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EMPOWERING USER INTERFACES WITH AI: PRACTICAL INSIGHTS AND LIMITATIONS

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Abstract

Artificial Intelligence (AI), conceptualized by John McCarthy in 1950 as the science and engineering of intelligent machines, has evolved into a multifaceted discipline. Its myriad definitions by researchers encompass the synthesis and analysis of computational agents exhibiting intelligent behavior. More recently, AI is characterized as a system's capacity to proficiently interpret external data, learn from it, and employ those insights to accomplish specific objectives through adaptable adaptation.

The trajectory of artificial learning has yielded diverse branches, including machine learning, deep learning, and narrow learning. Machine learning employs computational algorithms to enhance experiences, with supervised learning utilizing labeled data to predict outcomes, while unsupervised learning identifies patterns autonomously by discerning underlying structures within data.

Deep learning leverages extensive multilayer artificial neural networks to calculate precise numerical representations. Moreover, AI progressions have significantly impacted Human-Computer Interaction (HCI), a domain focused on conceiving, assessing, and deploying interactive computing systems for human utilization, while also investigating consequential phenomena related to them.

1. Artificial Intelligence

Artificial intelligence was first described by John McCarthy, father of Artificial intelligence, in 1950as the science and engineering of making intelligent machines. Since then, it has been defined in many ways by several researchers in the field of artificial intelligence; as the study of synthesis and analysis of computational agents that act intelligently [1] and recently defined AI as a system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation [2].

Artificial learning evolved with time and includes machine learning, deep learning, and narrow learning. Machine learning helps in learning and improve the experience by using computational algorithms [3,4]; it could be supervised machine learning when outcomes are predicted by providing labeled data to algorithms or unsupervised machine learning where algorithm detects new patterns without training by identifying the

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standard variables & learning the inherent structure of a given data [3,4].Deep learning uses a large multilayer artificial neural network to compute accurate number representations. AI advancement has also helped human-computer interaction (HCI), which deals with designing, evaluating, and implementing interactive computing systems for human use and studying significant phenomena surrounding them [5].

2. Human-Computer Interaction

HCI involves designing and using new computer technology to interface between people and computers. Latest HCI includes Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR), Eye-tracking, and Gaze Control. Virtual Reality could be full immersion VR when the simulated world is projected onto all walls of a room or head-mounted display (HMD), which tracks the motion to change the view with head-turning. In AR, digital information is overlaid onto the real world by using a partially transparent head-mounted display or by compositing the actual real scene with computer-generated elements. Mixed Reality combines information display with a physical object. In Eye Tracking and Gaze Control, eye position and where it is looking is tracked by a high-resolution close-up camera with the help of pupil position and a pair of small infrared spotlights.

3. Applications of Artificial Intelligence & Human-Computer Interaction

3a. Automation: Last few decades have seen an enormous jump in the number of automation being used in several industries for variable reasons to reduce cost & production time, better safety, improved efficiency, and workforce reduction. Recent CVOID 19 pandemic and realization of the importance of social distancing in preventing and controlling new infections have pushed its use even in a small industry, retail shops, hotels, restaurants, banks, and other customer services. Robots and Virtual Reality Programs, and other devices are being used to interact with the customers and deliver the products. Thermo-scanner and robots are being used for fever screening in public places and hospitals, aiding in the initial screening for COVID19 symptoms and allocation to respective medical specialties. Now semi or fully automatic cars, buses, trains have been used in different countries.

3b. Medicine:AI has transformed medicine in recent years; it is increasingly being used to make a proper early diagnosis [6,7,8,9], classify diseases and fractures, identify the different patterns of successful and failed treatment methods, predict the outcome of treatment modalities. It has been widely used and accepted in Radiology, Urology, Orthopaedics, and Internal Medicine. Intelligent robots, navigations, and software programs are being used to assist the surgeon in surgical planning and surgical procedures [10], early discharge, and better surgical outcomes. These robots and associated machines can detect errors in a scenario, monitor, control, and communicate with real-time notifications by analyzing the pressure, movements, sound, light, and temperature [11,12]. AI is also helping in the training of young physicians or surgeons in virtual or simulation environments to upgrade their knowledge, skills and to avoid complications or learn the outcome of their intervention without harming the actual patients. However, the use of AI has its limitations: they are expensive, have a long learning curve, extra time for their setup, helping in simple procedures requires proper supervision & data capturing during a surgical procedure, do not understand emotion, and provide creative thinking and have ethical issues.

3c. Finances: AI software allows banks and other financial institutions to decide smartly about credit lending decisions by analyzing various variables like taxes, mortgages, invoices, bank statements, need, and preferences of different borrowers. AI is helping businesses by arranging the invoices, deliveries, payments dates, penalty reminders for the customers and suppliers. AI provides unbiased, high-qualityaudits with remedial measures to detect preventable errors and profitable missed sales patterns.

3d. Human Resources: AI will play a significant role in human resources in the coming decades. Nowadays, AI is helping HR to recruit candidates who are a better fit for the company with optimum salary, improve internal mobility, reduce employee turnover with more incredible speed, and create more opportunities for training and maximum output.

3e. HCI: Google search app, Siri, Alexa, Cortana are voice-guided interfaces, touch-sensitive interfaces in electronic gadgets, ATM by using finger, stylus pen or tapping has made things more accessible and attractive. VR, AR, MR, and HMD are revolutionizing the recreation and entertainment industry by producing real-life experiences with video games, indoor sports, and thrilling activities.

4. Challenges of Artificial Intelligence & Human-Computer Interaction

4a. Businesses: They need to understand the current advancement in AI and the correct fit to reduce the extra cost of hiring specialized AI experts and software. AI requires the storage of an abundance of high-quality data to get the best results using various AI algorithms. Increased use of AI has created a fear that AI Bots and machines might cut the number of human jobs and force them to accept low salaries. AI algorithms learn and improve their performance with human interaction, which has led to some incidences involving racial, sexism, and ethical issues by the wrong interoperation.

4b. Medicine: Although AI is helping by improving the standard of medical and surgical practices. However, the use of AI has its limitations as they are expensive, have a long learning curve, extra time for their setup, only helping in simple procedures, requires proper supervision & data capturing during a surgical procedure, do not understand emotion, provide creative thinking, and have ethical issues [13,14].

4c. Privacy Breach: Privacy is one of the biggest concerns with AI and HCI, particularly in a big company. AI allows businesses to closely watch crucial aspects of their personal or professional lives like their locations, working habits, colleagues' interactions, interests, political or religious inclination, productivities, and hidden mistakes.

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