The Evolution of AI

- Introduction: Setting the Context for AI's Evolution
- The Four Key Stages of AI Development
- AI's Multifaceted Role in Government and Society
- Navigating Challenges and Ethical Considerations
- Conclusion and Future Directions

JOINT COUNCILS' EXECUTIVE MONTHLY REPORT
Developed by the Research Committee
November 2023

1. Introduction: Setting the Context for AI's Evolution

AI's Early Beginnings

The origins of AI date back to the mid-20th century, with its official term emerging in 1956. Prior to this, key figures were already setting the stage for AI's future.

AI's Interdisciplinary Impact

As a convergence of diverse disciplines including mathematics and neuroscience, AI's far-reaching impact extends beyond common understanding, highlighting the need for a holistic grasp of its development.

AI's Role in Modern Society

AI's integration into everyday systems, from customer service to environmental forecasting, underscores the importance of engaging with its historical context for ethical and efficient application.

Evolving Public Perception and Ethics

The public's initial wonder and concern towards AI have evolved, paralleled by ongoing ethical and philosophical discussions that continue to influence AI's trajectory.

Power Shifts Driven by AI

AI is a catalyst in altering power structures, such as the employer-employee relationship and governmental control. Acknowledging these shifts is crucial in navigating AI's societal implications.

Recognizing and addressing the complex ethical and power dynamics influenced by AI's rise is seen as increasingly important for steering its future in a way that aligns with societal values and equitable progress.

Sources: Evans, Guy-Warwick. "Artificial intelligence: where we came from, where we are now, and where we are going." (2017); Skinner, Rebecca Elizabeth. Building the second mind: 1956 and the origins of artificial intelligence computing. 2012.

Why Is This Report Important?

The rapid advancement of AI is shaping key aspects of national security, economic health, and societal well-being.

A deeper comprehension of this evolution allows leaders to craft informed strategies and regulate the infusion of this technology across industries better, more efficiently, and with a better positive impact.

Consider: AI is reshaping the employment landscape at an unprecedented pace. A robust grasp of its historical progression is instrumental for forecasting occupational shifts, enabling policymakers to navigate potential disruptions and prepare for emergent professions.

An analytical appreciation of where AI has been and where it is now lays the groundwork for astute planning and fostering internal and global partnerships geared towards a future where AI is seen by many as central to progress.

What is Covered in this Executive Report?

This report includes the following:

- Introduction: Setting the Context for AI's Evolution
- The Four Key Stages of AI Development
- Real-World Applications: AI in Government and Beyond
- Metrics and Measures: Assessing AI's Socio-Economic Impact
- Future Trajectories: Where is AI Heading Next?

2. The Four Key Stages of AI Development

Emergence of Artificial Intelligence (1956)
The journey of AI began in 1956, marking the birth of a new scientific field. Early AI endeavored to replicate human cognitive processes by using algorithms, setting the stage for future innovation and sparking a wave of interest in the study of machine intellect.

Advancement into Machine Learning (1997)
Transitioning in 1997, the AI community embraced Machine Learning. Systems could now learn from data, moving beyond the rigid rule-based algorithms of the initial stage. This evolution represented a transformative moment for AI, resulting in more versatile and self-improving systems.

The Dawn of Deep Learning (2017)
Around 2017, AI entered the Deep Learning era, characterized by intricate neural networks capable of recognizing complex patterns. Deep Learning has catalyzed breakthroughs in various applications, particularly enhancing machine proficiency in understanding human language and visual information.

Generative AI Epoch (2021)
The most recent phase, commencing circa 2021, is the era of Generative AI. Here, the technology's hallmark is the generation of novel content, spanning text, images, and sounds. It's the driving power behind novel applications such as autonomous artistic creation and sophisticated content production.

Overlapping and Regulation
The progression through these stages has been fluid, with each phase blending into the next and enriching the capabilities of AI. For instance, deep learning remains a cornerstone within Generative AI. As these transitions occur, it is critical for policy makers and regulators to keep pace, particularly to address the ethical ramifications as AI becomes more entrenched in social infrastructure.

HERE'S ANOTHER AI STARTUP LOOKING FOR FUNDING, ALTHOUGH THIS ONE IS A LITTLE DIFFERENT.

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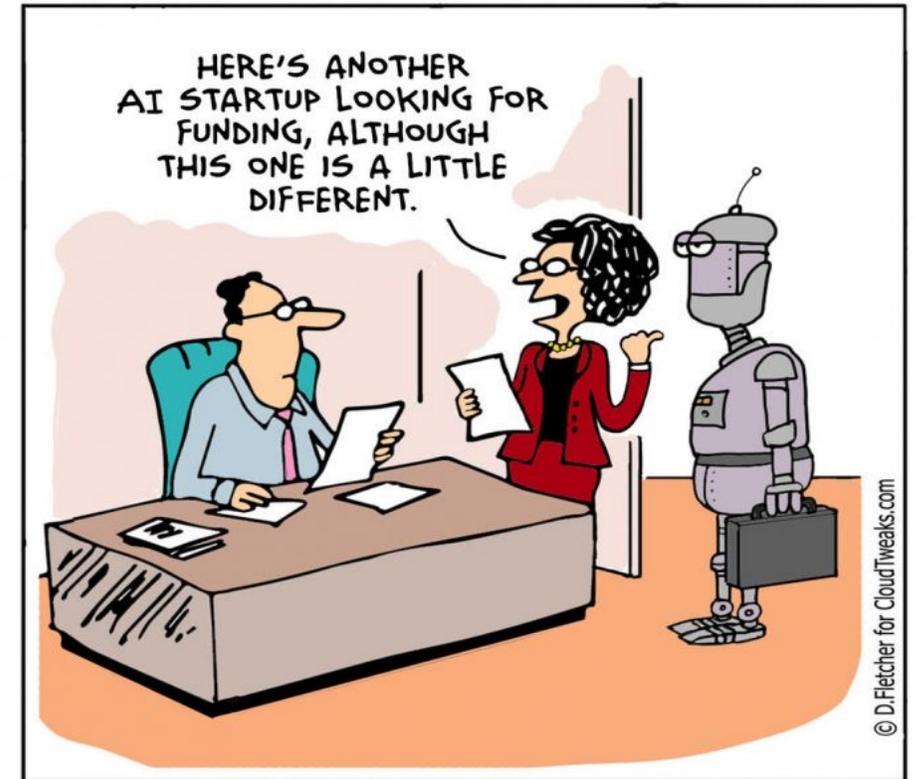
Sources: Marion, Tucker J., and Sebastian K. Fixson. "The transformation of the innovation process: How digital tools are changing work, collaboration, and organizations in new product development." Journal of Product Innovation Management 38, no. 1 (2021): 192-215; Schwab, Klaus. The fourth industrial revolution. Currency, 2017; Pfeifer, Rolf, and Josh Bongard. How the body shapes the way we think: a new view of intelligence. MIT press, 2006; Gill, Sukhpal Singh, Shreshth Tuli, Minxian Xu, Inderpreet Singh, Karan Vijay Singh, Dominic Lindsay, Shikhar Tuli et al. "Transformative effects of IoT, Blockchain and Artificial Intelligence on cloud computing: Evolution, vision, trends and open challenges." Internet of Things 8 (2019): 100118.

3. AI's Multifaceted Role in Government and Society

As we examine the practical implications of AI, its extensive influence is evident across multiple sectors, particularly within government operations where AI principles become more fundamental. These principles are crucial for the ethical integration of AI into society, demanding adherence to core values that ensure ethical standards and positive outcomes. They establish a framework for responsible use as AI becomes increasingly entrenched in public governance and societal functions, guiding the development and application of AI systems to align with the ideals of fairness, privacy and security, reliability and safety, inclusiveness, transparency, and accountability. Consider the following 6 principles below that have been developed by Google and Microsoft:

Fairness: Ensuring AI decisions do not discriminate and are equitable across all groups.

Privacy & Security: Protecting sensitive data and preventing unauthorized access to ensure trust in AI systems.

Reliability & Safety: Guaranteeing AI systems perform as intended and are safe for all users.

Inclusiveness: AI must be developed with diverse data and perspectives to serve the broad spectrum of society.

Transparency: Making the AI's decision-making processes clear to foster understanding and trust.

Accountability: Holding AI systems and their creators responsible for outcomes, both intended and unintended.

Sources: Choi, Tsan-Ming, Subodha Kumar, Xiaohang Yue, and Hau-Ling Chan. "Disruptive technologies and operations management in the Industry 4.0 era and beyond." Production and Operations Management 31, no. 1 (2022): 9-31; Clarke, Roger. "The Re-Conception of AI: Beyond Artificial, and Beyond Intelligence." IEEE Transactions on Technology and Society 4, no. 1 (2023): 24-33; Clarke, Roger. "The Re-Conception of AI: Beyond Artificial, and Beyond Intelligence." IEEE Transactions on Technology and Society 4, no. 1 (2023): 24-33; Google AI: Our Principles; Microsoft AI: Principles and Approach

4. Navigating Challenges and Ethical Considerations

As AI technologies advance, ethical considerations and challenges surface that necessitate carefully thought-out policies. Navigating these complexities is crucial for maximizing AI's potential while safeguarding societal values.

Data Privacy: Data privacy stands as a critical issue in the AI era. The need for large datasets to train potent algorithms should be balanced against imperatives to protect individual privacy. In this context, governments have a responsibility to advance data anonymization and encryption techniques. Regulatory frameworks like the European Union's GDPR could serve as models for achieving responsible data governance.

Job Market Disruption: AI's impact on labor markets necessitates fresh approaches to workforce strategy. As automation and AI technologies can potentially displace human labor in numerous sectors, initiatives like up-skilling and retraining programs become vital. The objective of public policy, therefore, should not be to stymie technological progression but to manage and ease the labor market's transition.

Algorithmic Bias: Addressing the problem of algorithmic bias is crucial for ensuring the equitable application of AI technologies. Because the data used to train these algorithms often reflects societal biases, it is important to integrate measures to detect and correct such biases within the AI development cycle. Oversight by regulatory bodies can assure both transparency and fairness in the implementation of these essential measures.

Security Concerns: Security vulnerabilities inherent in AI systems pose far-reaching risks. The potential for malicious uses of AI, from deep fakes to autonomous weaponry and cyber attacks, adds urgency to the need for stringent security measures. These should be a fundamental part of the AI development process and often necessitate collaborative efforts between the public and private sectors to actualize.

Ethical Research Practices: Ethical questions extend into the realm of AI research, particularly as issues of machine consciousness and decision-making autonomy gain relevance. Ethical oversight by research boards is critical for maintaining the integrity of AI-related scientific investigation. In addition, international collaborations could be instrumental in establishing universal ethical norms for AI research.

Public and Private Partnerships: The value of public-private partnerships in AI development cannot be overstated. Government-directed funding can effectively channel AI research toward goals that are aligned with public interest. Moreover, such collaborative frameworks can ensure that the speed of technological innovation does not outstrip the development of robust regulatory mechanisms.

Sources: Jobin, Anna, Marcello Ienca, and Effy Vayena. "The global landscape of AI ethics guidelines." Nature machine intelligence 1, no. 9 (2019): 389-399; Kazim, Emre, and Adriano Soares Koshiyama. "A high-level overview of AI ethics." Patterns 2, no. 9 (2021); Schiff, Daniel, Justin Biddle, Jason Borenstein, and Kelly Laas. "What's next for ai ethics, policy, and governance? a global overview." In Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society, pp. 153-158. 2020.

5. Conclusion and Future Directions

 Global Cooperation: The future of AI is not confined within any single nation's borders; it's a global endeavor. International collaboration can facilitate the sharing of best practices and ethical standards, thus creating a more unified approach to AI governance. Agreements on data privacy, algorithmic transparency, and ethical AI can mitigate risks and amplify benefits on a global scale. Therefore, policymakers should consider how to forge and strengthen international partnerships around AI.

 Adaptive Regulatory Frameworks: The dynamism inherent in AI technologies requires an equally adaptive regulatory environment. Given that AI is a rapidly evolving field, fixed and rigid regulations may become quickly outdated. Policies should, therefore, be designed to evolve in sync with technological advancements, incorporating regular reviews and updates. This approach ensures that the regulatory landscape remains both effective and relevant.

 Public Awareness and Education: Public perception of AI will significantly influence its future development and application. Therefore, educating the public about AI's capabilities, limitations, and ethical considerations is vital. A well-informed citizenry can contribute to a more nuanced debate about AI and its role in society. Governments can play a key role in this educational endeavor, developing curricula and public awareness campaigns that demystify AI and foster informed discussions.

 Inclusion and Diversity in AI Development: The perspectives that shape AI should be as diverse as the communities it serves. Inclusion of underrepresented groups in AI research and development can lead to more equitable and effective solutions. This extends beyond simply diversifying the workforce to encompass diverse inputs in AI ethics committees, focus groups, and public consultations. It's a comprehensive approach that adds depth and breadth to how AI technologies are developed and applied.

 Sustainability and Environmental Impact: As AI systems often require significant computational power, considerations regarding their environmental impact are increasingly pertinent. Governments should look to incentivize sustainable practices within the AI industry, such as the use of renewable energy sources for data centers. Addressing these environmental considerations is not just an ethical imperative but also aligns with broader societal goals of sustainability.

Sources: Morley, Jessica, Anat Elhalal, Francesca Garcia, Libby Kinsey, Jakob Mökander, and Luciano Floridi. "Ethics as a service: a pragmatic operationalisation of AI ethics." Minds and Machines 31, no. 2 (2021): 239-256; Morley, Jessica, Anat Elhalal, Francesca Garcia, Libby Kinsey, Jakob Mökander, and Luciano Floridi. "Ethics as a service: a pragmatic operationalisation of AI ethics." Minds and Machines 31, no. 2 (2021): 239-256.

For Further Reading

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- Haenlein, Michael, and Andreas Kaplan. "A brief history of artificial intelligence: On the past, present, and future of artificial intelligence." California management review 61, no. 4 (2019): 5-14.

- Powers, Thomas M., and Jean-Gabriel Ganascia. "The Ethics of the Ethics of AI." The Oxford handbook of ethics of AI (2020): 25-51.

- Ayling, Jacqui, and Adriane Chapman. "Putting AI ethics to work: are the tools fit for purpose?." AI and Ethics 2, no. 3 (2022): 405-429.

- Bench-Capon, Trevor, Michał Araszkiewicz, Kevin Ashley, Katie Atkinson, Floris Bex, Filipe Borges, Daniele Bourcier et al. "A history of AI and Law in 50 papers: 25 years of the international conference on AI and Law." Artificial Intelligence and Law 20 (2012): 215-319.

Other noteworthy articles:

- Cave, Stephen, Kanta Dihal, and Sarah Dillon, eds. AI narratives: A history of imaginative thinking about intelligent machines. Oxford University Press, 2020.

- Jiang, Yuchen, Xiang Li, Hao Luo, Shen Yin, and Okyay Kaynak. "Quo vadis artificial intelligence?." Discover Artificial Intelligence 2, no. 1 (2022): 4.

Research Repository
Access the Citizen First Research Repository.

Recent entries on the research repository:

Artificial Intelligence: Myths and Misconceptions

This report includes the following:

- Debunking Common AI Myths

- Myth 1: AI Will Surpass Human Intelligence Soon

- Myth 2: AI Can Make Ethical Decisions

- Myth 3: AI is an Independent Actor

- Towards an Informed Policy Framework on AI

Trends in the Daily Newsletter

The Information and Communications Technology Council (ICTC) predicts Canada will require an additional 250,000 jobs in the digital economy to reach a total of 2.3 million digital workers by 2025.

The federal government is consulting with provinces and territories to find ways to promote Canada to "digital nomads" and it's working on allowing start-ups to apply for work permits of up to three years for staff.

In July, Immigration, Refugees and Citizenship Canada launched a one-time H1-B specialty-occupation, open work permit initiative, which reached its goal of 10,000 applications within 24 hours.

For the past 20 years or so, our public service has been regularly surveying its employees using long questionnaires with more than 100 entries.

The results of these surveys are compiled and, typically, a rather whitewashed report goes out covering the changes in employees' opinions from the previous survey.

The most recent one was sent out in late 2022 with results reported a few months ago. While that report is quite extensive, it really does not tell a true story of the state of our public service.
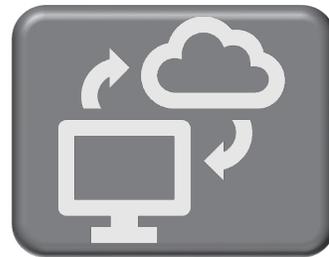
A report released by the Parliamentary Budget Officer on Friday projected that both the budgetary deficit and the federal debt-to-GDP ratio would rise in 2023-24.

The "Economic and Fiscal Outlook — October 2023" report, meant to help parliamentarians measure potential economic and fiscal outcomes, highlighted that the PBO "projects the Canadian economy to stagnate in the second half of 2023," with consumer spending expected to remain weak the rest of this year and during the first half of 2024 as the Bank of Canada "maintains a restrictive monetary policy to restore price stability."
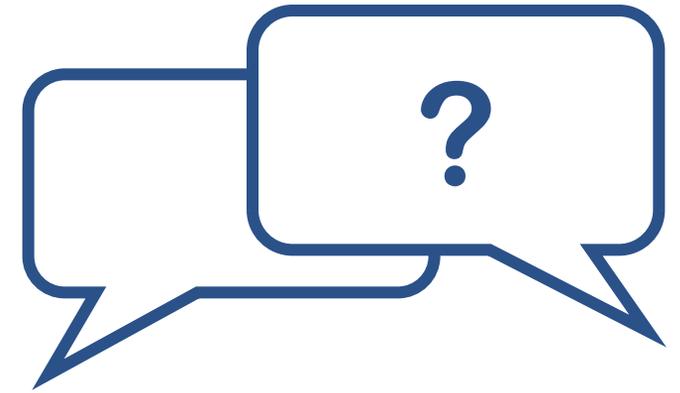
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