Agarwal, M. Bai, D. Liu, and X. Chen* 1486
Blind Image Deconvolution Using Deep Generative Priors ..... *M. Asim, F. Shamshad, and A. Ahmed* 1493
Multi-Angular Epipolar Geometry Based Light Field Angular Reconstruction Network ..... *D. Liu, Y. Huang, Q. Wu, R. Ma, and P. An* 1507
High-Contrast Reflection Tomography With Total-Variation Constraints ..... *A. Kadu, H. Mansour, and P. T. Boufounos* 1523
Segmentation-Driven Optimization For Iterative Reconstruction in Optical Projection Tomography: An Exploration ..... *X. Tang, H. A. J. Spaink, R. C. van Wijk, and F. J. Verbeek* 1537
An End-to-End Deep Network for Reconstructing CT Images Directly From Sparse Sinograms ..... *W. Wang, X.-G. Xia, C. He, Z. Ren, J. Lu, T. Wang, and B. Lei* 1548
Towards Reducing Severe Defocus Spread Effects for Multi-Focus Image Fusion via an Optimization Based Strategy ..... *S. Xu, L. Ji, Z. Wang, P. Li, K. Sun, C. Zhang, and J. Zhang* 1561
HDR Imaging With Quanta Image Sensors: Theoretical Limits and Optimal Reconstruction ..... *A. Gnanasambandam and S. H. Chan* 1571
Microwave Imaging Using Optimization With Variable Number of Dimensions ..... *P. Kadlec and M. Marek* 1586
Unsupervised Algorithm for Brain Anomalies Localization in Electromagnetic Imaging ..... *A. Brankovic, A. Zamani, A. Trakic, K. Bialkowski, B. Mohammed, D. Cook, J. Walsham, and A. M. Abbosh* 1595
Coherent Plug-and-Play: Digital Holographic Imaging Through Atmospheric Turbulence Using Model-Based Iterative Reconstruction and Convolutional Neural Networks ..... *C. J. Pellizzari, M. F. Spencer, and C. A. Bouman* 1607
Building Stereoscopic Zoomer via Global and Local Warping Optimization ..... *F. Shao, Y. Fei, Q. Jiang, X. Meng, and Y.-S. Ho* 1622

List of Reviewers 1636

EDICS—Editor's Classification Information Scheme ..... Available at https://signalprocessingsociety.org/publications-resources/ieee-transactions-computational-imaging/edics
Information for Authors ..... Available at https://signalprocessingsociety.org/publications-resources/information-authors