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# THE ARTIFICIAL INTELLIGENCE AND ECONOMY

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## ABSTRACT

*This paper examines the profound impact of Artificial Intelligence (AI) on the global economy, exploring its transformative effects across various sectors, the job market, and overall economic growth. The study begins by tracing the evolution of AI technology and its current state, providing context for its economic implications. It then delves into AI's influence on key industries such as manufacturing, finance, healthcare, and retail, highlighting how AI is driving innovation and efficiency. The research addresses the complex dynamics of AI in the job market, discussing both job displacement and creation, and the changing skill requirements in an AI-driven economy. The paper also analyzes the potential economic benefits of AI, including increased productivity, new business models, and projections for economic growth. However, it also confronts the challenges and concerns associated with widespread AI adoption, such as income inequality, data privacy issues, and regulatory hurdles. Furthermore, the study explores AI's role in global economic competition, examining how nations are positioning themselves in the AI race and the potential for shifts in economic power. The paper concludes by outlining strategies for preparing for an AI-driven economy, including education and workforce training initiatives, government policies, and business adaptation strategies. It also provides a future outlook, considering various scenarios for AI's long-term economic impact. This comprehensive analysis aims to provide a balanced view of AI's economic implications, offering insights for policymakers, business leaders, and individuals navigating the AI-driven economic landscape. The paper underscores the importance of harnessing AI's potential while addressing its challenges to ensure a prosperous and equitable economic future.*

## KEYWORDS

*artificial intelligence, economy, benefits, governmental policy*

## INTRODUCTION

In recent years, Artificial Intelligence (AI) has emerged as a groundbreaking force, fundamentally altering the global economic landscape. This technological revolution is redefining how businesses operate, how work is performed, and how economies function on a macro scale. As AI systems increasingly master tasks once exclusive to human cognition, we find ourselves at the cusp of a new economic era, one that promises both unprecedented opportunities and complex challenges. AI's

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influence extends far beyond simple automation. It encompasses a broad spectrum of technologies that mimic human intelligence, including machine learning, natural language processing, and computer vision. These advanced capabilities are not just enhancing existing processes but are catalyzing entirely new business models and economic paradigms. The economic implications of AI are vast and varied. In manufacturing, AI-driven robotics are streamlining production lines. In finance, AI algorithms are revolutionizing trading strategies and risk assessment. Healthcare is benefiting from AI-powered diagnostics and personalized treatment plans. Retail is being transformed by AI-enhanced customer experiences and supply chain optimizations.

These are just a few examples of how AI is reshaping industries and driving economic growth. Moreover, AI is proving to be a powerful tool in addressing some of the world's most pressing challenges. From developing sustainable energy solutions to enhancing food production and improving healthcare accessibility, AI technologies are contributing to global progress in ways that have significant economic ramifications. As we stand on the brink of this AI-driven economic transformation, it becomes crucial to understand its full scope and implications.

This paper aims to provide a comprehensive analysis of AI's impact on the global economy, exploring its effects across various sectors, its influence on labor markets, and its potential to drive economic growth. We will also delve into the challenges that come with widespread AI adoption, including ethical considerations, regulatory needs, and the imperative to ensure that the benefits of this technology are equitably distributed. By examining the current state of AI in the economy and projecting future trends, this study seeks to offer valuable insights for businesses, policymakers, and individuals navigating this new economic landscape. As AI continues to evolve and integrate into every facet of our economy, understanding its potential and preparing for its challenges will be key to harnessing its full benefits and shaping a prosperous, inclusive economic future.

## BACKGROUND ON ARTIFICIAL INTELLIGENCE AND ITS EVOLUTION

Artificial Intelligence, as a concept and field of study, has a rich history dating back to the mid-20th century. The term "Artificial Intelligence" was first coined in 1956 at the Dartmouth Conference, marking the birth of AI as a formal academic discipline. This conference, organized by John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon, set the stage for decades of research and development in the field. Since then, AI has undergone significant evolution, characterized by periods of rapid progress, setbacks, and renewed interest.

AI can be broadly defined as the development of computer systems capable of performing tasks that typically require human intelligence. These tasks include visual perception, speech recognition, decision-making, and language translation. However, AI is not a monolithic concept; it encompasses a wide range of technologies and approaches, each with its own strengths and applications.

The evolution of AI can be categorized into three main types: Narrow or Weak AI, General or Strong AI, and Artificial Superintelligence. Narrow AI, which is the most prevalent form today, is designed to perform specific tasks within a limited domain. Examples include virtual assistants like Siri or Alexa, recommendation systems used by streaming services, and image recognition software. General AI, which does not currently exist, would match or exceed human intelligence across a wide range of cognitive tasks. This remains a long-term goal for many researchers in the field. Artificial Superintelligence, a theoretical form of AI, would surpass human intelligence in virtually every aspect, including creativity, general wisdom, and problem-solving abilities.



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The development of AI has been marked by several key periods, each contributing to its current state. The 1950s and 1960s saw early enthusiasm and foundational work in AI, including the development of the first AI programs like the Logic Theorist and the General Problem Solver. This period was characterized by optimism and bold predictions about the future of AI. The 1970s and 1980s experienced the first "AI winter," a period of reduced funding and interest due to unmet expectations. This downturn was largely due to the limitations of early AI systems and the realization that creating human-like intelligence was far more complex than initially thought (Singla, Sukharevsky, Yee et al., 2024, Stryker, Kavlakoglu, 2024).

The 1990s and 2000s brought a resurgence of AI with advances in machine learning and the development of expert systems. This period saw AI begin to find practical applications in various industries, from finance to healthcare. From the 2010s to the present, we have witnessed dramatic progress in deep learning and neural networks, leading to breakthroughs in areas such as image and speech recognition, natural language processing, and autonomous systems. This current wave of AI development has been fueled by the availability of big data, increased computing power, and refined algorithms.

Today, AI is experiencing unprecedented growth and adoption across various sectors. Key areas of advancement include Machine Learning and Deep Learning, which enable systems to improve their performance on tasks through experience. These technologies have revolutionized fields like predictive analytics and pattern recognition. Natural Language Processing allows machines to understand, interpret, and generate human language, powering applications from chatbots to language translation services. Computer Vision enables machines to interpret and make decisions based on visual input, with applications ranging from facial recognition to medical image analysis.

AI is also making significant strides in robotics, integrating with physical systems for automation and complex task performance. This has led to advancements in manufacturing, logistics, and even healthcare, where AI-powered robots assist in surgeries and patient care. Furthermore, the development of autonomous systems, such as self-driving vehicles, showcases AI's ability to operate independently in real-world environments, promising to transform transportation and urban planning.

As AI continues to evolve, it is increasingly integrated into everyday technologies and business processes, driving innovation and economic transformation across industries. The impact of AI extends beyond technological advancements; it is reshaping business models, altering workforce dynamics, and raising important ethical and societal questions. Understanding this background and evolution is crucial for grasping the current and potential future impacts of AI on the global economy. The rapid advancements in AI technology are not only reshaping existing industries but also creating entirely new economic opportunities and challenges, setting the stage for a future where AI plays an increasingly central role in our economic and social structures.

## ARTIFICIAL INTELLIGENCE IMPACT ON VARIOUS ECONOMIC SECTORS

Artificial intelligence is revolutionizing numerous economic sectors, fundamentally altering how businesses operate and deliver value. This section explores AI's transformative effects across key industries. In manufacturing, AI is ushering in the era of Industry 4.0. Smart factories utilize AI-powered robotics and machine learning algorithms to optimize production processes, predict equipment failures, and enhance quality control. This results in increased efficiency, reduced downtime, and improved product quality. For instance, companies like Siemens and General Electric are implementing AI-driven



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predictive maintenance systems, significantly reducing operational costs and improving productivity (Ashta, Herrmann, 2021, Acemoglu, Restrepo, 2019, Bradley, 2024).

The finance and banking sector has embraced AI for risk assessment, fraud detection, and personalized customer service. AI algorithms analyze vast amounts of data to make more accurate lending decisions and detect unusual patterns indicative of fraudulent activities. Robo-advisors, powered by AI, are democratizing investment management by providing low-cost, automated financial advice. Companies like JPMorgan Chase are using AI to automate document review processes, saving thousands of work hours annually.

Healthcare is experiencing a paradigm shift with AI applications. Machine learning algorithms are enhancing diagnostic accuracy, particularly in medical imaging. AI-powered systems can detect diseases like cancer at early stages, potentially saving countless lives. In drug discovery, AI is accelerating the process of identifying potential new medications by analyzing molecular structures and predicting their effects. Telemedicine platforms are incorporating AI to triage patients and provide initial diagnoses, improving healthcare accessibility. In retail and e-commerce, AI is personalizing the shopping experience and optimizing supply chain management. Recommendation engines use machine learning to suggest products based on customer preferences and behavior (CFA, 2024, Deloitte, 2018).

AI-powered chatbots are enhancing customer service by providing instant, 24/7 support. In inventory management, AI predicts demand patterns, reducing overstock and stockouts. Amazon's anticipatory shipping model, which predicts customer orders before they're placed, exemplifies AI's potential in this sector. The transportation and logistics industry is being reshaped by AI through route optimization, autonomous vehicles, and predictive maintenance. AI algorithms are improving supply chain efficiency by optimizing shipping routes and predicting delivery times more accurately. The development of self-driving cars and trucks promises to revolutionize both personal and commercial transportation, with companies like Tesla and Waymo leading the charge. Agriculture is benefiting from AI through precision farming techniques.

AI-powered drones and sensors collect data on soil conditions, crop health, and weather patterns. Machine learning algorithms analyze this data to provide farmers with insights on optimal planting times, irrigation needs, and pest control measures. This results in increased crop yields, reduced resource usage, and more sustainable farming practices. The energy sector is leveraging AI to optimize power generation, distribution, and consumption. Smart grids use AI to balance supply and demand more efficiently, reducing waste and improving reliability. In renewable energy, AI is enhancing the prediction of wind and solar power generation, allowing for better integration of these variable sources into the grid. These examples illustrate how AI is not just improving existing processes but often completely reimagining how sectors operate. As AI continues to evolve, its impact on these and other economic sectors is expected to deepen, driving innovation, productivity, and economic growth across the global economy.

## ARTIFICIAL INTELLIGENCE AND JOB MARKET

The integration of Artificial Intelligence into the global economy is profoundly reshaping the job market, creating a complex landscape of challenges and opportunities. This transformation is characterized by job displacement in some sectors, job creation in others, and a widespread need for new skills across industries. One of the most significant impacts of AI on the job market is the automation of routine and repetitive tasks. Jobs that primarily involve predictable physical work or data processing are at the highest risk of displacement. For instance, roles in manufacturing, data entry, and basic customer service are increasingly being automated. A study by the McKinsey Global Institute estimates that by 2030, up to 800 million jobs worldwide could be lost to automation. However, while AI is displacing some jobs,



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it is also creating new ones. The development, implementation, and maintenance of AI systems require a workforce with specialized skills. New roles such as AI ethicists, machine learning engineers, and data scientists are emerging and in high demand. Additionally, AI is creating indirect job opportunities in fields that complement AI technologies, such as user experience design for AI interfaces or legal experts specializing in AI-related regulations.

The rise of AI is also transforming existing jobs rather than eliminating them entirely. Many roles are being augmented by AI, requiring workers to adapt and learn to work alongside intelligent systems. For example, in healthcare, while AI may take over tasks like image analysis, medical professionals are still needed to interpret results, make complex decisions, and provide patient care. This shift is driving a significant change in the skills required in the job market. There is a growing demand for skills that AI cannot easily replicate, such as critical thinking, creativity, emotional intelligence, and complex problem-solving. Technical skills related to AI, data analysis, and digital literacy are becoming increasingly valuable across various industries. The impact of AI on the job market is not uniform across all regions and demographics. Developed economies with higher labor costs may see faster adoption of AI and automation, potentially leading to more significant job displacement in the short term. However, these economies may also be better positioned to create and fill new AI-related jobs (Dupuy, 2024, Hazan, Madgavkar, Chui et al., 2024).

Developing economies, while potentially benefiting from AI-driven productivity gains, may face challenges in upskilling their workforce to meet the demands of an AI-driven economy. To address these challenges, there is a growing emphasis on lifelong learning and reskilling programs. Governments, educational institutions, and businesses are investing in initiatives to help workers adapt to the changing job market. For instance, Singapore's SkillsFuture program provides citizens with resources for continuous learning and skill development, including AI-related courses. The gig economy is also evolving in response to AI, with platforms using AI algorithms to match freelancers with projects more efficiently. This could lead to more flexible work arrangements but also raises questions about job security and workers' rights in an AI-driven economy. As AI continues to advance, the job market will likely see ongoing disruption and evolution. While the full extent of AI's impact on employment remains to be seen, it is clear that adaptability, continuous learning, and the development of uniquely human skills will be crucial for workers to thrive in the AI era. The challenge for policymakers and business leaders is to manage this transition in a way that maximizes the benefits of AI while minimizing social disruption and ensuring inclusive economic growth (Marr, 2024, Schwartz, 2018).

## ECONOMIC BENEFITS OF ARTIFICIAL INTELLIGENCE

Artificial Intelligence is poised to deliver substantial economic benefits across various sectors, potentially ushering in a new era of productivity and innovation. The economic impact of AI is multifaceted, encompassing increased efficiency, new business models, and overall economic growth. One of the primary economic benefits of AI is its potential to dramatically increase productivity. By automating routine tasks and augmenting human capabilities, AI allows workers to focus on higher-value activities. For instance, in manufacturing, AI-powered robots can work continuously without fatigue, increasing output while maintaining consistent quality. In knowledge-based industries, AI tools can process and analyze vast amounts of data quickly, enabling faster and more informed decision-making.

A study by Accenture predicts that AI could double annual economic growth rates by 2035 in developed economies. AI is also driving innovation and creating new business models. Companies are leveraging



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AI to develop personalized products and services, create more efficient supply chains, and enter new markets. For example, Netflix uses AI algorithms to recommend content to users, significantly improving customer satisfaction and retention. In the financial sector, AI-powered robo-advisors are making investment services accessible to a broader range of consumers. These innovations not only create new revenue streams for businesses but also contribute to overall economic growth. The economic impact of AI extends to cost savings for businesses and consumers. AI-driven predictive maintenance in industries like manufacturing and transportation can significantly reduce downtime and repair costs. In healthcare, AI-assisted diagnosis and treatment planning can lead to more cost-effective patient care. For consumers, AI-powered smart home devices can optimize energy usage, leading to lower utility bills. AI is also contributing to economic growth by addressing complex global challenges. In agriculture, AI is enabling precision farming techniques that increase crop yields while reducing resource usage. In the energy sector, AI is optimizing the integration of renewable energy sources into power grids, supporting the transition to a more sustainable economy.

These applications of AI not only create economic value but also contribute to solving pressing societal issues. The potential for AI to boost economic growth is significant. PwC estimates that AI could contribute up to \$15.7 trillion to the global economy by 2030. This growth is expected to come from productivity gains, increased consumer demand due to improved products and services, and the creation of new industries. However, it's important to note that the economic benefits of AI may not be evenly distributed. Countries and companies that are early adopters and innovators in AI technology are likely to see the greatest economic gains. This could potentially lead to increased economic inequality between nations and within societies. Moreover, the full realization of AI's economic benefits depends on overcoming several challenges. These include ensuring widespread access to AI technologies, addressing potential job displacement through retraining programs, and developing appropriate regulatory frameworks to govern AI use. Despite these challenges, the economic potential of AI is immense. As AI technologies continue to advance and become more integrated into various sectors of the economy, they are expected to drive significant productivity gains, foster innovation, and create new sources of economic value. The key to maximizing these benefits lies in proactive policies and strategies that promote AI adoption while addressing its potential drawbacks, ensuring that the economic gains from AI are sustainable and broadly shared across society.

## CHALLENGES AND CONCERNS

Despite its potential benefits, the widespread adoption of AI presents significant challenges and concerns (Cath, 2018, Lukić Nikolić, Brkljač, Jovanović, 2022, Novelli, Casolari, Rotolo et al., 2023, Russell, 2010):

- **Income Inequality:** As AI automates more jobs, there's a risk of widening the wealth gap between those who own AI technologies and those displaced by them. This could exacerbate existing economic inequalities.
- **Data Privacy and Security:** AI systems require vast amounts of data to function effectively, raising concerns about data privacy, security, and potential misuse. The collection and use of personal data by AI systems pose risks to individual privacy and autonomy.
- **Ethical Considerations:** AI decision-making processes can be opaque, leading to concerns about bias, fairness, and accountability. There are ongoing debates about the ethical implications of AI in areas such as autonomous weapons, facial recognition, and predictive policing.



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- **Regulatory Challenges:** The rapid development of AI technology often outpaces regulatory frameworks, creating uncertainties in areas such as liability, intellectual property rights, and consumer protection. Striking a balance between fostering innovation and ensuring public safety remains a challenge.
- **Technological Unemployment:** While AI creates new job opportunities, it also has the potential to displace a significant number of workers, particularly in routine and predictable tasks. This raises concerns about long-term structural unemployment and the need for large-scale workforce retraining.

## ARTIFICIAL INTELLIGENCE AND GLOBAL ECONOMIC COMPETITION

The development and adoption of AI technologies have become a key factor in global economic competition:

- **AI Race Between Nations:** Countries are increasingly viewing AI capabilities as crucial for economic and national security. This has led to what some call an "AI arms race," with nations like the United States, China, and European Union countries investing heavily in AI research and development.
- **Impact on International Trade:** AI is reshaping global trade patterns by enabling more efficient supply chains, personalized marketing across borders, and new forms of digital services. Countries with advanced AI capabilities may gain competitive advantages in international markets.
- **Potential for Economic Power Shifts:** As AI becomes more integral to economic productivity and innovation, it has the potential to shift the balance of economic power globally. Nations that lead in AI development and adoption may see their economic influence grow, while those lagging behind could face challenges in maintaining competitiveness.
- **Collaboration vs. Competition:** While there is intense competition in AI development, there's also recognition of the need for international collaboration on AI governance, standards, and addressing global challenges. **Implications for Developing Economies:** The AI revolution presents both opportunities and challenges for developing economies. While AI could help these countries leapfrog in certain sectors, there's also a risk of widening the technological and economic gap with developed nations.
- **Data as a Strategic Resource:** Access to large datasets is crucial for AI development, leading to increased competition for data resources and raising questions about data sovereignty and cross-border data flows. The interplay between these challenges and the dynamics of global economic competition will significantly shape the future economic landscape, influencing policy decisions, investment patterns, and international relations in the AI era.

## PREPARING FOR AN AI-DRIVEN ECONOMY

As AI continues to reshape the economic landscape, preparation is key for individuals, businesses, and governments (Ernst & Young, 2024, IBM, 2023, KPMG, 2023, Petronijević, Gavrilović, Radić, 2023):



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- **Education and Workforce Training:** There's an urgent need to revamp educational systems to equip future workers with AI-relevant skills. This includes emphasizing STEM education, critical thinking, and creativity. For the existing workforce, continuous learning and reskilling programs are essential to adapt to AI-driven changes in job markets.
- **Government Policies and Initiatives:** Governments must develop comprehensive AI strategies that address research funding, ethical guidelines, and regulatory frameworks. Policies should aim to foster innovation while ensuring equitable distribution of AI's benefits and mitigating its risks.
- **Business Strategies for AI adoption:** Companies need to develop strategies for integrating AI into their operations. This involves assessing where AI can add value, investing in necessary infrastructure, and cultivating an AI-savvy workforce. Businesses must also consider the ethical implications of their AI use.
- **Public-Private Partnerships:** Collaboration between government, industry, and academia is crucial for advancing AI research, addressing societal challenges, and ensuring responsible AI development.
- **Infrastructure Development:** countries need to invest in digital infrastructure to support AI technologies, including high-speed internet, cloud computing capabilities, and data centers.
- **Ethical and Legal Frameworks:** Developing robust ethical guidelines and legal frameworks for AI use is essential to address concerns about privacy, bias, and accountability.

## FUTURE OUTLOOK

The future of AI and its impact on the economy is subject to much speculation and analysis (Cazzaniga, Jaumotte, Li et al., 2024, Oppenheimer, Jaisson, Bell et al., 2024):

- **Potential Scenarios:** Various scenarios are envisioned, ranging from AI-driven utopias of increased productivity and solved global challenges to dystopian visions of mass unemployment and AI dominance. The reality is likely to fall somewhere in between, with outcomes heavily influenced by policy choices and societal responses.
- **Long-term Economic Implications:** In the long term, AI could lead to a significant restructuring of the global economy. This might include shifts in the nature of work, changes in economic power dynamics between nations, and the emergence of new industries and business models.
- **Technological Convergence:** The interaction of AI with other emerging technologies like blockchain, Internet of Things (IoT), and quantum computing could lead to unforeseen economic opportunities and challenges.
- **Sustainability and AI:** AI is expected to play a crucial role in addressing global challenges like climate change, resource scarcity, and healthcare, potentially leading to new economic paradigms focused on sustainability.
- **Human-AI Collaboration:** The future economy is likely to be characterized by increased human-AI collaboration, with AI augmenting human capabilities rather than simply replacing human workers.



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- **Ethical and Societal Considerations:** As AI becomes more advanced, questions about AI rights, the nature of consciousness, and the role of humans in an AI-driven world may become increasingly relevant, potentially reshaping economic and social structures. The future of AI in the economy remains uncertain and will be shaped by technological advancements, policy decisions, and societal attitudes. Preparing for this future requires flexibility, foresight, and a commitment to harnessing AI's potential for the benefit of all.

## CONCLUSION

The integration of Artificial Intelligence into the global economy represents one of the most significant technological shifts of our time. As we have explored throughout this paper, AI's impact is far-reaching, transforming industries, reshaping job markets, and altering the very fabric of economic structures.

The potential benefits of AI are immense. From dramatic increases in productivity and efficiency to groundbreaking innovations in healthcare, energy, and environmental management, AI promises to drive economic growth and address some of humanity's most pressing challenges. The ability of AI to process vast amounts of data, recognize patterns, and make predictions offers unprecedented opportunities for businesses to optimize operations, create new products and services, and enter new markets. However, the rise of AI also brings significant challenges. The potential for job displacement, widening economic inequalities, and ethical concerns surrounding data privacy and algorithmic bias cannot be overlooked. These challenges necessitate thoughtful policy responses, proactive business strategies, and a commitment to inclusive growth.

The global competition in AI development underscores its perceived importance as a driver of future economic success. Nations and corporations alike are investing heavily in AI research and development, recognizing it as a key to maintaining competitive advantage in the 21st-century economy. This race for AI supremacy, while driving innovation, also raises concerns about the concentration of economic power and the potential for a growing divide between AI leaders and laggards. Preparing for an AI-driven economy requires a multifaceted approach. Education systems must evolve to equip workers with the skills needed in an AI-augmented workplace. Governments need to develop comprehensive strategies that foster AI innovation while addressing its societal impacts.

Businesses must navigate the complexities of AI integration, balancing the drive for efficiency with ethical considerations and workforce concerns. Looking to the future, the full impact of AI on the global economy remains to be seen. The technology is still evolving, and its applications are continually expanding. What is clear, however, is that AI will play a central role in shaping economic outcomes in the coming decades. The challenge lies in harnessing its potential to create a future that is not only more productive and efficient but also more equitable and sustainable.

In conclusion, the AI revolution in the global economy is not just about technological advancement; it's about reimagining the relationship between technology, work, and society. As we move forward, it is crucial that we approach this transformation with a balanced perspective, embracing the opportunities while diligently addressing the challenges. The decisions made by policymakers, business leaders, and society at large in the coming years will be critical in determining whether AI becomes a force for widespread economic benefit or a driver of increased inequality. Ultimately, the goal should be to create an AI-driven economy that enhances human capabilities, creates new opportunities for fulfilling work, and contributes to the well-being of society as a whole. Achieving this will require ongoing dialogue, adaptive policies, and a commitment to ethical AI development. As we stand on the brink of this new



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economic era, the potential for positive transformation is immense, provided we navigate the challenges with wisdom, foresight, and a commitment to the common good.

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