



## An Effective of Artificial Intelligence on The Economy Factors

Nadia Mahmoud Hussein<sup>1</sup> , Sundos Abdulameer Alazawi<sup>2</sup> , Yasmin Makki Mohialden<sup>3</sup>

### Abstract

The fast advancement in artificial intelligence and machine learning has affected economic factors in financial institutions and laws. Artificial intelligence has improved financial services including smart advice, lending, monitoring systems, and customer assistance, but it has also created concerns and obstacles. This document summarizes financial AI and machine learning research, its applications, and its impacts. The study showed how artificial intelligence affects the financial industry in the country and the uses of Python libraries and applications related to the financial economics aspect.

**Keywords:** AI, Economy factors, Machine Learning, Python Libraries

### تأثير الذكاء الاصطناعي على العوامل الاقتصادية

نادية محمود حسين<sup>1</sup> ، سوندس عبد الامير حميد<sup>2</sup> ، ياسمين مكى محي الدين<sup>3</sup>

### المستخلص

أثر التقدم السريع في الذكاء الاصطناعي والتعلم الآلي على العوامل الاقتصادية في المؤسسات المالية والقانونية. حيث أدى الذكاء الاصطناعي إلى تحسين الخدمات المالية بما في ذلك الاستشارات الذكية، والإقراض، وأنظمة المراقبة، ومساعدة العملاء، ولكنه خلق أيضاً مخاوف وعقبات. تلخص هذه الوثيقة أبحاث الذكاء الاصطناعي المالي والتعلم الآلي وتطبيقاتها وتأثيراتها. أظهرت الدراسة مدى تأثير الذكاء الاصطناعي على الصناعة المالية في الدولة واستخدامات مكتبات وتطبيقات بايثون المتعلقة بالجانب الاقتصادي المالي.

الكلمات المفتاحية : الذكاء الاصطناعي، العوامل الاقتصادية، تعلم الماكينة، مكتبة لغة بايثون البرمجية

### Affiliation of Authors

<sup>1, 2, 3</sup> College of Science,  
Mustansiriyah University, Iraq,  
Baghdad, 10052

<sup>1</sup> [nadia.cs89@uomustansiriyah.edu.iq](mailto:nadia.cs89@uomustansiriyah.edu.iq)

<sup>2</sup> [ss.aa.cs@uomustansiriyah.edu.iq](mailto:ss.aa.cs@uomustansiriyah.edu.iq)

<sup>3</sup> [ymmiraq2009@uomustansiriyah.edu.iq](mailto:ymmiraq2009@uomustansiriyah.edu.iq)

### <sup>2</sup> Corresponding Author

### Paper Info.

**Published:** June 2024

### انتساب الباحثين

<sup>1, 2, 3</sup> كلية العلوم، الجامعة المستنصرية،  
العراق، بغداد، 10052

<sup>1</sup> [nadia.cs89@uomustansiriyah.edu.iq](mailto:nadia.cs89@uomustansiriyah.edu.iq)

<sup>2</sup> [ss.aa.cs@uomustansiriyah.edu.iq](mailto:ss.aa.cs@uomustansiriyah.edu.iq)

<sup>3</sup> [ymmiraq2009@uomustansiriyah.edu.iq](mailto:ymmiraq2009@uomustansiriyah.edu.iq)

### <sup>2</sup> المؤلف المراسل

### معلومات البحث

تاريخ النشر: حزيران 2024

### Introduction

The fourth industrial revolution is revealing the promise of artificial intelligence due to data accessibility, computer capacity, and better algorithms [1]. Financial industry needs are met by increasingly advanced AI algorithms as computer capacity grows. AI is used in loan and insurance underwriting, fraud detection, algorithmic trading, and investment management. AI also helps regulators discover unlawful financial institution activity[2]. AI's impact extends to achieving Sustainable Development Goals, particularly in reducing inequality and enhancing the safety and reliability of critical infrastructure, such as transportation, which fuels economic growth in

developing nations. By improving data collection on poverty through poverty maps, transforming agricultural practices, and promoting financial inclusion in the banking sector, AI contributes to poverty reduction. Furthermore, AI facilitates access to education, allowing individuals previously excluded from the traditional economy to participate [1, 3].

Intelligent technology has the potential to promote the creation of a global financial system resilient to crises. AI can mitigate the influence of the "human factor," a significant contributor to past financial crises. It offers stability, efficiency, and sustainable growth to the global financial system. Despite the numerous opportunities for optimizing financial management with AI, including rationalizing

decision-making, promoting social responsibility among financial subjects, enhancing analytical capabilities, and reducing reliance on social behavior, there are certain limitations [4].

Machine learning concepts like multivariate regression, principal component analysis, maximum likelihood estimation, hidden Markov models, neural networks, deep learning, and reinforcement learning are becoming increasingly relevant in economics. The primary focus of machine learning in finance is prediction, including price forecasting [5]. This study will elucidate how AI has impacted the financial system of the nation and delve into essential Python libraries commonly used in economics, along with notable applications in the field of financial economics [6].

This research contributes to our understanding of how AI and machine learning have reshaped the financial sector, emphasizing their potential to

address economic challenges and promote sustainable development. It also highlights the growing importance of machine learning concepts in economics and their application in financial forecasting and decision-making.

While AI has brought significant benefits to the financial sector, it has also raised concerns related to data privacy, algorithmic bias, and the need for regulatory frameworks to ensure responsible AI use. Additionally, the integration of AI into financial systems poses challenges in terms of workforce skill development and adapting to rapidly evolving technology. This research aims to address these challenges and provide insights into the transformative impact of AI on the financial economy.

### AI Python packages in economics

There are many AI tools in different languages for economics, some of them as shown in Table (1)

**Table (1): AI tools in different languages for economics**

No	Library Name	Description	Repository
1	NumPy	NumPy is a Python library for manipulating arrays, including linear algebra, Fourier transforms, and matrices [7].	<a href="https://numpy.org/">https://numpy.org/</a>
2	Pandas	Pandas is a Python data analysis and processing package, that provides data structures like data frames and statistical functions [8].	<a href="https://pandas.pydata.org/">https://pandas.pydata.org/</a>
3	Matplotlib	Matplotlib is a Python charting toolkit, ideal for creating various types of plots and visualizations [9].	<a href="https://matplotlib.org/">https://matplotlib.org/</a>
4	Seaborn	Seaborn is a Python visualization package built on Matplotlib, offering a high-level interface for statistical visualizations [10].	<a href="https://seaborn.pydata.org/">https://seaborn.pydata.org/</a>
5	Statsmodels	Statsmodels is a Python package for data exploration, statistical modeling, and hypothesis testing, with extensive statistical tools [11].	<a href="https://www.statsmodels.org/stable/index.html">https://www.statsmodels.org/stable/index.html</a>
6	sci-kit-learn	Scikit-learn is a versatile Python machine learning library, featuring various regression, classification, and clustering	<a href="https://scikit-learn.org/stable/">https://scikit-learn.org/stable/</a>

		algorithms [12].	
7	QuantEcon	QuantEcon is a non-profit organization focused on developing high-quality software for economic modeling [13].	<a href="https://quantecon.org/">https://quantecon.org/</a>
8	SymPy	SymPy is a Python library for symbolic mathematics, that offers computational algebra capabilities [14].	<a href="https://www.sympy.org/en/index.html">https://www.sympy.org/en/index.html</a>
9	NetworkX	NetworkX is a Python package for graph analysis and network modeling, useful for studying economic networks [15].	<a href="https://networkx.org/">https://networkx.org/</a>
10	Scrapy	Scrapy is an open-source framework for web scraping, useful for data extraction in economic research and data collection [16].	<a href="https://scrapy.org/">https://scrapy.org/</a>
11	Gurobi	Gurobi is an optimization software known for solving various optimization problems, available through Python's PuLP package [17].	<a href="https://www.gurobi.com/">https://www.gurobi.com/</a>

Table 2 provides a comparison of the listed Python libraries in terms of their capabilities and use cases in economics. Depending on your specific research

or analysis needs, you can choose the appropriate library or combination of libraries to work on it. as shown in Table (2)

**Table 2: Comparison of Python Libraries for Economics**

Factor	Numpy	Pandas	Matplotlib	Seaborn	Statsmodels	sci-kit-learn	QuantEcon	SymPy	NetworkX	Scrapy	Gurobi
Data Manipulation	✓	✓									
Data Analysis		✓			✓						
Data Visualization			✓	✓							
Statistical Modeling				✓	✓						
Machine Learning						✓					
Optimization											✓
Symbolic Mathematics								✓			
Network Analysis							✓		✓		
Web Scraping										✓	

## Related work

In [18], the authors examine the evidence supporting the significant impact of artificial intelligence (AI) on the economy. They provide insights into the growth of AI-related activities, including robotics exports, AI start-ups, and patent numbers. Furthermore, the paper discusses new research in the field, highlighting the potential of AI and robotics to drive production development while acknowledging potential mixed effects on the labor market, especially in the short term. It emphasizes that certain jobs and industries may thrive, while others could face labor market disruptions.

In [19], the paper proposes comprehensive measures for government divisions to mitigate the economic consequences of COVID-19 outbreaks and prepare for economic recovery. It emphasizes the transformative impact of the pandemic on people's lifestyles and the prosperity of the Internet sector. The paper recommends accelerating digital empowerment in conventional sectors, leveraging technologies like the Internet and 5G, and developing new digital infrastructure. Additionally, it suggests using electricity usage as a metric to calculate the real economic impact of extreme events.

In [20], the research investigates the impact and mechanisms of artificial intelligence on green economic growth, particularly in China. The study finds that AI can enhance green economic growth and may support local development while influencing sustainable economic development. It discusses both short-term and long-term consequences, highlighting that AI may have a more substantial role in promoting green economic growth over time, with reduced negative spillover effects as human capital levels increase.

[21] examines how ChatGPT and other AI-related

services affect the work sector. ChatGPT's impacts on employment are assessed using a supply-and-demand model and prior studies. This groundbreaking technology presents difficulties and possibilities in the near and long future. The report also detects ChatGPT-vulnerable jobs using text mining. These publications illuminate AI's complex economic effects. They discuss AI expansion, labor market disruptions, economic mitigation techniques, and AI's role in green economic development. They discuss technologies like ChatGPT and their effects on the job market and employment environment. They complete a picture of AI's impact on economic dynamics.

## AI Applications in Economics

AI has made substantial advances in economics, providing economists with a broad variety of applications and tools. The AI applications you suggested are examined below [22-27]:

**IBM Watson for Economics:** IBM Watson can analyze, predict, and make decisions using AI-powered analytics and machine learning.

**Microsoft Azure Machine Learning:** Azure Machine Learning provides tools and services for designing, training, and deploying machine learning models for economic modeling and analysis.

**Google Cloud AI:** Natural language processing and picture recognition may be used for economic research, sentiment analysis, and data processing.

**QuantLib:** Finance and investment economists need QuantLib, an open-source quantitative finance library with pricing, risk management, and modeling capabilities.

**STATA:** Economists utilize STATA for data analysis, which may be combined with AI models

for advanced data analysis.

EViews: EViews, another statistical program for time-series analysis and forecasting, can be combined with AI for more accurate forecasts.

Tableau and Power BI: These data visualization technologies help economists communicate their results and ideas via dynamic and informative dashboards.

Bloomberg Terminal: Bloomberg Terminal delivers real-time financial market data, news, analytics, and AI-powered market analysis and trading choices.

AI is useful for processing large datasets, automating regular processes, and generating complicated model predictions in economics. AI may also improve economic research by examining individual and market behavior, boosting our knowledge of economic dynamics.

Since AI might affect the job market and economy, labor-AI relations are important to investigate. This research helps policymakers and economists plan

for automation and AI-related labor force changes.

AI utilizes prediction models to purchase and sell financial instruments in algorithmic trading in financial economics. This tool might optimize portfolio management and investing techniques.

AI is transforming economics by delivering sophisticated data analysis, modeling, and decision-making capabilities, and it is constantly expanding its applications.

Table 3 compares different AI apps, helping economists pick the best ones for economic research, forecasting, and data analysis.

The Key Features column lists the main features and capabilities of each AI application.

Use Cases: Identifies the ideal applications or activities for each application in economics.

Economic Analysis Integration: Explains how each application may be incorporated into research, modeling, or analysis. as shown in Table (3)

**Table 3: Comparison Table of AI Applications in Economics Based on Various Factors**

Application	Key Features	Use Cases	Integration with Economic Analysis
IBM Watson for Economics	Advanced analytics, machine learning, NLP	Economic forecasting, data analysis	Integration into economic models
Microsoft Azure Machine Learning	Comprehensive ML tools and services	Economic modeling, predictive analysis	Integration with data analysis
Google Cloud AI	Natural language processing, image recognition	Sentiment analysis, data processing	Integration with research projects
QuantLib	Quantitative finance library, risk management tools	Financial instrument pricing, risk analysis	Essential for financial economics
STATA	Statistical software for data analysis	Data analysis, econometric modeling	Integration with AI-enhanced analysis
EViews	Time-series analysis, forecasting capabilities	Economic forecasting, data visualization	Integration with AI for predictions

Tableau and Power BI	Data visualization, interactive dashboards	Data presentation, insights communication	Integration with AI for insights
Bloomberg Terminal	Real-time financial data, AI-powered analytics	Financial market analysis, trading decisions	AI-enhanced trading capabilities

## Conclusions

In conclusion, artificial intelligence (AI) is becoming a key force in our lives and the global economy, affecting many areas. It might transform data analysis, decision-making, and innovation. AI presents both benefits and difficulties for society and the economy as it advances.

AI can boost productivity, create new goods and services, stimulate markets, and produce new revenue. It might boost economic development and benefit consumers and companies.

However, extensive AI usage raises worries and hazards. AI may consolidate power in super corporations, which might hurt the economy. AI may also increase global economic inequities by creating demand for some talents and making others obsolete, changing the labor market. AI may potentially increase economic inequality, lower wages, and lower taxes.

It is important to note that these worries are genuine but not inevitable as AI grows. Well-crafted laws and regulations may harness AI's promise while minimizing its drawbacks. Governments and international organizations may help society benefit from AI.

The European Union (EU) can boost its global competitiveness and steer AI development toward its economic and social objectives. A unified approach that capitalizes on the EU's strengths and solves its flaws is needed. The EU can lead the way in designing a future where AI benefits the economy and society by doing so.

In conclusion, AI has a major influence on the

economy and society, but intelligent policymaking and responsible innovation may overcome its obstacles. AI has great promise, and how we develop it will shape our economy and society.

## References

- [1] Xie M, editor Development of artificial intelligence and effects on financial system. Journal of Physics: Conference Series; 2019: IOP Publishing.
- [2] Golić Z. Finance and artificial intelligence: The fifth industrial revolution and its impact on the financial sector. Zbornik radova Ekonomskog fakulteta u Istočnom Sarajevu. 2019(19):67-81.
- [3] Mhlanga D. Artificial intelligence in the industry 4.0, and its impact on poverty, innovation, infrastructure development, and the sustainable development goals: Lessons from emerging economies? Sustainability. 2021;13(11):5788.
- [4] Marwala T, Hurwitz E. Artificial intelligence and economic theory: skynet in the market: Springer; 2017.
- [5] Agrawal A, Gans J, Goldfarb A. Economic policy for artificial intelligence. Innovation policy and the economy. 2019;19(1):139-59.
- [6] Popkova EG, Parakhina VN, editors. Managing the global financial system on the basis of artificial intelligence: possibilities and limitations. The Future of the Global Financial System: Downfall or Harmony 6; 2019: Springer.

- [7] Kadhim RW, jaffar Raheem M, Mohialden YM, Hussien NM. A Review of the Implementation of NumPy and SciPy Packages in Science and Math. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*. 2022;13(03):663-7.
- [8] Bisong E. *Building machine learning and deep learning models on Google cloud platform*: Springer; 2019.
- [9] Lemenkova P. Testing linear regressions by StatsModel Library of Python for oceanological data interpretation. *Aquatic Sciences and Engineering*. 2019;34(2):51-60.
- [10] Kramer O. *Machine learning for evolution strategies*: Springer; 2016.
- [11] Sargent TJ, Stachurski J. *Finite Markov Chains. Lectures in Quantitative Economics*. Consultado en: <https://lectures> ...; 2019.
- [12] Meurer A, Smith CP, Paprocki M, Čertík O, Kirpichev SB, Rocklin M, et al. *SymPy: symbolic computing in Python*. *PeerJ Computer Science*. 2017;3:e103.
- [13] Hagberg A, Swart P, S Chult D. *Exploring network structure, dynamics, and function using NetworkX*. Los Alamos National Lab.(LANL), Los Alamos, NM (United States); 2008.
- [14] Kouzis-Loukas D. *Learning scrapy*: Packt Publishing Livery Place; 2016.
- [15] Touretzky C, editor *Beyond the Optimizer: Gurobi's Hidden Gem Features and Applications in the Chemical Industry*. 2022 AIChE Annual Meeting; 2022: AIChE.
- [16] Furman J, Seamans R. *AI and the Economy. Innovation policy and the economy*. 2019;19(1):161-91.
- [17] Ai H, Zhong T, Zhou Z. The real economic costs of COVID-19: Insights from electricity consumption data in Hunan Province, China. *Energy Economics*. 2022;105:105747.
- [18] Qian Y, Liu J, Shi L, Forrest JY-L, Yang Z. Can artificial intelligence improve green economic growth? Evidence from China. *Environmental Science and Pollution Research*. 2023;30(6):16418-37.
- [19] Zarifhonarvar A. *Economics of chatgpt: A labor market view on the occupational impact of artificial intelligence*. Available at SSRN 4350925. 2023.
- [20] Cao L. *AI in finance: A review*. Available at SSRN 3647625. 2020.
- [21] Pournader M, Ghaderi H, Hassanzadegan A, Fahimnia B. *Artificial intelligence applications in supply chain management*. *International Journal of Production Economics*. 2021;241:108250.
- [22] Rahmani AM, Rezazadeh B, Haghparast M, Chang W-C, Ting SG. *Applications of artificial intelligence in the economy, including applications in stock trading, market analysis, and risk management*. *IEEE Access*. 2023.
- [23] Gries T, Naudé W. *Modelling artificial intelligence in economics*. *Journal for labour market research*. 2022;56(1):12.
- [24] Bickley SJ, Chan HF, Torgler B. *Artificial intelligence in the field of economics*. *Scientometrics*. 2022;127(4):2055-84.
- [25] Chui M, Hazan E, Roberts R, Singla A, Smaje K, Sukharevsky A, et al. *The economic potential of generative AI: The next productivity frontier*. Retrieved from the McKinsey Digital website: <https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-economic-potential-of-generative-ai-the-next-productivity-frontier>. 2023.

- [26] Sattar IA, Gaata MT, editors. Image steganography technique based on adaptive random key generator with suitable cover selection. 2017 Annual Conference on New Trends in Information & Communications Technology Applications (NTICT); 2017: IEEE.
- [27] Ernst E, Merola R, Samaan D. Economics of artificial intelligence: Implications for the future of work. IZA Journal of Labor Policy. 2019;9(1).