Human or Machine: Reflections on Turing-Inspired Testing for the Everyday

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Abstract:

Turing's 1950 paper introduced the famed "imitation game", a test originally proposed to capture the notion of machine intelligence. Over the years, the Turing test spawned a large amount of interest, which resulted in several variants, as well as heated discussions and controversy. Here we sidestep the question of whether a particular machine can be labeled intelligent, or can be said to match human capabilities in a given context. Instead, but inspired by Turing, we draw attention to the seemingly simpler challenge of determining whether one is interacting with a human or with a machine, in the context of everyday life. We are interested in reflecting upon the importance of this Human-or-Machine question and the use one may make of a reliable answer thereto. Whereas Turing's original test is widely considered to be more of a thought experiment, the Human-or-Machine question as discussed here has obvious practical significance. And while the jury is still not in regarding the possibility of machines that can mimic human behavior with high fidelity in everyday contexts, we argue that near-term exploration of the issues raised here can contribute to development methods for computerized systems, and may also improve our understanding of human behavior in general.

1 Introduction

Turing's 1950 paper (Turing, 1950) introduced the famed "imitation game", a test originally proposed as part of the definition of the concept of machine intelligence; i.e., as a means to determine whether a computer can be labeled as being intelligent. Over the years, the Turing test has been the subject of a broad spectrum of research and commentary, which has resulted in several variants thereof (French, 2000; Hoffmann, 2022).

Turing-like imitation-tests have also been proposed in quite different contexts, e.g., as a means for evaluating computer models and simulations (like in urban planning, biology hydrology) (Hagen-Zanker et al., 2023; and Harel, 2005; Beven et al., 2022), odor reproduction systems (Harel, 2016), autonomous driving abilities of vehicles (Kalik and Prokhorov, 2007), chess playing software (Rosemarin and Rosenfeld, 2019), and

molecular generators (Bush et al., 2020).

Here, we completely sidestep the issue of defining or measuring intelligence, and the practical question of whether a machine can be built to replace, or mimic, a person in the performance of some specific task (Sifakis, 2023). Instead, Inspired by Turing's imitation game, we examine certain present-day issues manifested in ordinary interactions amongst humans, and between humans and machines. For the most part, we concentrate on the possibility and importance of determining whether one is interacting with a human or with a machine. We term this the Humanor-Machine (H-or-M) question.

In the near future, service centers with automated chatbots, healthcare conversational agents, service robots in stores, autonomous vehicles, and other machines performing functions that were traditionally carried out by humans, will play an ever-growing role in everyday life (Sheth et al., 2019; Parmar et al., 2022; Frank and Otterbring, 2023; BBC, 2021). While in general, machines are at present unable to perform non-trivial interactive tasks in a way that conceals the fact they are machines and not humans, we expect that in the future this will change dramatically, and the question of whether the party with which one interacts (the "agent" in the sequel) is a human or a machine, will become increasingly relevant.

Even when the agent with whom we are interacting is known to be a human, an appropriate variant of the question is still relevant, since that human's behavior may be dictated by a machine, as in a person reading aloud some text composed by a machine or driving a car by merely following computer-generated operation and navigation instructions.

Similarly, when the agent is conspicuously a machine, the H-or-M question explores who is behind the *decisions* or *choices* underlying the agent's role in the interaction. For example, when the agent displays a piece of text as part of an interaction, we want to know if the act of composing the text and the decision to display it right now were carried out by a human or by the agent.

If one insists, the original Turing test and its many variants can be viewed as a special case of the H-or-M question, where, in a controlled laboratory setting, a human acts as an interrogator in attempting to reveal the human-or-machine identity of an unidentified and hidden agent, based on observing the agent's responses and actions to his or her prodding questions. Our inspiration from the Turing test here is manifested in our focus on the interactive aspects of this process. The main differences are (i) we concentrate on everyday interactions, rather than on a controlled lab setup. and (ii) we are interested in the relevance of the outcome of each such test to the interaction at hand, rather than in tagging the agent as possessing a fixed, persistent property, say, of being intelligent, or being qualified for a certain task. Thus, the question of whether a stand-alone, noninteractive artifact, like a piece of text, a video clip, a picture, or a medical diagnosis, was created by a person or a machine (Noll, 1966) is outside the present scope.

A most famous variant of the H-or-M question is manifested in Captcha—where computer applications act as the interrogator, presenting hard AI problems to users in order to verify that they are humans and not machines (Von Ahn et al., 2003). Special cases of the H-or-M question with human interrogators have been studied in a variety of contexts from psychiatric therapy interactions (Heiser et al., 1979) to reasoning about drone behavior (Traboulsi and Barbeau, 2021).

Parts of our discussion are presented as questions, some of which may justify separate, focused research efforts by scientists and philosophers.

2 Are We Different When We Interact with Machines?

One kind of relevance the H-or-M question might have, is to the way in which knowing the answer could affect human behavior.

The relationship between actual humans and machines that present themselves as almost human, has been explored in a variety of ways in arts, sciences and philosophy. Suffices to consider movies like "The Matrix", "The Terminator" series, and "Her", and books like "Machines Like Me", and "I, Robot"¹. Scientists have also researched human-machine relations (Reinkemeier and Gnewuch, 2022; Milcent et al., 2022; Hindriks et al., 2022) and proposed that the science of sociology should study AI-related issues (Woolgar, 1985; Liu, 2021). Studies that focus on the differences between human responses to humans and responses to human-like machines, in normal kinds of interaction contexts are emerging(Frank and Otterbring, 2023).

Intuitively, the H-or-M question seems relevant in many contexts, directly affecting people's behavior. It may even arise subconsciously, like the inevitable tendency to try to incorporate gender perception in first impressions (Signorella, 1992; Ruble and Stangor, 1986).

So, why is the H-or-M question so important to people? Here are some examples of personagent interactions, where having an answer may affect the person's behavior.

Some languages require distinguishing humans from non-human agents, and in the case of a human agent often also detecting the gender. A person conducting a text exchange with a service center may be inclined to use different pronouns or verbs for humans and for machines, both

¹A nice summary of how these works present the relations and interactions between humans and human-like machine agents can be readily obtained with a properly phrased query to OpenAI's Chat-GPT.

when addressing the representative and when discussing what another representative may have communicated in a prior exchange.²

In order to plan his or her next steps, a person is more likely to try to figure out particular patterns in the behavior of the conversing agent if the agent were known to be a machine, rather than a human, and to make more of an effort to relate to those patterns. One reason for this is that machines are expected to follow patterns more consistently than humans. Also, when we know that we are interacting with a machine, we may be able to find out more about the machine's "identity" (e.g., its make and model, the software controlling it, etc.), and then use shared knowledge about what to expect or how to interact with this particular type of agent.

Most importantly, how would our expectations change knowing that the agent interacting with us is a machine rather than another human? Would we be briefer and less polite, knowing that machines are not offended? Be more accepting of a formal, dry, or even rude attitude, knowing that machines will not normally be considerate? Be more patient with "stupid" or repeated answers, or with inconsiderate actions, such as when driving behind an overly cautious and slow autonomous vehicle (AV), knowing that machines are limited, and their behavior cannot be readily changed? Be less patient when experiencing delayed responses, knowing that machines are usually fast and task oriented? Make a stronger effort to explain ourselves, knowing that a machine is expected to be more limited than a human in "understanding"? Be more inclined to report the machine's dangerous or unacceptable behavior to the police, or to its owner or manufacturer, knowing that we would probably get a less angry or offended response than in the case of directly criticizing a human? Be less inclined to develop a personal, sympathetic relationship with the machine? Be more open to learning from the machine's behavior?

Here is an example of the last-listed of these questions. When observing an AV in front of us negotiating a complicated situation differently from the way we would have dealt with it, we might be inclined to mimic the AV, assuming that much thought and serious design and testing had been carried out to yield such behavior. However, even that is far from obvious, and we might actually do quite the opposite: unlike the natural tendency to "follow the crowd", we may prefer to make our own decisions in such cases, thinking ourselves to be "smarter" and more experienced than a typical machine.

It would also be interesting to identify areas in which having the answer to the H-or-M question does *not* affect human behavior. Would we still be curious about the answer? If so, what purpose would knowing it serve? And if not, will the indifference to the type of agent we are interacting with affect patterns of interaction in this area?

Another angle of the relevance of the H-or-M question is the effect of incorrect determination. For example, will a human agent be offended when they realize that an interacting person thinks they are a machine? And dually, how embarrassed will a person be when they realize that the agent with whom they have developed a relationship is a machine?

3 When and How Should H-or-M be Easily Resolvable?

Let us now discuss the following issue. Should the answer to the human-or-machine question be provided, a priori, in certain appropriate situations? If so, when and how should this be done?

In what contexts should the answer be provided to the person once, explicitly, either in advance, as is the case with some service chatbots, or perhaps constantly and automatically, as is done with "recording in progress" indicators in phone calls and teleconferences? For example, should autonomous vehicles be clearly marked as such? Should autonomous drones be marked differently from remotely controlled ones (Traboulsi and Barbeau, 2021)?

Should a human-like receptionist robot be clearly marked as such, in order to not be mistakenly thought to be human? And should humancontrolled interactions be labeled as such, or should this be the default?

Should there be standards for communicating this information—using, say, text, icons or spoken words? In some case perhaps in responses to programming interfaces?

When should the H-or-M question be left for the interested person to answer for themselves, without a dedicated, explicit interface? One context in which this is likely to be the case is when the agent's behavior is a collaborative operation, partly human and partly machine, with different portions of the interaction being human-driven,

²We expect special linguistic patterns to evolve for cases where such a determination remains unknown.

machine-driven or a finely interwoven mixture.

Are there cases where the answer should actually be hidden? We are interested here mainly in ethical contexts, excluding situations of conflict, oppression or fraud. Thus, for example, detection of whether interactions in social media or in a dating website are with a human or with a machine are out of the present scope. Hence, we ask, are there ethical cases where even searching for the answer should be forbidden or blocked? Section 6 contains some examples from the worlds of training and therapy, where this may be applicable.

4 Some Inherent Differences Between Humans and Machines

One cannot delve into the H-or-M question without considering the essential differences between the behavior of human agents and that of machine agents — in general and in specific contexts. Turing himself dedicated a section to such a discussion in his 1950 paper (Turing, 1950), though clearly some distinctions have changed dramatically over time; e.g., in the capability to learn and to adapt to changing conditions. Such differences between humans and machines are sometimes phrased as goals in achieving artificial intelligence and described as characterization of unique human faculties in perception, cognition and reasoning; See, for example, (Sifakis, 2022, Ch. 6,7) and (Russell and Norvig, 2002, Ch. 1.1) and references therein. Some of these differences bear on the significance of the answer to interacting persons, and some can help in the design of interrogation strategies.

Without getting into psychological, biological and philosophical discussion, we list below some such differences, as may be described by people in the context of everyday interactions with agents. We phrase them as tentative facts, hence the quotation marks. Our intention is to bring them to the surface and invite discussion of the readily observable behavioral differences between humans and machine when functioning as interactive agents.

- Free will: "Machines are completely preprogrammed, whereas humans have free will."
- Emotions: "Humans have emotions and feel compassion, whereas machines do not."

- Context awareness: "Humans are sensitive to context and to innumerable explicit and tacit inputs, to which a typical machine is blind."
- Common sense and worldly familiarity: "A human has more common sense and knowledge regarding relations between entities and cause-and-effect patterns in the world than any single average machine."
- Narrow specialties: "A human's expertise in a given domain is expected to be more focused and limited than a machine's." For example, when a medical patient encounters a problem in the web or smartphone application of a healthcare provider, and discusses it with a representative at the provider's service center, the patient does not expect the representative to be able to also discuss actual medical issues. In general, machines do not have this limitation.
- Learning: Turing claimed that humans retain both long and short term memory and learn from them, and machines often do not. However, these days the opposite might be the case. Machines can be equipped with vast memories, can access voluminous repositories of data, to which they can then apply powerful machine learning algorithms, where humans capabilities would be more limited.

Still, humans can often be taught new tasks more simply than machine, sometimes by simple conversation. For example, if a person needs an agent (human or machine) to carry out a task that the agent does not know how to do (human agent) or is not programmed for (machine agent), the person is more likely to succeed in teaching a willing human agent to do the task than in teaching a typical computerized agent.

- Collaboration: "Machines are becoming better positioned to take advantage of multiagent collaboration." For example, car-to-car communication for better coordination on a highway is probably easier to implement technologically than driver-to-driver communication. Thus the H-or-M question directed at a group of cars, wondering if they are all autonomous or some are driven by multiple humans, may be partly answered by observing their coordination practices. The use of the idiom 'like a well-oiled machine' to describe the operation of a human organization, hints at our intuition in this regard.
- Mistakes: "Humans make more mistakes than

machines."

• Diversity: "Human behavior involves more randomness and arbitrary actions, and is less predictable, than that of machines." Thus, different humans working on the same task exhibit more diversity than different machines of the same model working on the same task. Similarly, the performance of a human repeating a given task is more diverse than that of a machine repeating the task.

Better understanding of these differences may pave the way to bridging them, by endowing machines with certain desired human capabilities, and to a lesser extent vice versa. This can be valuable not only for concealing the H-or-M answer in everyday tasks when appropriate, but for improving the performance of both humans and machines.

5 Some Aspects of H-or-M Interrogation

In the classical Turing Test, the interrogator is proactive, and is usually in total control of the interaction. The agent is expected to merely react to the inquiries and statements coming its way. Thus, this is an interrogation in the true sense of the word.

Some variants of the Turing test are non-verbal in nature (Ciardo et al., 2022; Avraham et al., 2012). The interrogator challenges the agent to act in certain ways, and then analyzes the resulting behavior, including seeking patterns therein. Still, here too the entire exchange is orchestrated as an interrogation.

In contrast, for situations where the agent does not offer an answer to the H-or-M question, we are interested in passive, or implicit, interrogations. For example, a person interacting with a service center is expected to focus on the issue at hand — rather than making an effort to unmask the agent's identity — and to possibly derive an H-or-M answer from the agent's communications on that issue only. Similarly, a human driver observing the non verbal behavior of a nearby vehicle might be interested in determining whether it is autonomous or driven by another human, but this will be done mostly from totally passive and uninvolved observation. There could be some modest interrogator-like behavior on the part of the observing human, such as deliberately trying to pass the vehicle in question, or getting overly

close to it, which could indeed help in resolving the H-or-M question .

This leads to another aspect of interrogation: how does the person interact with the agent? Clearly, even just seeing the agent in action may provide clues, which, while often insufficient, may be quite relevant. Hearing is another important channel. The classical Turing test is constrained to textual (typewritten) interaction. However, while this limitation seems appropriate for achieving fairness — since it masks gender differences between human speakers and overcomes technological constraints in speech synthesis — it robs the interrogation of an entire emotional dimension that is manifested in speech prosody. This may be appropriate for testing intelligence only, devoid of emotions, but it may be inappropriate if we are interested in the H-or-M question in interactions that normally involve speech. The same may also apply to interactions where agent actions could involve touch, smell, and possibly even taste.

What about other kinds of physical interactions? Can the interrogator ask to see the results of a blood test of the agent? Since in this paper we are interested in implicit interrogations in everyday situations, we leave this aspect and other "limitations of imitation" for a future discussion.

With the fast improvement in machine capabilities and usage, we expect the importance of the H-or-M issue to increase over time. Thus, it is likely that techniques for conducting proactive interrogations in a concealed manner, within matter-of-fact verbal or non-verbal interactions, will evolve. In some cases, these techniques may be crafted from the knowledge we have about distinctions between human and machine behavior, and in others they may evolve naturally or subconsciously, leading to better understood differences between humans and machines. Such techniques may be supported by computerized tools and the sharing of historical information about interactions and interrogation results.

The ability to conduct productive implicit Hor-M interrogations may even become a standard algorithmic/computational thinking skill that humans can be expected to acquire. Furthermore, if the techniques can be formalized and generalized, we may see automated tools that help humans, as well as other automated agents, in obtaining an answer to the H-or-M question.

Taking the development of implicit interrogation strategies a step further, if these can be formalized or automated, will humans and machines eventually learn to detect them? Such detection could trigger direct responses, in order to save time and effort, or perhaps redoubled efforts to conceal the answer. Would a human agent be offended if they notice that the person they are interacting with is not sure that they are indeed human? Will people use such interrogation to tease agents, or perhaps to hint that the agent's behavior is too rigid?

6 When is Imitating Humans Desired?

Many kinds of tasks can be handled satisfactorily by both machines and humans. Often machines exceed human performance, especially when one considers only the most basic functions of the task. Such is the case of navigating an aircraft in good weather, for example, or approving or denying a loan in a clear-cut case. When will human stakeholders be interested in building machines that in performing a task focus on mimicking human behavior, even at the cost of sacrificing some potential capabilities of the machine?

In this section we deal with situations where the H-or-M question has been resolved, so that it is not a hidden or deceptive identity that is the issue, but, rather, the question of when humanlike behavior is actually desired as an additional feature of a well-performing machine. In short, when would we actually want to imitate a human?

Here are some examples.

Assistance in the physical training of humans, or in various kinds of therapy; say, in sports, music or dance. Here acute perception and delicate reactions are needed, but these should be combined with human-like imperfections (on the part of the machine agent), with which the person being trained must cope.

Mimicking a human's behavior in testing a machine. Consider a robot that mimics the behavior of a human operator in testing some "ordinary" machine. The functionality of the tested machine need not have anything to do with mimicking humans. The testing robot feeds stimuli to the machine, e.g., presses buttons, pulls levers, keys in commands, etc., and reacts to the tested machine's actions and responses. The robot should sometimes hesitate, make mistakes, and even behave in a totally inappropriate way, but within the bounds of human behavior. The ultimate goal of the setup is to test the machine's reactions, not those of the testing robot. In a variant of the above, a broad area of possible application involves determining whether certain dangerous or complicated tasks can be carried out by typical humans. Examples include checking whether a newly cleared precarious mountain trail is safe for hikers, or if the weight and shape of some large and heavy object still allows average people, or perhaps expert porters, to lift and carry it, and how many people are actually required. Thus, the previous paragraph's case of a robot testing a machine could be turned around: for a given machine, can a typical person operate it successfully and safely?

In the TV and film industry, it would be interesting to see how well a robot would be able to replace a stunt person, filling in for a human actor, by mimicking a human's performance but not exceeding it. Some illuminating videos can be seen here (Xplained, 2022).

Human-like robots may serve in researching human behavior, helping in the systematic setting up of experiments. The researchers will of course have to make allowance for expected differences in participant behavior.

There are also related issues that are more about humans' capabilities than about their limitations. A good example involves assessing students and their delivered projects. In a variety of adjudication situations several informal factors may have to be considered, and acting as a human may be useful. E.g., in an oral test, an examiner who knows the student, either from previous acquaintance or from an earlier conversation, may realize that an incorrect or deficient answer does not represent ignorance/failure, but could be the result of a misunderstanding, or an assumption that some elements of the answer are obvious. The examiner will then take interactive steps to confirm this. And when not knowing the student, the human examiner may still be able to determine when to pursue such clarifications and when not to. He or she will also know how to distinguish between a student who has indeed mastered the topic but just "missed" that particular question, and when attempts to rephrase the question have in fact given away the answer. It would be nice if automated interactive testing can be made to be closer to conversations with humans than to filling out multiple choice forms with just "correct" and "incorrect" answers.

A methodological question then emerges, regarding developing machines that mimic humans, together with their human limitations and imperfections: will there be systematic ways to evaluate whether this mimicking ability is accomplished, or to methodically compare different versions of a system in this regard? The very pursuit of such system engineering endeavors may deepen our understanding of human behavior.

7 Discussion

While the issues and questions we have raised may pique one's curiosity, we may still ask, why are they interesting? Why do we want to know now what people will do with answers to the Human-or-Machine question? Can't we just wait and see? Why do we care about how people will go about labeling systems, or eliciting the answer in some indirect ways? Why do we need to articulate differences between humans and machines with regard to observable behaviors in particular contexts?

We believe that better understanding of these issues can advance science and technology in many ways. Here are some examples.

First, In current methods for developing computerized agents, the design of human interfaces involves a delicate balance between the value of friendly, intuitive human-oriented behavior (say, through the use of natural language), and the value of succinctness and predictability of typical machine behavior (say, using menu-based selections). Understanding how human behaviors and expectations differ between interacting with humans and machines can help in the design of human-computer interfaces and business processes. This may, on the one hand, improve agent development productivity and the quality of the final products, and, on the other hand, perhaps also contribute to more satisfaction on the part of human users and to improving their well-being.

For example, if it turns out that people use a different subset of the language when interacting with machines that understand natural language, the training of such agents may become more focused and more efficient than when training on general natural language.

Second, a major factor in rich interactions is trust. Understanding the differences between how trust-building emerges in human-human interaction vs. human-machine interaction may allow us to better understand this elusive concept, and to create protocols for enhancing and accelerating trust-building in a variety of contexts.

Third, we are all familiar with cartoons depicting people grumbling or getting angry with their computers. For our own well-being, knowing that we are interacting with a machine rather than with a human may require us to channel our own natural emotions differently. System developers are already well aware that certain system behaviors may evoke anger, frustration, and other emotions. Translating such knowledge into system design decisions will be even more complicated in the case of agents that mimic humans. It would also be nice if researchers in the behavioral sciences and coaches in relevant kinds of therapy and training become prepared for developments in this area.

This may not be easy at all. Will researchers be able to create the everyday nature of interactions in a controlled environment? Will lab experiments with a limited number of kinds of machine agents be representative? And conversely, when collecting data from real-world interactions, will enough ground truth information be available with regard to whether the agents are humans or machines?

In summary, recent technological advances give intelligent machines critical roles in our everyday lives. We do not know if such machines will come to be treated as conventional objects, like personal computers or ATMs, or as different kinds of living species, or perhaps, in the long run and in particular cases, even become indistinguishable from human professionals.

However that may turn out, we are convinced that determining whether one is interacting with a machine or with another human is likely to become a central question. The insights to be gained from studying the question and its ramifications may have surprised even Turing.

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