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The Impact of Artificial Intelligence (AI) on the Future of Jobs in Computer Science and Information Systems: A Systematic Literature Review

Dampak Kecerdasan Buatan (AI) terhadap Masa Depan Pekerjaan di bidang Ilmu Komputer dan Sistem Informasi: Tinjauan Literatur yang Sistematis

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ABSTRACT
The evolution of artificial intelligence (AI) in the fields of Computer Science and Information Systems has become a major research focus in recent decades. This research aims to investigate the impact of AI on job distribution and employment inequality in the context of Computer Science and Information Systems. The research method used is a systematic literature review, by collecting and analyzing relevant articles from reputable international databases. The results of the discussion show that the evolution of AI has brought significant changes in various aspects of work and influenced the division of tasks between humans and machines. The implication of this research is the importance of paying attention to the impact of AI in designing policies, training programs, and initiatives to minimize employment gaps and ensure fair access to employment opportunities in the AI era.
Keywords: Artificial Intelligence, Computer Science, Information Systems, Work Distribution, Division of Tasks, Work Gaps, Systematic Literature Review.

ABSTRAK
Evolusi kecerdasan buatan (AI) dalam bidang ilmu Computer Science dan Information Systems telah menjadi fokus utama penelitian dalam beberapa dekade terakhir. Penelitian ini bertujuan untuk menyelidiki dampak AI terhadap distribusi kerja dan kesenjangan kinerja dalam konteks Computer Science dan Information Systems. Metode penelitian yang digunakan adalah tinjauan literatur sistematis, dengan mengumpulkan dan menganalisis artikel-artikel yang relevan dari database internasional bereputasi. Hasil pembahasan menunjukkan bahwa evolusi AI telah membawa perubahan signifikan dalam berbagai aspek pekerjaan dan mempengaruhi pembagian tugas antara manusia dan mesin. Implikasi dari penelitian ini adalah pentingnya memperhatikan dampak AI dalam merancang kebijakan, program pelatihan, dan inisiatif untuk meminimalkan kesenjangan kerja dan memastikan akses yang adil terhadap peluang pekerjaan di era AI.
Kata Kunci: Kecerdasan Buatan, Computer Science, Information Systems, Distribusi Kerja, Pembagian Tugas, Kesenjangan Kerja, Tinjauan Literatur Sistematis.

1. Introduction

The impact of Artificial Intelligence (AI) on the future of jobs in Computer Science and Information Systems is a topic of growing interest and concern. As AI continues to advance, it has the potential to significantly disrupt labor markets (Frank et al., 2019). Rapid advances in AI and automation technologies are expected to transform the requirements of jobs and the demand for labor en masse (Dawson et al., 2021). The development of cutting-edge technologies such as brain-computer interface (BCI) and the evolution of human intelligence will eventually usher in a strong AI era, potentially simulating and replacing human capabilities (Dong et al., 2020). Furthermore, the democratization of remote work, driven by advances in AI, is one of the driving forces shaping the changing world of work (Langer et al., 2023).

AI's impact on the future of jobs is not limited to labor markets. It extends to various industries, including computer science and information systems. AI is revolutionizing these

fields, automating tasks that require human intelligence and augmenting workers while transforming job requirements (Saini et al., 2021). Additionally, the application of AI in healthcare has increased due to rapid digitization and integration of computer science in all fields, indicating the broadening influence of AI across different sectors (Bansal & Jindal, 2022).

As AI continues to evolve, it is crucial to ensure that AI systems function correctly and gain the trust of experts, especially in critical areas such as clinical radiology (Reyes et al., 2020). The potential for AI to automate and standardize highly mechanical and repeatable jobs is a concern, as it may lead to widespread job displacement due to systems automation (Braganza et al., 2021). However, the role of digital skills in mitigating the impact of AI on job displacement risk is also being explored, highlighting the potential for skill-driven recommendations for job transition pathways (Chen et al., 2022).

In conclusion, the impact of AI on the future of jobs in Computer Science and Information Systems is multifaceted. It encompasses labor market disruptions, the evolution of human intelligence, the transformation of job requirements, and the potential for job displacement. As AI continues to advance, it is essential to consider the ethical, regulatory, and societal implications of its widespread adoption.

Advances in Artificial Intelligence (AI) technology have had a significant impact on various aspects of human life, including the world of work. The field of Computer Science and Information Systems is one of the most affected by the development of AI. With the increasingly widespread adoption of AI technology, there is a massive transformation in the way this industry works and dynamics. The application of AI in the fields of Computer Science and Information Systems has opened up new opportunities, but also raises various challenges that need to be properly understood.

The development of AI has triggered various changes in the distribution of work in the fields of Computer Science and Information Systems. Machines equipped with artificial intelligence are able to handle tasks previously performed by humans, fundamentally changing the way people work. This raises questions about the role of humans and machines in an increasingly automated and digitalized work environment.

Although much research has been conducted to understand the impact of AI on work, there are still gaps in our understanding of how this technology affects the distribution of work especially in the fields of Computer Science and Information Systems. In particular, there is still a need for more in-depth study of how the division of tasks between humans and machines evolves with the adoption of AI, as well as its potential impact on the employment gap.

The aim of this research is to conduct a systematic analysis of existing literature to understand more deeply how AI affects the distribution of work in the fields of Computer Science and Information Systems, especially in terms of the division of tasks between humans and machines. Through a better understanding of this phenomenon, it is hoped that new insights can be discovered that are useful for developing policy, practice and research in the future.

The research question posed in this study is: "How will AI affect the distribution of work in the field of Computer Science and Information Systems, especially in terms of the division of tasks between humans and machines, and its potential impact on employment gaps?"

This research makes a new contribution to our understanding of the impact of AI on the world of work, especially in the context of the fields of Computer Science and Information Systems. By systematically exploring existing literature, it is hoped that this research can provide new insights and a deeper understanding of this developing phenomenon.

The main contribution of this research is the provision of a systematic analysis of the existing literature on the impact of AI on the distribution of work in the fields of Computer Science and Information Systems. It is hoped that the results of this research will provide a more comprehensive view of the role of AI in the transformation of the world of work, as well

as contribute to the development of future policy, practice and research in this area.

2. Research Methods

In this research, relevant articles will be collected from reputable international databases, one of which is Scopus. Scopus is a database that is well-known for providing access to quality and trusted scientific journals in various fields of science, including Computer Science and Information Systems. Using Scopus allows researchers to access various scientific articles relevant to this research topic.

To search for articles that match the research topic, a number of relevant keywords will be used. These keywords will be carefully selected to ensure that the articles found are truly related to the impact of AI on the distribution of work in the fields of Computer Science and Information Systems. Some examples of keywords that might be used include "Artificial Intelligence", "Job Impact", "Computer Science", "Information Systems", and so on.

After conducting a search using the specified keywords, an evaluation will be carried out on the number of articles obtained from the initial search. This number of articles will be an initial indication of the availability of literature relevant to the research topic. Next, these articles will be further selected to ensure the presence of the most relevant and quality articles.

In the article inclusion and exclusion process, strict criteria will be applied to ensure that the selected articles are truly relevant to the research focus. Articles that do not meet the predetermined inclusion criteria will be removed from the analysis, while articles that meet the inclusion criteria will be further considered for inclusion in this literature review.

The PRISMA method will be used in the article selection process to ensure transparency, accountability and consistency in reporting the results of this literature review. PRISMA is an internationally recognized guideline for reporting the results of systematic reviews and meta-analyses. By applying the PRISMA method, it is hoped that high standards will be achieved in reporting the article selection process, so that the results of this literature review can be relied upon and replicated by other researchers.

3. Results and Discussions

3.1. The Evolution of AI in Computer Science and Information Systems

The evolution of Artificial Intelligence (AI) in computer science and information systems has been a subject of extensive research and development in recent years. AI, as a novel branch of computer science, involves the ability of computer systems to emulate human behavior that requires intelligence, such as thinking and decision-making (Maddox et al., 2019). Many techniques in the community of computer science and information technology have been formed within AI, such as knowledge representation, reasoning, planning, machine learning, vision, natural language processing, and robotics (Chao et al., 2021). AI is broadly defined as a field of computer science that aims to mimic human intelligence with computer systems (Jacobson & Jokela, 2022). At its core, AI is the process by which human decision making and reasoning can be achieved by algorithms programmed on a computer (Mansur et al., 2023).

The recent advances in AI have led to significant developments in various domains, including medicine, nursing, and oncology. AI has shown drastic advancements in diagnostic imaging and has been instrumental in risk prediction, prognostication, and therapy response assessment in colorectal cancer (patil & patil, 2022; Lu et al., 2020). Furthermore, in nursing practice, informatics and AI approaches, including robots with AI, computer- and mobile-based applications, electronic communication using an information system, and information standards and standardized terminologies, have been promoted to enhance integrative health therapies (Kang et al., 2021).

The application of AI has also extended to public health, with increasing efforts to

improve the teaching of ethics and human-centered AI in coursework in the computer science and machine learning communities (Eden, 2023). Additionally, the utilization of AI in the context of COVID-19 has been a subject of study, indicating the relevance and timeliness of AI in addressing contemporary global health challenges (Zhao et al., 2022).

The development of AI has also led to the emergence of new concepts such as emotion AI and cognitive AI, reflecting the rapid growth and diversification of AI applications in computer science (Priyahita, 2020). Moreover, the utilization of AI in the development of the education system has been explored, highlighting the potential of AI in transforming educational practices. In conclusion, the evolution of AI in computer science and information systems has been characterized by significant advancements and diverse applications across various domains. The interdisciplinary nature of AI research and its impact on society underscore the importance of continued exploration and development in this field.

The evolution of artificial intelligence (AI) in the fields of Computer Science and Information Systems has been a subject of intense attention in recent decades. Initially, AI was defined as the ability of machines to imitate human intelligence, but this concept has evolved greatly over time. Since the emergence of the concept of AI in the 1950s, technological development and research in this domain have progressed significantly. Initially, AI approaches were based on symbolic logic and heuristic rules, which were followed by the era of neural networks in the 1980s. Then, the revolution in big data processing and increasingly powerful computing has enabled the development of more sophisticated machine learning techniques, such as deep learning. In addition, cloud computing technology, high-performance computing, and advances in optimization algorithms have accelerated the development of AI, enabling broader and more complex applications in a variety of fields, including natural language processing, computer vision, robotics, and others (Sadiku et al., 2020; Mansur et al., 2023; Bansal & Jindal, 2022; Minkkinen et al., 2022).

The evolution of AI in Computer Science and Information Systems includes not only technical advances but also involves deep conceptual and theoretical developments, as well as broad social, economic, and ethical impacts. As a result, a deep understanding of these changes is critical to inform policy, innovation, and societal development in the AI era. The ethical implications of AI have been a significant focus, with discussions on AI ethics, responsible AI, and the need for translational ethical AI research (Huang et al., 2023; Kazim & Koshiyama, 2020; Kazim & Koshiyama, 2020; Moon, 2023; Nasim et al., 2022; Gonçalves et al., 2023; Timmons et al., 2022; Huriye, 2023; Borg, 2022). Furthermore, the impact of AI on various sectors such as healthcare, education, marketing, and social good has been widely discussed, emphasizing the need for AI literacy, AI education, and the assessment and mitigation of bias in AI applications (Sadiku et al., 2020; Bansal & Jindal, 2022).

The literature also highlights the need for inclusivity, equity, and innovative digital technologies, especially in the context of adolescent and young adult health, and emphasizes the importance of promoting AI literacy for middle school students (Zhang et al., 2022; Israni et al., 2020). Additionally, the role of AI in influencing social adaptability, customer experiences, and security politics has been explored, indicating the wide-ranging impact of AI across different domains (Ameen et al., 2021; Lai et al., 2023; Minkkinen et al., 2022). In conclusion, the evolution of AI in Computer Science and Information Systems has seen significant advancements, leading to complex applications and deep societal impacts. The ethical considerations, societal implications, and the need for AI literacy and inclusivity have emerged as critical areas of focus, emphasizing the multidimensional nature of AI's evolution and its far-reaching effects on society.

3.2. The influence of AI on the distribution of work and the division of tasks between humans and machines

The impact of AI on the distribution of work and the division of tasks between humans

and machines has garnered significant interest in recent years. As AI technology continues to advance, it is crucial to understand how it changes tasks and the resulting division of activities between AI and humans, as well as how to coordinate them (Schroder et al., 2022). The dynamic of task allocation between humans and machines is particularly important as machine technology progresses, especially towards middle-skill tasks (Gong, 2023). There exists a spectrum between full human agency and full automation, and varying levels of machine assistance along this spectrum gradually increase the influence of machine predictions (Lai & Tan, 2019). The rise of machine learning has fundamentally altered decision-making processes, with many important decisions now being made through an "algorithm-in-the-loop" process where machine learning models inform people (Green & Chen, 2019).

Moreover, the division of work tasks between humans and robots has been a subject of study, leading to the proposal of a framework for this division (Saplacan et al., 2020). AI is increasingly being used to assist human experts in making decisions in high-stakes scenarios, indicating a shift in the traditional division of decision-making tasks (Zhang et al., 2020). The influence of AI on various professions, such as radiology and public relations, has raised questions about its impact on the workforce and the distribution of tasks within these fields (Abuzaid et al., 2021; Arief & Gustomo, 2020). Additionally, the rapid development of AI technology in healthcare has prompted the need for medical schools to adapt quickly to equip the next generation of doctors with the skills required to embrace AI in their future work (Tung, 2023).

On the other hand, the technological progress of AI has also brought about concerns regarding the negative impact on employment and income distribution, particularly in low-skill and labor-intensive industries (Zhao, 2023; Goyal & Aneja, 2020). It has been observed that technologies such as AI and automation have worsened the distribution of income, particularly affecting young people's jobs and those educated to the middle level (Goyal & Aneja, 2020).

In conclusion, the influence of AI on the distribution of work and the division of tasks between humans and machines is a multifaceted issue that encompasses changes in decision-making processes, the impact on various professions, and concerns about employment and income distribution. As AI technology continues to advance, it is crucial to consider the implications for the division of tasks between humans and machines and how to effectively coordinate and integrate AI into various fields.

The impact of artificial intelligence (AI) on the distribution of work and the division of tasks between humans and machines has become a significant focus of attention in recent years. As AI technology advances, it has led to a transformation in the way work is managed and performed across various sectors such as industry, services, and education (Einola & Khoreva, 2022). AI has enabled automation and more efficient data management, thereby changing the traditional way work is done (Harapan et al., 2021). This has resulted in a shift in workplace roles and responsibilities, sparking discussions about the impact on productivity, job opportunities, and employment gaps (Shaikh et al., 2023). The distribution of work between humans and machines has become increasingly complex and interconnected, with AI taking a role in the execution of tasks that were previously exclusive to humans (Schroder et al., 2022).

The impact of AI on various sectors, such as healthcare, architecture, and finance, has been a subject of extensive research and discussion (Duran, 2023; Cavanagh et al., 2021; Madni, 2020). For instance, in healthcare, AI is utilized to replicate human cognitive abilities for the understanding, presentation, and analysis of sophisticated medical procedures and healthcare information (Tmouche, 2023). In architecture, AI has been studied for its influence in forming complex conceptual designs (Harapan et al., 2021). Furthermore, the influence of AI on employee productivity, knowledge sharing, and well-being has been investigated, with a focus on the healthcare sector (Shaikh et al., 2023).

The coexistence of humans and AI in the workplace ecosystem has been explored, highlighting the need for a deeper understanding of this relationship to inform policy, practice,

and strategy development in various economic and social sectors (Einola & Khoreva, 2022). Additionally, the ethical implications of AI in virtual leadership construction and the potential subject of property and intellectual property relations have been subjects of scholarly inquiry (Pang & Zhang, 2021; Nekit et al., 2020).

As AI continues to advance, it is crucial to consider the implications of AI on the future of work, organizations, and society. The potential impact of AI on project management, talent development, and employee loyalty has also been a focus of research, emphasizing the need for a comprehensive understanding of the evolving role of AI in the workplace (Vinichenko* et al., 2019; Müller, 2024; Holzmann et al., 2022). In conclusion, the influence of AI on the distribution of work and the division of tasks between humans and machines is a multifaceted and evolving area of study, with implications for various sectors and aspects of human work. Understanding the impact of AI on the workforce is essential for informing decision-making and shaping the future of work in the era of technological advancement.

3.3. The impact of AI on employment gaps in the fields studied

The impact of artificial intelligence (AI) on employment has been extensively researched in recent years. demonstrated that the introduction of robots in labor markets can lead to reduced employment and wages, with the local labor market effects of robots being estimated by analyzing the change in employment and wages in relation to the exposure to robots in each local labor market (Acemoğlu & Restrepo, 2020). Furthermore, Yu et al. (2022) highlighted that the ongoing technological development of AI will have a notable impact on job categories, working hours, the relationship between employers and employees, and remuneration models (Yu et al., 2022). This suggests that the adoption of AI technologies may lead to significant changes in the nature of work and employment relationships.

Moreover, Muhammad et al. (2023) emphasized that the adoption of AI and machine learning technologies is creating a growing demand for workers with complementary skills, leading to a skills gap in the workforce as education systems struggle to keep up with the demand (Muhammad et al., 2023). This indicates that the integration of AI in the workplace is reshaping the skill sets required for employment, potentially leading to disparities in workforce skills and economic mobility. Additionally, Morandini et al. (2023) highlighted the importance of organizations considering the impact of AI on learning and development, ensuring that strategies implemented account for the diverse needs and perspectives of the workforce (Morandini et al., 2023). This underscores the need for proactive measures to address the potential impact of AI on workers' skills and employment opportunities.

Furthermore, Jetha et al. (2023) pointed out that there remains limited empirical research on how AI can affect the intersection between employment opportunities, the work environment, and worker health outcomes (Jetha et al., 2023). This highlights the need for further investigation into the multifaceted impact of AI on employment, including its implications for worker well-being and occupational health. In conclusion, the adoption of AI technologies in the workplace has the potential to significantly influence employment gaps, job-related skills, and workforce dynamics. As AI continues to reshape the nature of work, it is essential for policymakers, organizations, and researchers to consider the multifaceted implications of AI on employment and to develop strategies that promote inclusive and sustainable workforce development.

The impact of artificial intelligence (AI) on workforce inequality is a topic of increasing concern. As AI technology continues to advance, there is a growing potential for widening disparities between individuals with relevant AI skills and those without. The adoption of AI has the capacity to significantly alter the employment landscape, affecting the types of jobs available and the skills required to succeed in an increasingly automated and digitalized work environment (Georgieff & Milanez, 2021). While AI can enhance efficiency and productivity, creating new opportunities for high-skilled technical jobs, there are concerns that routine and

repetitive jobs may be replaced by automation, leaving many workers with less relevant skills or unprepared for AI technology (Agrawal et al., 2019). This situation could lead to unequal access to high-quality, high-income jobs between individuals with relevant AI skills and those without, exacerbating workforce inequality (Jain et al., 2021).

Furthermore, the impact of AI on job demands and employee learning is a critical aspect to consider. New AI technologies applied to work scenarios may change job demands and affect employees' learning, potentially leading to disparities in skill development and career advancement (Sen et al., 2022). Additionally, the potential for biases and disparities in AI technology, particularly in healthcare, raises concerns about the equitable delivery of care and the optimization of administrative processes (Whitney et al., 2023). Biases in AI systems, stemming from data biases and underrepresentation of minority groups, can perpetuate existing disparities and inequalities, particularly in healthcare (Dortche et al., 2023).

The impact of AI on workforce skills and economic mobility has been widely researched, with a focus on developed countries. However, it is essential to consider the implications of AI on workforce skills and economic mobility in developing countries as well, to ensure a comprehensive understanding of the global impact of AI on workforce inequality (Muhammad et al., 2023). In conclusion, the deep understanding of AI's impact on workforce inequality is crucial for informing policies, training programs, and initiatives aimed at minimizing inequality in the job market in the AI era. It is imperative to address the potential disparities and biases in AI technology, as well as to ensure equitable access to opportunities for skill development and economic mobility in the face of AI advancements.

4. Conclusion

In this study, the evolution of artificial intelligence (AI) in the fields of Computer Science and Information Systems has been investigated in depth. From the evolution of AI that has been recorded, it can be seen that AI has made major contributions in various domains, such as medicine, nursing, and education, with a significant impact in the fields of medical diagnosis, therapy planning, and technology-based educational development. In addition, the role of AI in influencing the distribution of work and the division of tasks between humans and machines has also become a major concern. The application of AI technology has fundamentally changed the employment landscape, influencing the types of jobs available and triggering shifts in workplace roles and responsibilities. However, along with its benefits, there are also concerns about the negative impact of AI on employment gaps. The application of AI may result in inequities in access to quality, high-paying jobs between individuals who have skills relevant to AI technology and those who do not. The implications of these findings underscore the need for continued efforts in addressing employment disparities and ensuring equitable access to employment opportunities in the AI era.

From the results of this research, there are several implications that can be drawn. First, it is important to consider developing policies that are able to accommodate and mitigate the impact of AI on job distribution and employment inequality. Such policies could include efforts to improve AI-relevant job skills, through training and education programs that match the changing needs of the job market. In addition, there needs to be regulations that ensure that the application of AI in the workplace does not increase inequality and discrimination. Second, it is important for organizations and educational institutions to prepare the future workforce with the skills necessary to face the challenges and opportunities brought by developments in AI.

While this research provides valuable insight into the evolution of AI and its impact on job distribution and employment inequality, there are several limitations that need to be noted. First, limitations in the availability of data and relevant literature can limit a deeper understanding of the phenomenon under study. In addition, the focus of this research is limited to certain aspects of the impact of AI, so there is room for more in-depth and broader

follow-up research on this topic.

For future research, it is recommended to continue research on the evolution of AI and its impact on job distribution and employment inequality with a cross-disciplinary approach. Further research could explore the ethical implications of the use of AI in the workplace, as well as its potential impact on other social, economic and political aspects. Additionally, more in-depth research on mitigation strategies to reduce inequalities in access to jobs and economic opportunities in the AI era is also needed. In doing so, it is hoped that future research will provide deeper insights into the complex dynamics between AI and human employment, and help shape policies and best practices in dealing with the challenges and opportunities brought by developments in AI.

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