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"A Review on Human Collaboration with Machines using Artificial Intelligence and Machine Learning"

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Abstract

The medical industry is collaborating with AI as a result of AI breakthroughs, which may lessen the number of overworked professionals, solve shortages, and raise standards of care. Adoption problems, skepticism, and biases in clinical decision-making are still challenges, nevertheless. The purpose of this assessment of the literature is to point out any gaps and provide topics for further study to solve these issues. In order to facilitate collaborative shared situational awareness between humans and systems, the research delves into the architectures and algorithms for a cognitive system of Intelligent Information Software Agents (ISAs). This system is designed to draw conclusions from data, knowledge, observations, experiences, and self-assessment.The goal of the research is to create software agents and their algorithms so that they can replicate human knowledge creation and reasoning on their own. This will allow for monitoring and collaboration between humans and AI.The primary goal of the project is to develop and put into use ISA Cognitron architecture and algorithms for an autonomous system that oversees intricate network resources. The Cognitive, Interactive Training Environment (CITE) system provides a wearable interface for smooth user interaction with computing equipment and facilitates human interaction learning through operator engagement.A natural language user interface is made possible by AlterEgo technology, which uses neuromuscular signals from internal speech articulators to reconstitute speech.[1] This technique provides intelligence augmentation by enabling a bidirectional link with computing devices. User studies provide 92% median word accuracy and system durability.

This research investigates how AI agents perceive social interactions in a cooperative game environment, focusing on participants' subjective impressions of their partners' likeability, IQ, rapport, responsiveness, leadership roles, and whether they perceive them as human or artificial intelligence.

1.Introduction

The field of artificial intelligence (AI) is expanding quickly and has the potential to drastically change how businesses create value. In order to analyze vast volumes of data, produce profitable projections,[21] and spot patterns, it makes use of contemporary algorithms and computing power. Artificial Intelligence (AI) is the

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frontier of computing advances that lead to novel systems and applications that communicate with people.The use of multiple robots for executing these tasks increases robustness and improves efficiency compared to the use of a single robot. In recent years, multi-robot systems have been applied to complex tasks that were previously performed by humans alone. These tasks include fire-fighting, landmine detection, decontamination of radiation, agricultural work, underwater missions, warehouse operation, and Search and Rescue (SAR).[1] AI-based systems are revolutionizing how people engage with technology and coexist with it. Notable examples of this include Alexa and Siri, which help professionals in IT support roles as well as users in the private sector. These examples demonstrate how AI-based systems are becoming more and more common.These days, people view computers as cooperative companions that add value to both parties through gestures and organic communication.[23] Natural language processing techniques have advanced to the point where people now perceive computers as human. AI-driven systems are growing smarter and more autonomous, gaining personality, empathy, and emotional intelligence that affects how we connect with one other.[24]

The authors of "Exploring Human-AI Collaboration in Operational Decision Making," a thorough analysis, examine the complex relationships that exist between artificial intelligence (AI) systems and human decision-makers in organizational settings.[17] Based on an extensive body of literature and a fascinating case study of a Shanghai, China-based cargo carrier company, the paper clarifies the many roles that artificial intelligence (AI) and humans play in operational decision-making.The decision-making process is deftly broken down by the writers into three separate activities: choice, intellect, and design. They carefully look at the intersections and collaborations between AI and human intelligence at every level using this paradigm.[22] The identification of complementarity, substitutability, and modularity as the three main collaboration modes is especially interesting since it provides important insights into the subtle ways AI enhances human decision-making abilities.Moreover, by clarifying the relative benefits of human and AI decision-makers, the study significantly adds to the body of existing knowledge.[20] The authors offer practical advice for practitioners looking to maximize the cooperation between human and AI agents in operational decision-making scenarios by outlining the advantages and disadvantages of each. Overall, "Exploring Human-AI Collaboration in Operational Decision Making" is regarded as a foundational work in the field that adds to our knowledge of the mutually beneficial link between artificial intelligence and human cognition.[19] For academics and professionals who want to fully utilize AI in corporate decision-making processes, this work is indispensable due to its thorough examination and useful implications.Because humans frequently struggle to describe the rules they apply to solve problems, Polanyi's paradox made it difficult for early attempts at artificial intelligence to emulate human decision-making.[18]But instead of relying on clearly stated human norms, modern AI, like deep neural networks, has made great progress by developing adaptable models from large datasets. Thanks to these developments, AI is now extensively useful and efficient in a variety of fields, including image, text, and speech processing as well as medicine.[2] It is acknowledged that not all decision-making processes can be entirely automated because some activities are still difficult for AI to complete, even though it is predicted that AI will continue to advance and become more prevalent in daily life.[3] Notwithstanding advances in

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artificial intelligence, the authors stress the critical function of human-in-the-loop AI and the continued significance of human participation in decision-making processes[16]. They examine the idea of delegation, in which jobs can be delegated to AI algorithms or humans based on their individual skill sets. This method recognizes Polanyi's paradox, according to which people can frequently add supplementary knowledge to algorithms even when they are unable to express their decision criteria with clarity.[25]

LITERATURE REVIEW

It has been proven that robots deployed in real space often encounter problems while doing their jobs. Especially since mistakes happen all the time. In these cases, the problem must be resolved by the operator. In other words, since robots are often a part of themselves, human employees must assist them when necessary.[1]Artificial intelligence (AI)-based applications hold great promise for business and can be used in many different fields; Production is one of them. However, it is not used much anymore.[28] When using artificial intelligence in the production sector, technology, competition and people need to be taken into consideration. Advanced design and management methods are required for the interaction of complex technologies with humans. Therefore, it is important to create collaboration as AI and humans can complement each other and have great potential.[3]Recommendation systems for collaborative filtering make recommendations based on implicit patterns by analysing large [27]data sets using AI algorithms. Decisions about business and client relationships are made using these systems. By establishing correlations between variables and previous data sets, predictive systems build models that predict future events[5].In biometrics, biological features are extracted and digitized for human-computer interaction. Data management enables smart machines to solve complex tasks such as disease detection. Chatbots,[4] entertainment bots, and human-machine interaction are examples of computer-human interaction. These systems can help provide online services, account management, product support, and human services[5].AI uses machine learning (ML) to create algorithms that can learn from data and predict future events on their own, without the need for human intervention. While unsupervised learning shows relationships and patterns in data without labels or categories, supervised learning uses previously sorted and classified data to learn general patterns about objects and outcomes.[5]This article reviews various methods and best practices for using AI in mechatronics to improve human resources information (HRI). It includes adaptive states, skills-based cognitive processes, behavioral processes,[26] negotiation and deliberation. It also includes data collection, evaluation, compliance and security procedures. Critical research on interpersonal communication, self-concept, and cognitive enhancement effects is also provided.[6]

Artificial intelligence (AI) and augmented intelligence (IA) or intelligence augmentation are two methods of increasing human intelligence. IA augments human decision-making through machine learning and predictive analytics, while AI performs tasks that require human intelligence based on rules and data. Although artificial intelligence tries to improve human intelligence, it does not work without human help. Its purpose is to replace monotonous employees. The potential of augmented intelligence and the digital revolution has been the subject of

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many studies, many of which have analyzed research inconsistencies and reported significant findings. We also see problems with the use of this revolutionary technology. While our analysis shows that more research is needed, especially in the fields of medicine, manufacturing, and medicine, which have many unique opportunities and challenges, this paper also provides a broader context for greater intelligence and digitalization[7].

Human-computer collaborative hybrid-augmented intelligence

2.1 Human intelligence vs. artificial intelligence

Human intelligence is dynamic, creative and complex; has the ability to communicate, think and interact with the environment. [29]It is influenced by change, emotional awareness and integration. People are good at collaboration and optimization and show the best of individual skills. Human intelligence is attributed to the structure of the brain, which makes it incomplete and unnecessary information. This amazing experience improves learning, thinking, collaboration and other cognitive skills[13]. Characteristics of intelligence include standardization, repeatability, and logic, which limit the ability to process information. Its mechanical properties allow efficient reprocessing. Logic, on the other hand, enables AI to succeed at discrete tasks such as problem solving and solving symbolic problems, highlighting the difference between AI and human intelligence.[15]

2.Acceptance of Artificially Intelligent Beings by Humans

People had mixed reactions to non-intelligent robots; however, artificial intelligence (AI) has the potential to improve human performance in decision-making, national security, and military training. But AI can change some human positions, which will affect whether people accept or reject it. An important aspect of intellectual property is the use of education. [14]They will need to train people in the technology and its capabilities so they can interact, communicate and collaborate with intelligence agencies. It will take some time for people to accept this process on a daily basis, as acceptance will vary across generations and cultures.[19]

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financial advisors who care and put clients' needs first, AI finds it difficult to build relationships and trust with clients. The use of artificial intelligence in financial planning also raises concerns about customer security and privacy because cybersecurity measures will not be like the machines themselves. AI's financial decision-making ability may be compromised by online financial fraud.[23]

Future Directions

The burgeoning field of human-AI collaboration in healthcare has witnessed a notable surge in publications over time, reflecting a growing interest and recognition of its potential benefits. This trend underscores a significant area of exploration for Information Systems (IS) researchers, who can offer valuable insights and solutions to the myriad challenges associated with this evolving domain.[33] Despite the increasing volume of research, there remains a dearth of comprehensive studies in IS outlets, suggesting ample opportunities for novel contributions. Moreover, given the inherently multidisciplinary nature of human-AI collaboration in healthcare, collaborations with experts from related fields are essential to tackle complex issues effectively.[35]

An analysis of past research reveals an uneven distribution across different diseases and clinical practices, highlighting the need for a more nuanced approach. While generalized AI solutions for multiple diseases offer cost-effectiveness, tailoring interventions to specific disease characteristics holds promise for enhancing effectiveness. Future investigations could explore less-studied clinical practices such as prognosis and prevention, complementing the predominant focus on diagnosis and treatment. Moreover, considering diverse population segments, such as children who present unique challenges in collaboration, could further enrich our understanding and inform targeted interventions.[36] A predominant emphasis on design and implementation methods in existing literature underscores the value of augmenting traditional approaches with field studies and surveys. These methodologies offer deeper insights into real-world practices, facilitating the development[12] of more contextually relevant solutions. Additionally, while a significant portion of papers evaluate AI performance in isolation, there is a pressing need to assess collaborative outcomes, usability, and acceptability of human-AI collaborative technologies.[32]

From an organizational perspective, Information Systems (IS) researchers can delve into how healthcare organizations stand to benefit from harnessing the potential of human-AI collaboration while addressing the necessary adaptations in workflow integration, reconfiguration, and coordination. As human-AI collaboration reshapes workflows and roles within healthcare settings, future research could explore strategies for facilitating organizational change through targeted training programs aimed at developing collaboration competencies among staff. At the societal level, the broader adoption of human-AI collaboration calls for a revaluation of medical education curricula to ensure alignment with evolving practices and technologies.[34] Additionally, there is a need for more studies focusing on adoption patterns and strategies within healthcare settings.

Examining healthcare professionals' perspectives on AI is crucial for understanding the dynamics of collaboration. A fundamental question arises regarding how professionals perceive AI – as a mere tool or as a collaborative teammate.[11] This perception significantly influences decision-making processes and the utilization of AI-driven recommendations. While ideally, collaboration with AI should mirror interactions with human peers, there is a risk of professionals relegating AI to a subordinate role, potentially undermining its contributions. Exploring concepts such as autonomous agent teammate-likeness (ATT) and other human-

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agent theories can shed light on the psychological aspects of human-AI collaboration within healthcare contexts.[37]

Methodology

The methodology employed in this study ensures transparency and reproducibility through a systematic literature review framework, guided by established protocols. Following the methodology outlined by reference [17], a comprehensive search strategy was devised using a combination of keywords and Boolean operators to capture relevant literature on human-AI collaboration in healthcare.[7] The search string was carefully constructed to encompass variations in terminology and account for potential synonym usage, ensuring inclusivity of pertinent contributions.
The primary focus of the search was to identify publications describing hybrid intelligence, defined as the integration of human and AI systems. However, recognizing the evolving nature of terminology in this emerging field, additional criteria were incorporated to capture related concepts such as collaboration, teamwork, coordination, and cooperation.

These terms were chosen based on their conceptual similarity to hybrid intelligence and the likelihood of authors using them interchangeably. To maintain rigor and relevance, the search string was applied to specific fields within publications, including titles, abstracts, and keywords. Where possible, efforts were made to restrict the search to peer-reviewed sources to uphold scholarly standards.[46] The iterative review process involved two distinct cycles to ensure thorough screening and selection of relevant contributions.[43]
During the initial review cycle, publications were scrutinized based on predetermined exclusion criteria. Contributions were excluded if the terms hybrid intelligence or AI were used in contexts divergent from the intended scope, such as referring to different types of AI algorithms or purely theoretical frameworks. Additionally, non-collaborative or non-instantiated works, as well as those focusing solely on technical improvements in machine learning, were excluded to maintain alignment with the research focus.[45]

In the second review cycle, a more in-depth examination of publications was conducted to assess their alignment with critical characteristics of cyber-physical systems (CPS).[39] This involved scrutinizing the research context descriptions to ensure specificity and instantiation of problem scenarios, accompanied by user studies to validate the collaborative nature of the research. Publications lacking sufficient detail or primarily addressing physical tasks unrelated to intellectual collaboration were further excluded to uphold methodological rigor.[38] Throughout the review process, efforts were made to minimize bias and ensure comprehensiveness. Forward and backward searches were conducted to identify additional relevant articles, augmenting the initial search results. The methodology outlined in this study provides a robust framework for systematically identifying and selecting literature on human-AI collaboration in healthcare[10], laying the foundation for insightful analysis and future research directions.[8]

Limitations

Human-AI collaboration holds immense promise for revolutionizing various aspects of healthcare delivery, from diagnosis and treatment to administrative tasks and patient care. However, despite its potential benefits, this emerging paradigm is not without its limitations and challenges, as highlighted in the literature.[47] These limitations encompass various dimensions, including technical, ethical, social, and organizational aspects, each presenting unique hurdles that must be addressed to realize the full potential of human-AI collaboration in healthcare. From

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a technical perspective, one of the primary limitations of human-AI collaboration lies in the inherent constraints and biases embedded within AI algorithms. Machine learning algorithms, while powerful in processing large volumes of data and identifying patterns, are susceptible to biases present in the training data, leading to erroneous or discriminatory outcomes. Moreover, AI systems may lack the capacity to contextualize information or exhibit common sense reasoning, limiting their ability to fully comprehend complex healthcare scenarios.[44] Additionally, interoperability issues among different AI systems and electronic health record (EHR) platforms pose significant challenges to seamless integration and data exchange, hindering the effectiveness of collaborative efforts.

Ethical considerations represent another critical limitation of human-AI collaboration in healthcare.[48] Concerns regarding patient privacy, data security, and consent mechanisms arise with the proliferation of AI technologies in healthcare settings. The collection, storage, and utilization of sensitive patient data by AI systems raise questions about data ownership, consent, and transparency, necessitating robust regulatory frameworks and ethical guidelines to safeguard patient rights and confidentiality. Moreover, the opaque nature of AI decision-making processes, often referred to as the "black box" problem, undermines trust and accountability in collaborative interactions, raising ethical dilemmas regarding responsibility and liability for AI-generated recommendations or decisions.

Social and cultural factors also pose significant challenges to effective human-AI collaboration in healthcare. Resistance to change among healthcare professionals, stemming from fear of job displacement or loss of autonomy, impedes the adoption and acceptance of AI technologies in clinical practice. Moreover, disparities in access to AI-enabled healthcare services exacerbate existing inequalities, widening the gap between privileged and marginalized populations. Cultural biases and norms may also influence perceptions of AI technologies, leading to scepticism [9] or mistrust among certain demographic groups, further complicating efforts to promote widespread adoption and equitable access to AI-driven healthcare solutions.[42]

Organizational barriers present additional challenges to the implementation and scalability of human-AI collaboration in healthcare settings. Resistance from healthcare institutions and stakeholders, driven by concerns over cost, complexity, and workflow disruptions, hinders the integration of AI technologies into existing care delivery models. [41]

Conclusion

The collaborative environment between humans and artificially intelligent systems that has been outlined is a ground-breaking method for encouraging cognitive trust and reliance on self-governing systems among human mentors[49]. This novel framework ushers in a new era of human-machine collaboration by enabling the creation of knowledge goods that embodies state-of-the-art cognitive interaction between humans and artificially intelligent systems. Both humans and AI systems collaborate in this setting, learning from one another and using different operating modes to best leverage their unique advantages.

The development of cognitive procedural memory is essential to this partnership because it facilitates the improvement of information and attitudes about the worth of artificial life forms and autonomous systems. People can actively interact with and adjust to the capabilities of AI systems by developing cognitive self-awareness, self-evaluation, and self-regulation.[8]

By utilizing the synergies between artificial intelligence and human cognition, this ground-breaking method of collaboration has the potential to transform a wide range of fields, including industry and

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healthcare.[50] This paradigm facilitates improved problem-solving, decision-making, and innovation by utilizing cognitive trust and reliance. This, in turn, advances the development of a technologically advanced and more linked society.

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