Towards Singularity: Implications to Intelligent UI with Explainable AI approach to HCI

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ABSTRACT

This paper has the aim of incorporating and prototyping the realms and the possibilities of future UI designs. It collectively analyses recent AI techniques and signifies the need for Intelligent User Interfaces (IUIs) that might shape future inventions and act beneficially for understanding the technological impacts it can produce. The architecture of HCI is prone to undergo a drastic transformation where multimodal interaction through cyborg automation will play a major role in singularity. For solving current issues in UI designs such as gender, disability, and color issues, Explainable AI (XAI) is further improving interpretability and explainability of Machine Learning (ML) algorithms. This paper furthermore explains the convergence of Engineering and Life sciences with its association to improving the outlines of future UIs on a process of gaining collective intelligence.

Keywords: UI (User Interface), AI (Artificial Intelligence), IUI (Intelligent User Interface), HCI (Human Computer Interaction), XAI (Explainable Artificial Intelligence), ML (Machine Learning)

1. INTRODUCTION

Intelligent User Interfaces (IUIs) have emerged as a field, which involves designing and implementing an AI that overly covers human skills and capabilities, so that human per- formance with an application excels. AI is on a verge of recursively improving and gaining meta-intelligence. Machine learning, Robotics, Automation Technology, Artificial Intelligence, and Internet of Things are the disciplines that will play a chief role in unifying human knowledge and in developing an Intelligent Interface. Gender differences and dis- abilities also generate an important need for developing a better UI. The recent trends in technological advancement have seen improvement from traditional mouse, keyboard devices (WIMP Interfaces) to various Tangible User Interfaces (TUIs), which has helped in getting closer with the users. IUIs include email filters, email response systems, spoken dialogue systems, and head- worn User Interfaces. Intelligent processing is very difficult to predict and it involves limiting the responsibility of users in their thoughts and judgment as it can outperform traditional human techniques. As of now, humans are intelligent narrow-predictable systems. Re- searchers are working towards understanding the spontaneous unpredictability of humans through IUIs. Currently, Intelligent User Interfaces are available more in the User Interface of the system compared to the intelligence available in the backend of the system. Implementing multimodal interactions, natural language processing, graphical interfaces and conversational mediators can enhance the communication between the users and the system. A need to replace traditional, screen-based HCI techniques and interfaces with new collaborative learning interface emerges.

Explainable Artificial Intelligence (XAI) proposes to make a shift towards more transparent AI. It aims to create a suite of techniques that produce more explainable models whilst maintaining high performance levels. [29] Along with developing Intelligent UIs, explainable capabilities should also be incorporated. AI systems are getting more complex and XAIs can result in making AI more understandable to humans. Along with transparency, trust concerns also play a vital role when decision making capabilities are handled by the system and XAI acts as a formal technique to collectivize the social, ethical and legal pressure calls. Undesired results are often yield by AI based systems. XAI acts as a measure of justification, control and improvement of current AI based systems. For users to understand the model, the interaction between the humans and machines should be effective. Proportionality thesis, which states that increases in intelligence lead to proportionate increases in the capacity to design future generations of AIs, is true. [26] With advancement in training algorithms a possibility of technological singularity can be agreed. AI systems might recursively improve itself in order to reach dominance. Quantum computing has drastically reduced the limitations of computational abilities and also influences hyper-communication. But there is always optimist and pessimistic approaches towards this concept. Predictions of the end of the human job because of replacement by robots and AI are lacking in sufficient analysis and evidence that cover the technical, social and economic effects.[27] However, designing futuristic UIs will surely need improved and self learning AI capable of generating adaptive interfaces on its own. Cyborgs can also help in

shortening the gap of connection between users and the system thereby creating reliable and appropriate datasets for generating intelligent interfaces.

The paper has been structured across sections of impact by singularity. Firstly, the recent technological limitations are described. Next, the social implications of intelligent user interface is reviewed, while presenting the contributions from Artificial Intelligence. Finally, a general overview of proposed design is described in depth. The paper ends envisioning the economical and medical implications towards singularity.

2. TECHNOLOGICAL LIMITATIONS

Augmented Reality is the most gravitating technology implementing AI and IUI. Despite the fact that mobiles have numerous utilizations in their current scenario, there are a few issues that ought to be tended to before the innovation turns out to be completely marketed and goes standard. To start with, graphics ought to be rendered over the wearer's full extent of vision, not in part. The innovation ought to likewise be furnished with a superior comprehension of normal body developments, guaranteeing that the display gets lighter and more slender. Internet connection is as yet an issue since there are such significant numbers of spots where no availability is accessible. In spite of the fact that bioelectronics has numerous points of interest it might prompt negative contentions with the Invention of organic machines called "Cyborgs". The same number of researchers has persuasively contended, when an innovation is out there, you can't cause it to leave. There was never an innovation that mankind at any point deserted wholesale, even the nuclear bomb or different weapons of mass pulverization with the ability to clear out all life on Earth. Whenever people are offered the opportunity to use PCs and electronic innovations inside their bodies to accomplish similar outcomes, it is practically sure they will grasp them paying little mind to the dangers. Accordingly, debates about the future of society that are focused on robots are flawed, because they fail to consider the increasing numbers of cyborgs who will have capabilities superior to robots. [9]

While tangible interaction shows promise to enhance computer mediated support for a variety of application domains including learning, problem solving, and entertainment, TUIs are currently considered difficult to design and build. [28] While it has some positive impacts, the distribution of the interface also leads to some usability issues. Notwithstanding the difficulties related with planning and building conventional UIs, TUI designers face a few theoretical, methodological, and specialized challenges. Among others, these difficulties include: the absence of fitting interaction deliberations, the weaknesses of current UI programming instruments to address ceaseless and equal interactions, just as the need to cross disciplinary limits so as to interlink the physical furthermore, computerized universes.
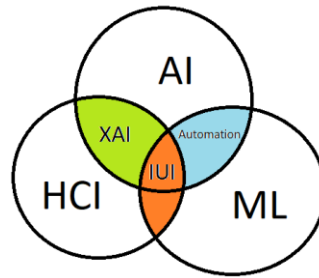
3. SOCIAL IMPLICATIONS

One of the steps in order to achieve technological singularity is limiting the biases among end users. Sex differences are biological differences and it is important to explicitly define differences instead of using the blanket terms "male" and "female". Gender affects what we do, and how we do it including the interactions we have with other people, the research we do, and the designs we create, and for whom.[13] Gender based biases is prone to users involved in the workplace. These factors are barely considered while designing interactive User Interfaces. While men's voices can operate voice-controlled software without any issue, women have been reported struggling to do so in various settings.[14] Male and female users are different and people are different. Gender is just one parameter in the big picture. But these differences should not be seen as natural or inherent. Instead, as stated above, sociocultural context plays important role gender roles vary, depending on when and where one looks. Prevalent issues when looking at gender difference are: binary division, mashing up sex and gender, and immutability of gender. [13] Dementia is a general term for a decline in mental ability severe enough to interfere with daily life. Eventually, memory loss might occur. Real and virtual worlds produce a mixed reality to produce new episodic memory visualizations where physical and digital objects interact in real-time. Due to our full dependence on automated systems, human memory is getting lost substantially. The current technologies and applications for blind people in the HCI field have seen huge limitations for coordination of IUI, ML and XAI. Many useful devices and systems are created to solve the practical problems that blind people meet in their daily lives, but the important parts are missing: problems in social interaction, especially in face-to-face communication.[15]

4. NEED BASED DESIGN

Change is going on rapidly in the field of computer design. We realize that quantum computing– the presentation of material science into the field of software engineering — will be critical; that PCs will turn out to be extremely, exceptionally minuscule, the size of a particle. That is going to have a gigantic effect, little PCs that we may swallow inside a pill and that will at that point find out about your sickness and set about restoring it; that unites natural registering too, where we can print portions of the body. It is believed we're going to see the expanding injecting of figuring into all parts of our lives. Most of the exciting computer research now occurring involves combining molecular and cellular biology with genomics, engineering and knowledge of physical sciences. [12]
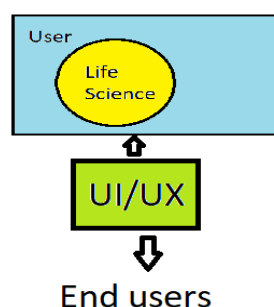
As a basic and important term in the interaction design, usability is an overall rating of the degree of use in the human computer interaction, which guarantees the realization of interaction.[10] The amalgamation of the life, engineering and physical sciences promises to essentially alter and speed our scientific trajectory. Designers ought to be guided by the regular and human thought, making common advancements of the utilizing methods of the end products. In this way, the improvement headings of clients' needs and product capacities can be appropriately guided. Creators ought to advance the utilization and activity of interface from a wide range of zones, for example, design, ergonomics, cognitive psychology, linguistics and semiotic, at last accomplish the perfect objective of improving the ease of use of end products.

5. ECONOMICAL IMPLICATIONS
One of the primary obstructions to executing AI is the accessibility of information. Information is frequently disrupted or conflicting and of low quality, all of which presents difficulties for organizations hoping to make an incentive from AI at scale. To conquer this, it is ought to have a reasonable methodology from the beginning for sourcing the information that the AI will require. The blockchain is a disruptive technology with a tremendous transformation potential for our societies. Risks and benefits related to its possible applications, however, must be carefully weighted, avoiding utopian expectations, as well as the pitfalls of technocratic reasoning and determinism. [5] Both AI and blockchain include specialized multifaceted nature and there is by all accounts a feeling of understanding among specialists that these advancements will have genuine business suggestions in the following five to ten years. The joint utilization of the two advances may adjust the tech and business worldview essentially enough for business pioneers to take more notification of improvements in this space.

6. MEDICAL IMPLICATIONS
Visual data coordinated with other information modalities can empower a rich client experience and an increasingly viable and effective communication. People present disabilities in diverse ways. A significant percentage of the general population does not possess the necessary minimum physical ability to use standard input/output devices. [16] The technology that is becoming more useful, effective, and affordable is Computer vision-based interaction. In human-to-human association, various notable realities and highlights around each other, for example, identity, age; outward appearances and gestures can be recognized. With the advent of XAI the need to understand and explain AI has arisen. Along with research progress, machine learning has encroached into many different fields and disciplines. Some of them, such as the medical field, require high level of accountability, and thus transparency, which means we need to be able to explain machine decisions, predictions and justify their reliability. [30]

7. CONCLUSION
In this research paper, a survey on interpretability and explainability of AI is performed in general, and different interpretations are presented suggested by different research works into distinct categories. Human jobs are at a verge of being undertaken by the advent of IUI, HCI and XAI. The incorporation of Machine Learning with these fields enforces singularity to overtake the present system. Singularity is seen to influence economy, medicine, technology and society. The advancement of the three fields (HCI, XAI, IUI) has been implicating some serious concerns that will affect all the interconnected fields. Without proper research and validation any advancement taken will influence to initiate a ravaging chain of events. Although there are negative issues concerned, singularity is also seen to be ethical if properly directed. Current problems can be solved through a long term planning approach and a better technological reform can be emphasized.

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