ANSO
Alliance of International Science Organizations

Highlight

Artificial Intelligence

Paving the Way for a Human-Centered AI Era

Special Issue
May 2025
Issue.01

Abstract

The rapid advancement of artificial intelligence (AI) has significantly transformed various aspects of our lives, from healthcare and transportation to entertainment and manufacturing. This article explores the historical development of AI, its current impact on different industries, and the challenges it presents, such as ethical concerns, job displacement, and data privacy issues. The concept of digital humanism is introduced as a framework to ensure that AI development aligns with human values and needs, emphasizing ethics, transparency, and accountability. The article also discusses the importance of ethical AI development and the need for a human-centric approach to AI design. By examining the future outlook of AI and digital humanism, this article highlights the potential for AI to bridge cultural and societal divides and promote global cooperation. The conclusion underscores the importance of balancing technological progress with ethical considerations to harness AI's power for the greater good of humanity.

Introduction

In the contemporary era marked by the rapid advancement of digital technology, artificial intelligence (AI) has become an integral part of our daily existence. It has revolutionized our working methods and has far-reaching impacts on our social interactions, entertainment, healthcare, and more. However, as AI technology continues to evolve at an unprecedented pace, we are confronted with a myriad of challenges and issues. This article delves into the historical progression of AI, its current state, and future prospects, with a particular emphasis on the significance of digital humanism in this context.

The Promise and Peril of AI

AI holds the promise of solving some of the world's most pressing problems, from climate change to healthcare accessibility. However, it also poses significant risks, including job displacement, privacy violations, and the potential for autonomous weapons systems. As we navigate this complex landscape, it is essential to consider both the benefits and the dangers of AI.

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The Role of Digital Humanism

Digital humanism offers a framework for ensuring that AI development aligns with human values and needs. It emphasizes the importance of ethics, transparency, and accountability in AI systems. By prioritizing human well-being and dignity, digital humanism can help guide AI development toward beneficial outcomes for all.

The Origin and Development of AI

Early Exploration

The concept of artificial intelligence (AI) has its roots in the early 20th century, with pioneers like Alan Turing laying the theoretical groundwork. Turing's work on computation and the famous Turing Test provided a framework for understanding machine intelligence. However, it was not until the 1950s that AI began to take shape as a distinct field of study.

In 1956, John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon organized the Dartmouth Conference, widely regarded as the birth of AI as an academic discipline. The conference brought together researchers from various fields, including mathematics, psychology, and engineering, to explore the possibilities of machine intelligence. The Dartmouth Conference laid the foundation for AI research and established the field's initial goals.

The founding fathers of AI. Image source: https://www.presidency.ucsb.sedu/documents/article-will-hurd-will-robots-take-my-job

The First Wave of AI: Symbolic AI and Expert Systems

The early years of AI were dominated by symbolic AI, which focused on representing knowledge through symbols and rules. Researchers attempted to create programs that could perform tasks requiring human-like reasoning. One of the earliest successes was the Logic Theorist, developed by Allen Newell and Herbert A. Simon in 1956. This program was capable of proving mathematical theorems and represented a significant milestone in AI research.

The 1960s and 1970s saw the development of expert systems, which were designed to emulate the decision-making abilities of human experts in specific domains. These systems used knowledge bases and inference engines to provide solutions to complex problems. MYCIN, developed in the 1970s, was one of the most successful expert systems and was used for diagnosing bacterial infections.

The Second Wave of AI: Machine Learning and Neural Networks

The 1980s and 1990s marked a shift in AI research towards machine learning and neural networks. Machine learning involved developing algorithms that could learn from data and improve their performance over time. This approach allowed AI systems to adapt to new information and make predictions based on patterns in the data.

Neural networks, inspired by the structure of the human brain, became a central focus of AI research during this period. These networks consisted of interconnected nodes that could process and transmit information. The backpropagation algorithm, developed in the 1980s, revolutionized neural network training by efficiently adjusting the weights of connections between nodes.

The availability of large datasets and advances in computing power have been crucial factors in the success of deep learning. Companies like Google, Facebook, and Amazon have leveraged their vast data resources to develop powerful AI systems. These systems have revolutionized industries such as healthcare, finance, and transportation.

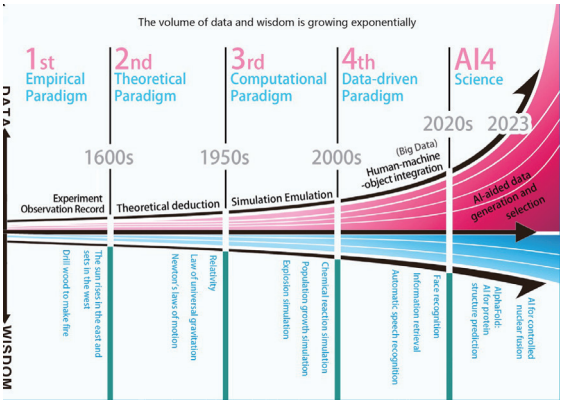
The Third Wave of AI: Deep Learning and Big Data

The 21st century has witnessed the rise of deep learning and big data, which have transformed AI research and applications. Deep learning involves training neural networks with many layers, enabling them to learn complex representations of data. This approach has achieved remarkable success in various domains, including image recognition, natural language processing, and speech recognition.

The Nobel Prize in Physics (2024) awarded to neural network pioneers. Image source: Christine Olson (2024). "Physics Nobel awarded to neural network pioneers who laid foundations for AI." The Conversation, 8 October 2024. https://theconversation.com/physics-nobel-awarded-to-neural-network-pioneers-who-laid-foundations-for-ai-240833

Key Milestones in AI Development

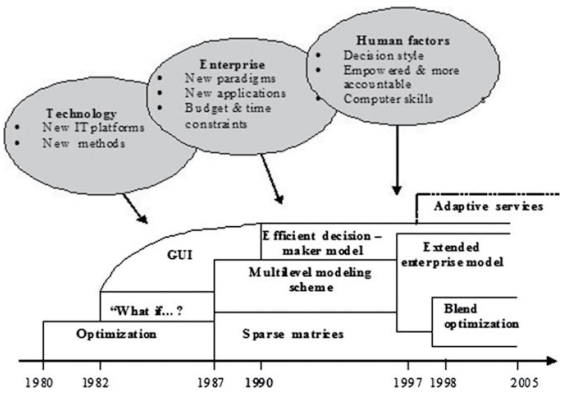
- - **1956 Dartmouth Conference**: The birth of AI as a field of study.
- - **1960s-1970s**: Early AI projects and the development of expert systems.
- - **1980s-1990s**: Machine learning and neural networks gain prominence.
- - **2000s-Present**: Deep learning and big data drive AI advancements.



The growth of AI's volume of data and wisdom. Image source: Yongjun Xu, Fei Wang, Zhulin An, Qi Wang, and Zhao Zhang (2023). "Artificial intelligence for science—bridging data to wisdom." The Innovation, 4(6). https://doi.org/10.1016/j.xinn.2023.100525

Important Projects and Technologies

- **DSS Dispatcher**: An early AI project aimed at facilitating decision-making through computer systems.



DSS Dispatcher: an early project. Image source: Filip et al. (2017), p. 56.

- **DMKDM**: A forerunner of modern digital clones, the Declarative Model of a Knowledgeable decision-maker was designed to stimulate creativity and support model building, experimentation, and solution evaluation in various situations, including crises.

The Current State of AI

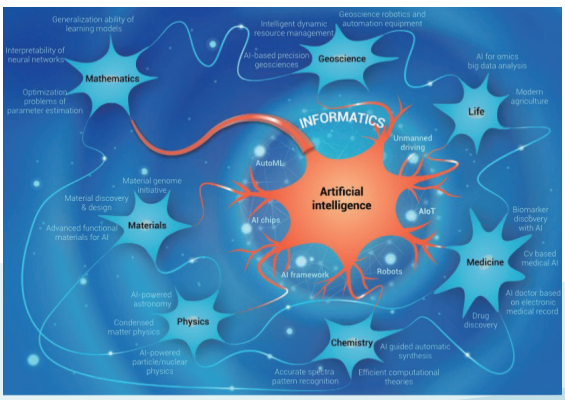
Global Impact

As highlighted by Andrew Ng, AI is transforming almost every major industry, much like how electricity changed numerous sectors about 100 years ago. This technological revolution is enriching the lives of many and opening up new opportunities across different domains.

Andrew Ng. Image source: https://commons.wikimedia.org/wiki/File:Andrew_Ng_at_TechCrunch_Disrupt_SF_2017.jpg

AI in Various Industries

- **Healthcare**: AI is used for disease diagnosis, drug discovery, and personalized treatment plans.
- **Transportation**: Autonomous vehicles and traffic management systems improve safety and efficiency.
- **Entertainment**: AI algorithms recommend movies, music, and other content.
- **Manufacturing**: AI optimizes production processes and quality control.



AI and science. Image source: Xu et al. (2021). https://www.cell.com/action/showPdf?pii=S2666-6758%2821%2900104-1

AI Development in Romania

- - **Historical and Current Developments**: Romania has a rich history in AI spanning various domains such as cognitive agents, natural language processing, and artificial neural networks. The Romanian Academy's research institutes have been instrumental in advancing AI research.
- - **Government Strategy**: The Romanian government has approved a National AI Strategy for 2024-2027, focusing on digital public administration, economy, education, and other strategic axes to promote AI development.

Controversies and Challenges in AI

Technological Limitations

Computers lack consciousness, critical thinking, and the ability to perform all types of reasoning like humans. They cannot take responsibility for things beyond their design and are not capable of reflection or having feelings.

Ethical and Social Issues

- - **Privacy and Security**: With the widespread application of AI, data privacy and security have become major concerns.
- - **Employment Impact**: Automation may lead to significant job losses, posing challenges to the social employment structure.
- - **Ethical Concerns**: AI development raises ethical questions such as algorithmic bias and decision-making transparency.

Key Challenges in AI Development

- - **Ethical Concerns and Bias**: AI systems can perpetuate and even exacerbate existing biases in society.
- - **Talent Shortage**: The rapid growth of AI technology has outpaced the availability of skilled professionals.
- - **Regulatory and Legal Challenges**: Navigating the complex landscape of global AI regulations is a significant challenge.
- - **Data Privacy and Security**: Ensuring the security of sensitive data used by AI systems is crucial.
- - **Social and Economic Impact**: AI's impact on the labor market and economy requires new strategies for training and retraining employees.

The Rise of Digital Humanism

Digital Humanism vs. Dataism

- - **Digital Humanism**: It seeks to empower people to achieve what they previously thought impossible or redefine the way they achieve their goals. It emphasizes a human-centric approach, using technology to enhance human well-being.
- - **Dataism**: Introduced by Brooks and later defined by Harari, it treats "information flow" as the ultimate goal, potentially overshadowing human values and individual worship.

Practices and Initiatives

- - **Vienna Manifesto**: Calls for shaping technologies according to human values and needs rather than letting technologies shape humans.
- - **Digital Enlightenment Forum**: Promotes the integration of digital technologies with human values to foster a more humane and fair society.
- - **Stanford University's AI Center**: Focuses on human-centered AI research and the Responsible Hybrid Intelligence Initiative.

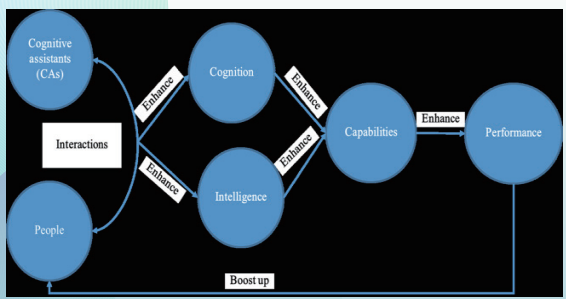
Future Outlook

Technological Advancements

AI technology will continue to evolve, with closer integration of human and machine intelligence. We can expect more intelligent assistants, cognitive systems, and other innovations that enhance human capabilities.

The Integration of AI in Everyday Life

AI will become increasingly integrated into our daily lives, from smart homes to personalized education. Smart home systems will be able to learn our preferences and adjust settings automatically, while AI-powered educational tools will provide personalized learning experiences for students of all ages.



Steps to boost human performance. Image source: Xu et al. (2021). https://www.cell.com/action/showPdf?pii=S2666-6758%2821%2900104-1

AI in Healthcare

AI will play a crucial role in healthcare, from disease diagnosis to drug discovery. AI systems will be able to analyze vast amounts of medical data to identify patterns and predict disease outbreaks. In drug discovery, AI will accelerate the development of new treatments by simulating molecular interactions and identifying potential drug candidates.

AI in Transportation

Autonomous vehicles will become more common, improving road safety and reducing traffic congestion. AI will also optimize public transportation systems, making them more efficient and environmentally friendly.

Social Changes and Challenges

As technology progresses, social structures and relationships will transform. We need to address issues like the digital divide and social inequality and find ways to ensure that AI benefits all of humanity.

The Digital Divide

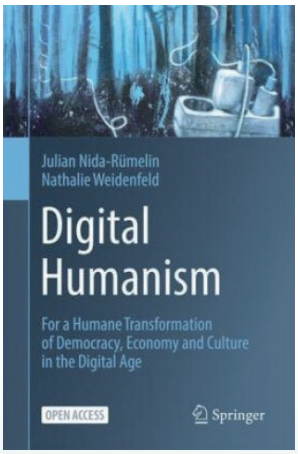
The digital divide refers to the gap between those who have access to digital technologies and those who do not. As AI becomes more prevalent, this divide may widen, exacerbating social inequalities. To address this, governments and organizations must work to ensure that everyone has access to AI technologies and the skills to use them effectively.

Social Inequality

AI has the potential to both reduce and increase social inequality. On one hand, AI can provide access to education, healthcare, and other resources for underserved populations. On the other hand, if AI development is concentrated in the hands of a few, it could lead to greater inequality. To ensure that AI benefits all of humanity, we must develop policies and initiatives that promote equitable access and use of AI technologies.

The Importance of Digital Humanism

Digital humanism will play a crucial role in guiding the future development of AI. It reminds us to prioritize human values and dignity in the pursuit of technological progress, ensuring that AI serves the greater good of humanity.



Recommended book. Image source: https://link.springer.com/book/10.1007/978-3-031-12482-2

Ethical AI Development

Ethical AI development is crucial in ensuring that AI systems are fair, transparent, and accountable. This requires a multi-faceted approach involving policymakers, technologists, ethicists, and the public. Governments and international organizations must establish clear ethical guidelines and regulatory frameworks to govern AI development. This includes ensuring that AI systems are free from bias, transparent in their decision-making processes, and accountable for their actions.

Human-Centric AI Design

Digital humanism calls for a human-centric approach to AI development. This means that AI systems should be designed to enhance human capabilities and improve quality of life. AI should not be seen as a replacement for human intelligence but as a tool to augment it. By focusing on human needs, we can develop AI systems that are more intuitive, user-friendly, and beneficial to society.

The Future of AI and Digital Humanism

The future of AI will be shaped by our ability to balance technological advancement with ethical considerations. As AI continues to evolve, we will need to address new challenges and opportunities. Digital humanism will play a crucial role in guiding this process, ensuring that AI serves the greater good of humanity.

Collaborative AI Systems

One potential future scenario is the development of AI systems that can work collaboratively with humans, enhancing our capabilities and solving complex problems together. This requires a shift from viewing AI as a separate entity to seeing it as an integral part of a human-AI ecosystem.

In this ecosystem, AI systems would act as partners, providing support, insights, and solutions while respecting human autonomy and dignity.

Bridging Cultural and Societal Divides

AI has the potential to bridge cultural and societal divides by providing access to information and resources for people from diverse backgrounds. By developing AI systems that are accessible and beneficial to everyone, we can promote global cooperation and understanding. This requires addressing issues of digital divide and ensuring that the benefits of AI are distributed equitably.

Final Thoughts

The AI era presents us with a unique opportunity to create a better future for all. By embracing digital humanism and prioritizing ethical AI development, we can harness the power of AI to address some of the world's most pressing challenges. It is essential that we approach this journey with caution, foresight, and a commitment to human values. Only then can we ensure that AI serves as a force for good in our increasingly complex world.

Conclusion

The AI era has arrived, bringing both unprecedented opportunities and challenges. Digital humanism offers a vital perspective in helping us navigate these changes and ensure that AI development aligns with human interests and values. By striking a balance between technological advancement and societal well-being, we can harness AI to create a better future for all.

The Dual Nature of AI: Opportunities and Risks

AI presents a dual nature, offering significant opportunities while posing substantial risks. On the one hand, AI has the potential to solve some of the world's most pressing problems. In healthcare, AI can lead to more accurate disease diagnosis, personalized treatment plans, and accelerated drug discovery. This can significantly improve patient outcomes and reduce healthcare costs. In transportation, autonomous vehicles can enhance road safety, reduce traffic congestion, and lower carbon emissions. In environmental protection, AI can analyze vast amounts of data to help combat climate change and promote sustainable development.

However, AI also poses risks that cannot be ignored. Job displacement due to automation is a major concern, as AI systems can perform tasks previously done by humans, leading to significant unemployment in certain sectors. Privacy violations are another critical issue, as AI systems often require large amounts of personal data, which can be misused or fall into the wrong hands. The development of autonomous weapons systems raises ethical questions about the use of force and the potential for AI to be used in harmful ways.

The Role of Digital Humanism in Shaping AI's Future

Digital humanism provides a framework for ensuring that AI development aligns with human values and needs. It emphasizes the importance of ethics, transparency, and accountability in AI systems. By prioritizing human well-being and dignity, digital humanism can help guide AI development toward beneficial outcomes for all.

Digital humanism calls for a human-centric approach to AI development. This means that AI systems should be designed to enhance human capabilities and improve quality of life. AI should not be seen as a replacement for human intelligence but as a tool to augment it. By focusing on human needs, we can develop AI systems that are more intuitive, user-friendly, and beneficial to society.

The Importance of Ethical AI Development

Ethical AI development is crucial in ensuring that AI systems are fair, transparent, and accountable. This requires a multi-faceted approach involving policymakers, technologists, ethicists, and the public. Governments and international organizations must establish clear ethical guidelines and regulatory frameworks to govern AI development. This includes ensuring that AI systems are free from bias, transparent in their decision-making processes, and accountable for their actions.

Technologists must incorporate ethical considerations into the design and development of AI systems. This involves using diverse and representative datasets to train AI models, implementing fairness-aware machine learning techniques, and developing mechanisms for explainability and transparency. Ethicists and social scientists must engage with technologists to provide insights into the societal impact of AI and help develop ethical guidelines. Public awareness and participation are also essential in ensuring that AI development reflects the values and needs of society.

The Future of AI and Digital Humanism

The future of AI will be shaped by our ability to balance technological advancement with ethical considerations. As AI continues to evolve, we will need to address new challenges and opportunities. Digital humanism will play a crucial role in guiding this process, ensuring that AI serves the greater good of humanity.

One potential future scenario is the development of AI systems that can work collaboratively with humans, enhancing our capabilities and solving complex problems together. This requires a shift from viewing AI as a separate entity to seeing it as an integral part of a human-AI ecosystem. In this ecosystem, AI systems would act as partners, providing support, insights, and solutions while respecting human autonomy and dignity.

Another important aspect of the future is the potential for AI to bridge cultural and societal divides. By developing AI systems that are accessible and beneficial to people from diverse backgrounds, we can promote global cooperation and understanding. This requires addressing issues of digital divide and ensuring that the benefits of AI are distributed equitably.

Additional Content

Key Ethical Guidelines for Trustworthy AI

The EU's AI HLEG proposed seven key requirements for trustworthy AI, including human agency and oversight, technical robustness and safety, privacy and data governance, transparency, diversity and non-discrimination, societal and environmental well-being, and accountability.

Evolution of Chatbots

Chatbots have evolved from simple programs like ELIZA and PARRY to more advanced systems like Siri, Watson, and Alexa. They are now used in various applications, including mental health support, chronic disease management, and customer service.

Impact of AI on Warfare

The increasing use of AI in warfare and autonomous weapons raises significant concerns about the ethical implications and potential risks to humanity.

The Role of Science

Science can help bridge cultures and nations, serving as a universal language that brings people together. In today's globalized world, scientific research is more important than ever in addressing global challenges.

Digital Humanism vs. Dataism on Google Scholar

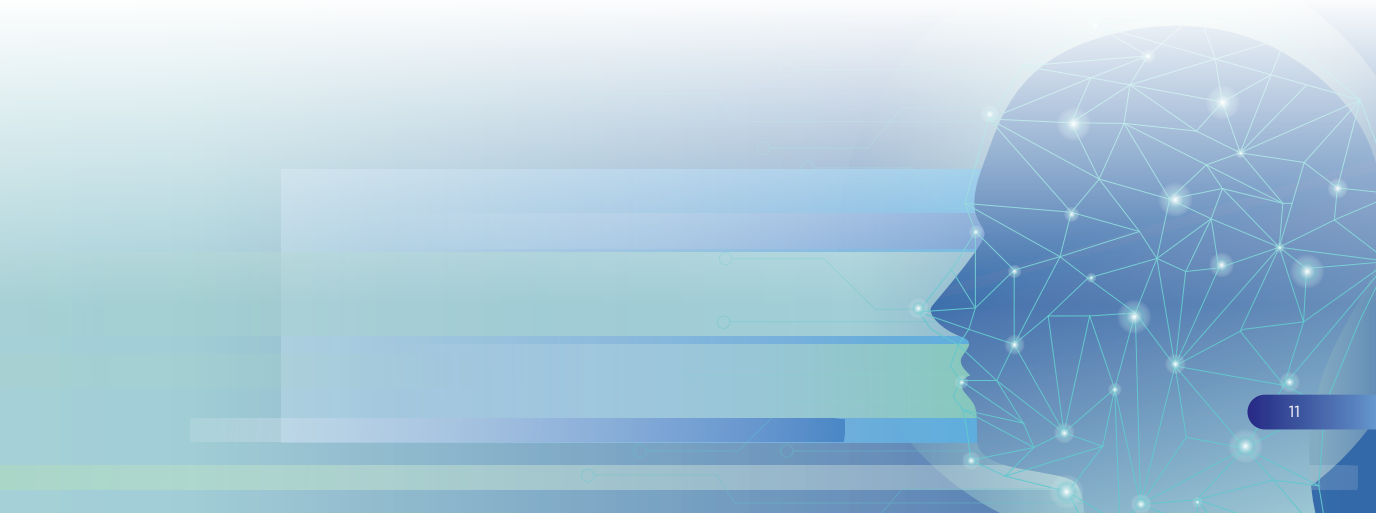
- - **Dataism**: The number of entries related to dataism has fluctuated in recent years, with 1,010/16 entries from 2017-2019, 804/11 from 2020-2021, and 1,200/21 from 2022-2023.
- - **Digital Humanism**: The number of entries related to digital humanism has also changed, with 166/30 entries from 2017-2019, 110/30 from 2020-2021, and 601/37 from 2022-2023.

The Romanian Academy's Role

The Romanian Academy has played a significant role in advancing AI research, with various institutes and researchers contributing to the field. The academy's research in AI spans multiple domains, including cognitive agents, natural language processing, and artificial neural networks.

The Romanian Academy (1866-).

This Special Issue is based on the PowerPoint presentation of Professor Florin Gheorghe Filip of the Romanian Academy at the China-Romania Science Forum in Bucharest, Romania, on November 15, 2024, with permission granted to the ANSO Secretariat for its edition and printing.



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This article provides a comprehensive overview of AI and digital humanism, incorporating various aspects from the Filip. F.G's PPT content from China-Romania Science Forum. The references section includes sou