

# Leveraging Information Systems and Statistical Computing to Model the Evolution of the Artificial Intelligence Labor Market in the Digital Economy<sup>\*</sup>

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## Abstract

The study proposes a comprehensive methodology for analyzing the complex relationships between technological progress in Artificial Intelligence and Labor Market dynamics, using the tools of Information Systems and Statistical Computing. The era of artificial intelligence is characterized by introducing new technologies and creating new professions and jobs. The labor market is transforming under the influence of artificial intelligence: some professions are losing their relevance and are being replaced by information technologies based on artificial intelligence. The rapid development of software, hardware, and intellectual support for artificial intelligence information technologies is driving the labor market's need for relevant IT professionals, as well as for those IT professionals who develop and improve such technologies. These trends are driving the development of the IT labor market. The labor market of the future builds its career paths for IT specialists, forming a demand for relevant skills that characterize the professional qualities of the labor potential. In order to determine the trends in the labor market for IT specialists in the field of artificial intelligence, the state of the relevant labor market is evaluated based on statistical data, the demand for professions, salary growth trends are determined, the requirements for professionals in this field in terms of the skills they must possess are clarified, the factors of salary dynamics, demand for specific professions and skills, as well as geographical distribution and industry specifics are analyzed. Applying statistical analysis and K-Means clustering methods, the study revealed high salary volatility, leading roles of AI Researcher, Machine Learning Scientist, and AI Engineer, dominance of Manufacturing and Technology among the industries consuming AI talents, and key skills such as PyTorch, NLP, and Machine Learning. The study's findings provide important information for understanding current trends in the digital economy in the AI labor market and predicting future career trajectories.

## Keywords

information systems, statistical computing, digital economy, labor market, labor resources, labor potential, IT professionals, artificial intelligence, modeling, career trajectory, career mobility, IT skills

## 1. Introduction

A quarter of a century after the Information Revolution, humanity is experiencing another revolution. It is associated with the development of artificial intelligence technologies and their massive integration into most areas of human activity. These are industry, technology and engineering, education, media and entertainment, marketing, advertising, trade, financial sector, gaming, etc. Integration of AI technologies into most spheres of human life influences changes in the modern economy, giving impetus to the transformation of the labor market.

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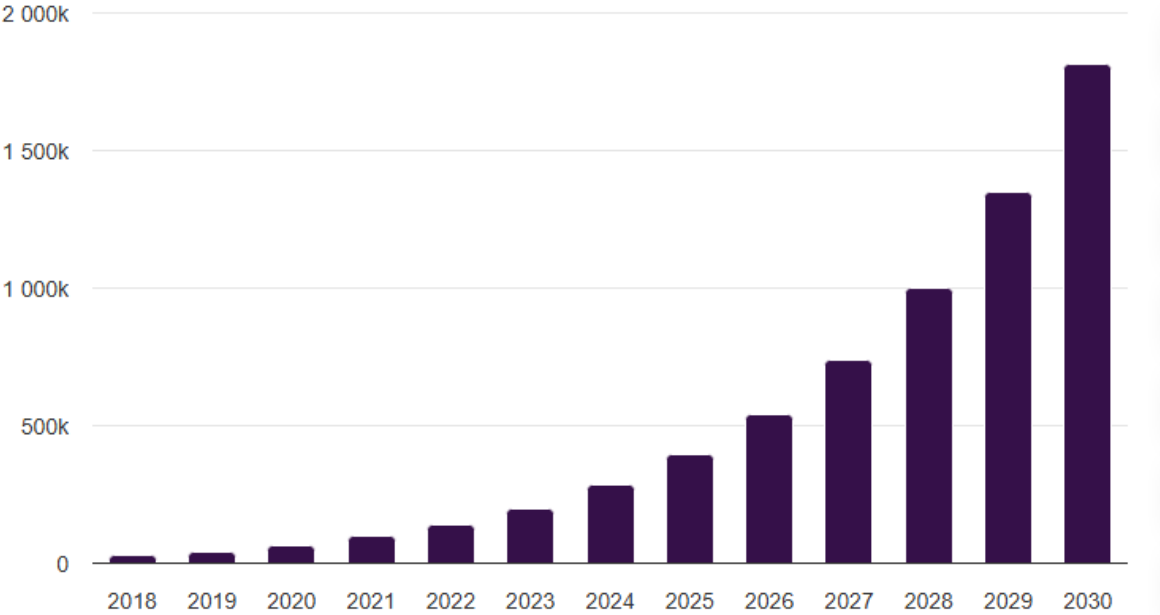


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From the moment of opening mass access to generative artificial intelligence for the average member of the information society in 2022, “...there is a transformational impact of AI on the dynamics of the global economy” [1]. Most people tend to think that “...the emergence of AI in mass use is a turning point in world history” [1], and AI shortly will play a strategic role in the economic development of the enterprise, the state, and humanity.

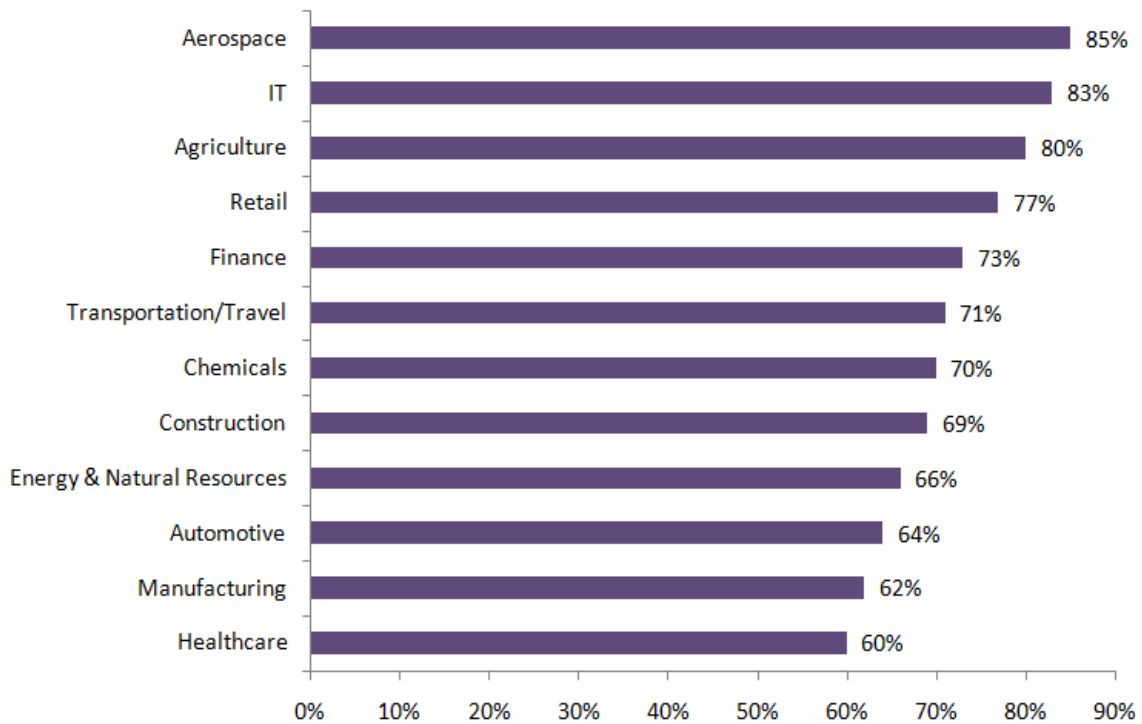
Succession of the economic ecosystem under the influence of artificial intelligence, in particular, the labor market ecosystem, creates challenges for the existence of many modern professions. For example, the emergence of generative AI could make the following professions disappear shortly: salespeople, consultants, call center operators, journalists, logisticians, translators and marketers. Some IT professionals focused on performing standard tasks, such as designers, web developers, and computer system administrators, are also at risk of losing their jobs, because AI can write basic code and configure information systems. Such rapid development of AI is a catalyst for the development of humanity and the emergence of new professions related to the use of AI technologies. These professions include AI Trainer, Virtual World Designer, Human-AI Interaction Designer, Sustainable City Planner, Robot Behavior Tester, AI-Powered Education Designer. All of these professions are those of the future.

According to AI statistics for 2025 officially published by Grand View Research [2] (see Fig. 1), it is expected that the global annual revenue in the AI industry will reach USD 1811.7 billion by 2030, with a compound annual growth rate of 35.9% from 2025 to 2030.



**Figure 1:** Global artificial intelligence market, 2018-2030 (US\$M) [2]

The research by Amani U. [3] considers the issues of AI implementation in various sectors of the economy. The highest adoption rates (as of January 2025) are in the aerospace industry (85%), IT (83%), and agriculture (80%) (see Fig. 2). While concerns about job automation remain, 41% of companies believe that AI will change jobs but not disappear. It is also expected that labor productivity will increase by 50% due to the use of AI over the next five years.



**Figure 2:** The level of AI adoption in various sectors of the economy as of January 2025 [3]

As a result, AI is now actively entering various spheres of human activity, including business. This is leading to the transformation of jobs and professions around the world. At the same time, there are several views on these transformation processes. Some people see AI as a competitor, which will lead to a decrease in the number of jobs in the world. Another group of people sees AI as a catalyst for productivity and a means to expand human capabilities.

In recent years, the number of publications devoted to various aspects of AI has increased. These are works that describe the ways and experience of using AI in industry, technology, medicine, software development, education, etc. There are also scientific papers describing trends in the labor market under the influence of AI technologies, providing statistical data on changes, and forecasting new professions and specialties [4, 5].

Liu J., Chen K., Lyu W. in their article [6] focused on the analysis of labor market demand in the field of statistics and AI. The authors analyzed about 280 million job ads in the United States from 2010 to 2022 using statistical analysis. The study revealed a sharp increase in demand for statistics-related positions (in general and in the field of AI). The study revealed the emergence of disciplinary clusters in AI jobs involving statistics. Moreover, the authors emphasize the special place of statistics as a science in the AI revolution.

The authors of [7] conducted a comprehensive analysis of the labor market in the field of AI and machine learning in the period from 2022 to 2024. This period is characterized by the beginning of the active use of AI technologies by society. The study analyzes characteristics of job offerings in terms of titles, geography, required skills, and salary within a high volume job posting data.

It is also important to highlight a few works in the field of AI that reveal various aspects of the use of this technology in different industries. The article [8] examines the transformative impact of generative AI on creative professionals in the marketing sector. Works [9, 10] consider the moral, ethical, legal, and social aspects of using AI in professional activities, the cognitive features of human interaction with AI systems are described in [11]. A systematic overview of the impact of AI on the future labor market is given in [12, 13].

Some studies focus on the impact of AI on the professional activities of programmers. The article [14] examines the impact of generative artificial intelligence on professions related to software development and testing. The study surveyed novice programmers about their use of AI

tools in the process of performing work tasks. The survey results showed that 65% of respondents actively use generative AI in their work, 12% moderately, 18% minimally, and 5% do not use it at all. Overall, this study proves the important role of generative AI in the process of software development by beginners.

Wang Changlin and Jiao Du investigate the impact of AI on the distribution of the labor market. The study found that the introduction of AI has a positive impact on the share of labor income through two key channels: improving innovation capacity and accelerating technological modernization [15].

Based on the results of the analysis of reference sources, it has been found that there is currently a need to analyze the results of research on models of labor market dynamics of IT specialists in the field of AI and to study trends in the development of their career trajectories.

The **purpose** of the study is to model the evolution of the labor market for IT specialists in the field of AI in the digital economy by integrating information systems and statistical computing.

## 2. Selection of methods and diagnostics

The study was conducted by statistically analyzing labor market data in the field of artificial intelligence. For this purpose, the data from the AI Job Market Trends dataset [16] was analyzed. After preliminary data processing, 500 data instances from 2020 to 2025 were selected for the study: Date, Job Title, Industry, Skills, Salary, Location. A fragment of the dataset is shown in Fig. 3.

	Date	Job Title	Industry	Skills	Salary	Location
494	2024-12-13 16:38:28.617234464	Machine Learning Scientist	Finance	PyTorch, Machine Learning	142615	New York
495	2024-12-17 08:30:46.893787552	AI Researcher	Education	Deep Learning, Data Analysis, Python	143523	New York
496	2024-12-21 00:23:05.170340672	Machine Learning Scientist	Manufacturing	Deep Learning, Data Analysis, Python, PyTorch,...	175103	Bangalore
497	2024-12-24 16:15:23.446893760	Natural Language Processing Engineer	Healthcare	NLP, Machine Learning	164476	Tokyo
498	2024-12-28 08:07:41.723446880	Data Scientist	Technology	Computer Vision, Big Data, NLP, Python	172769	New York

**Figure 3:** Fragment of data for the study

The methodology included the use of statistical methods to study the trends in the labor market for IT specialists in the field of AI, namely, Grouping, Frequency Analysis, faceted distributions, categorical distributions, Point-Biserial Correlation, as well as graphical presentation of the results. Python tools and libraries: Numpy, Pandas, Matplotlib, Seaborn, etc. To implement the K-Means cluster analysis and visualize the results, we used Python libraries: Pandas, Numpy, Matplotlib.pyplot, Seaborn, Sklearn.preprocessing, Sklearn.cluster, Sklearn.decomposition, Sklearn.metrics.

The combination of these analysis methods made it possible to find out how AI is transforming the labor market. The information obtained will make it possible to determine salary trends, demand for certain skills of IT specialists, which will provide valuable data for training and employment opportunities, and their mobility in the labor market in the context of the rapid development of AI. The research findings provide an understanding of what trends will be relevant in the AI labor market shortly. This study will be useful for those planning to implement data analysis in this area of the economy by providing examples of the use of data analysis tools using the Python language.

## 3. Results and discussion

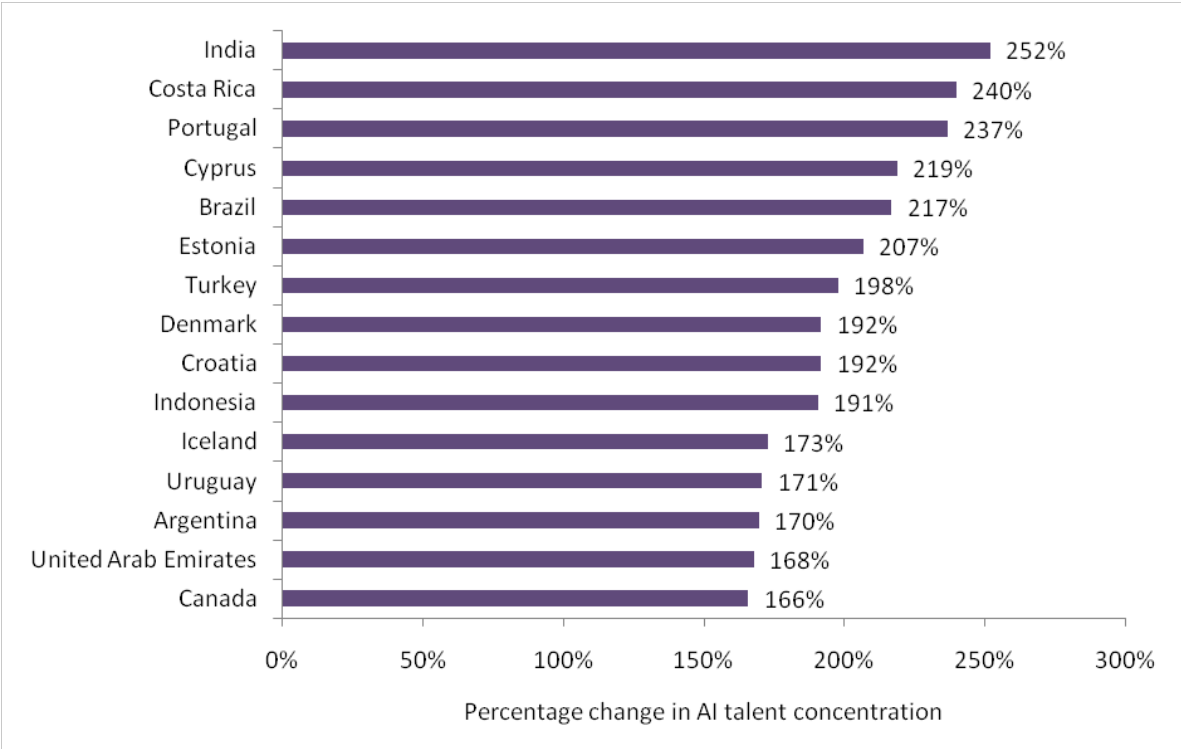
Artificial intelligence has now become a key aspect of business processes, deeply integrated into everyday life, and its economic role is expected to grow even more in the future. AI has a significant impact on the economy in general and the labor market in particular.

Optimally implemented at enterprises, AI automates production processes, increases the productivity of goods and services, and facilitates the development of new products and services. At the same time, it may pose challenges in terms of job redistribution and the need to adapt economic activities.

As a result of AI adoption, the labor market is transforming, including job cuts due to automation of processes in certain sectors of the economy and the emergence of new professions, increasing demand for specialists in the development, implementation, maintenance, and management of AI systems. These professions include data analytics, data scientists, machine learning engineers, AI ethics specialists, etc. [17–19]. At the same time, AI tools also provide an opportunity to automate certain aspects of IT specialists’ work (e.g., automatic code generation), which may change the specifics of their work. However, professions that require skills that are difficult to automate and that are only inherent in humans will be relevant in the labor market. It’s about creativity, critical thinking and emotional intelligence. The introduction of AI in all areas of activity and its rapid development require constant upskilling of the workforce and continuous retraining. Global data show that 60% of employees believe in the significant changes that AI will bring to their professional activities over the next five years. At the same time, only 36% of them believe that their jobs will be directly replaced by artificial intelligence during this period [20].

A positive consequence of these transformations in the AI industry is the growing demand for highly skilled professionals, which generates competition between economic entities for skilled professionals, with one of the consequences being higher wages. A study of AI talent by country (as shown in Fig. 4) identifies them based on the skills and experience listed in LinkedIn profiles. Despite the possible effects of LinkedIn’s coverage, the data shows a significant increase in the concentration of AI talent in many countries since 2016. India (252% growth), Costa Rica (240%), and Portugal (237%) stand out as the countries that showed the largest increase in their AI talent [20].

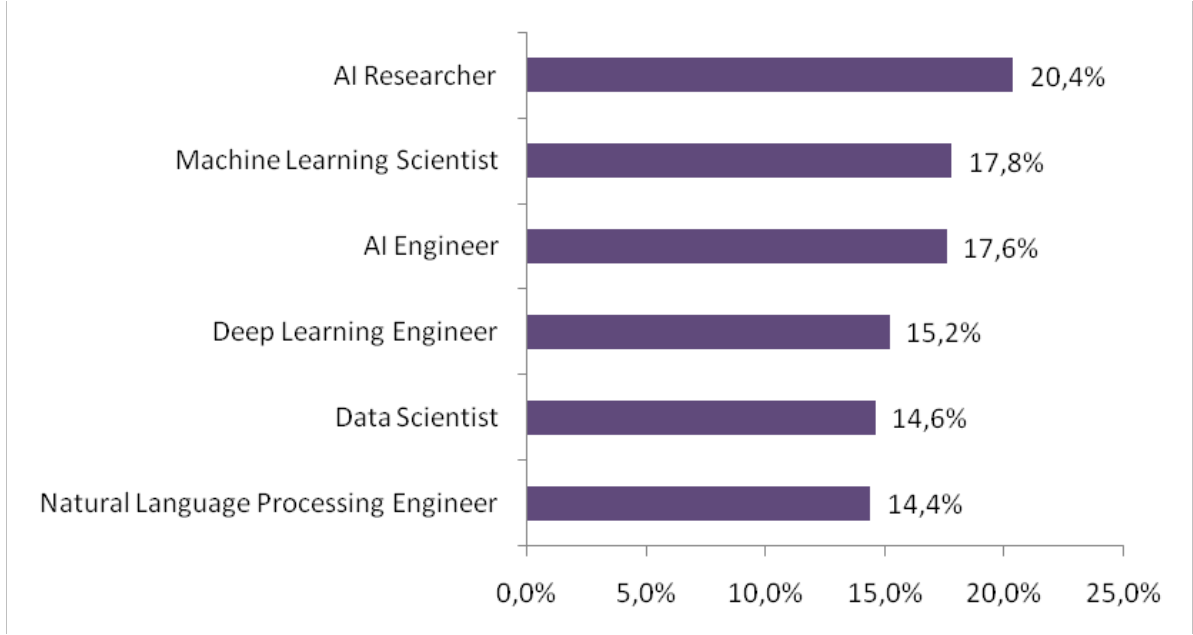
To understand how the labor market for AI IT specialists has changed, let’s analyze statistical data. Let’s find out which professions are currently in the highest demand in the AI labor market, how their salaries are growing, and what skills of IT specialists are in high demand.



**Figure 4:** Dynamics of AI talent concentration by region (2016–2024)

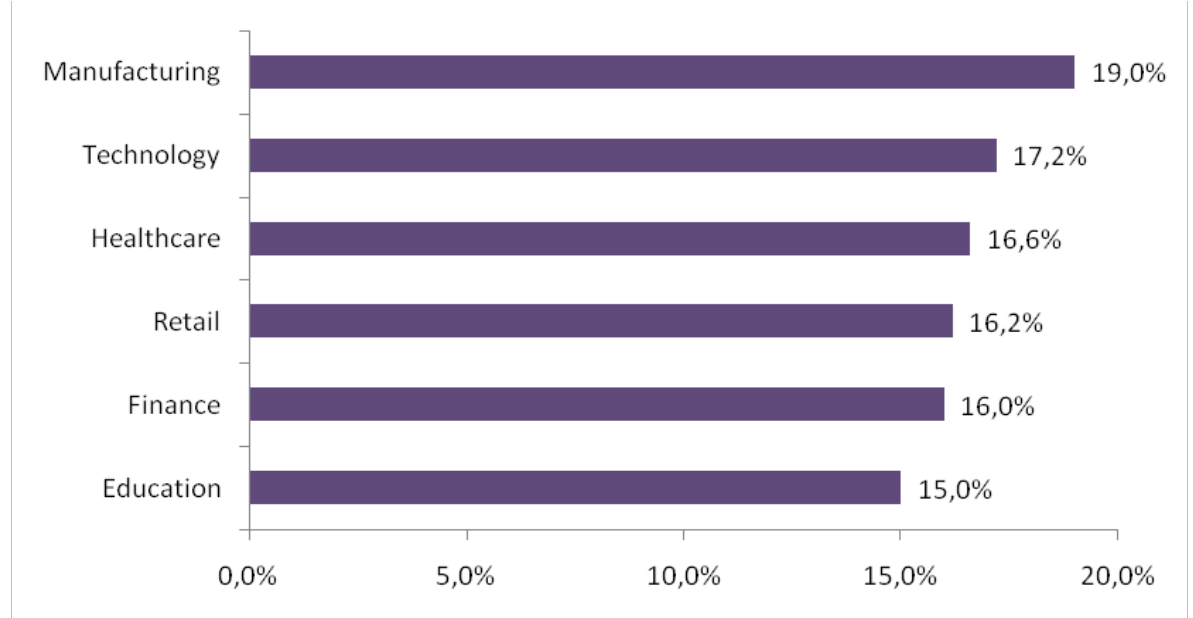
Source: LinkedIn, 2024

According to the studied data, in 2020–2024 (see Fig. 5), the most popular professions in the labor market of AI specialists were AI Researcher (20.4%), Machine Learning Scientist (17.8%), and AI Engineer (17.6%).



**Figure 5:** The most popular professions in the labor market of IT specialists in the field of AI

According to the summary data for 2020-2024 (see Fig. 6), the industries that implemented AI technologies and required the most IT specialists were Manufacturing (19%) and Technology (17.2%). The analysis shows that while many sectors of the economy used AI technologies, the dominant ones in 2020–2024 were Manufacturing, Technology, and Healthcare.

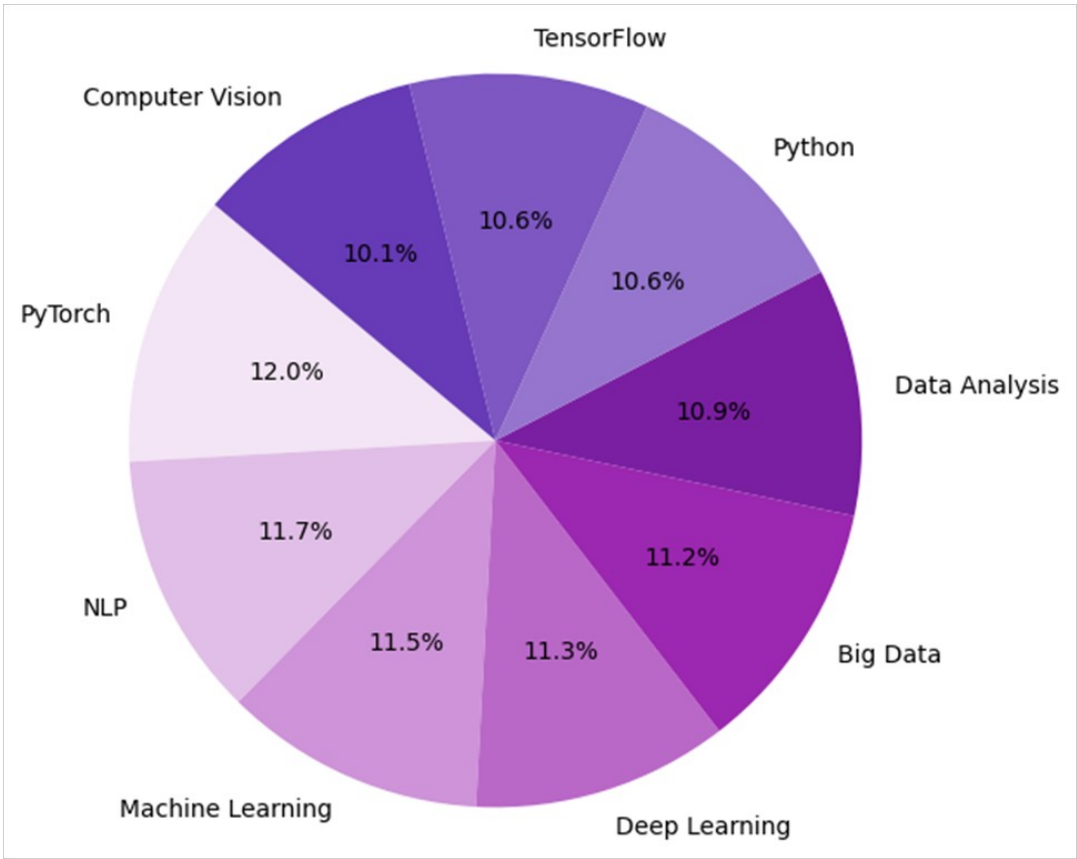


**Figure 6:** Dynamics of industries in which AI IT specialists were most in demand (based on summarized data for 2020–2024)

Technical skills are important indicators that characterize the requirements for IT specialists in the field of AI. Fig. 7 shows the relative demand for AI technical skills for IT professionals. We identified unique skills in the requests for advertised vacancies during 2020–2024 and determined the frequency of their inclusion in labor market requests. Using the Pandas library of the Python programming language:

```
unique_values = exploded_series.unique()
unique_counts = exploded_series.value_counts()
```

We used the Matplotlib library of the Python programming language to build the pie chart.

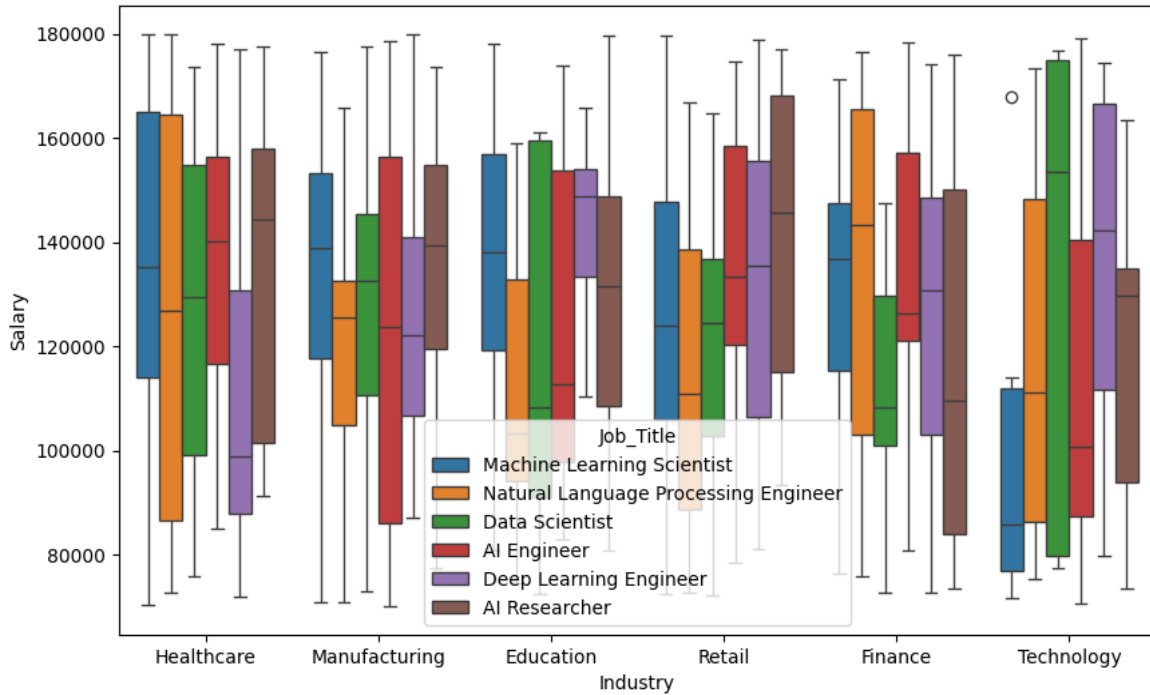


**Figure 7:** Labor market demand for IT specialists skills in the field of AI (based on summary data for 2020–2024)

The purpose of calculating this indicator is to determine the intensity of the inclusion of AI technical skills in a particular Job Market request for an advertised vacancy. The level of AI technical skills prevalence signals their spread among labor market requests. Thus, in 2020-2024, the most common labor market requests were for PyTorch (12%), NLP (11.7%), Machine Learning (11.5%), Deep Learning (11.3%), Big Data (11.2%).

Let's analyze the salary (\$ per year) for the offered vacancies in the industries that require IT specialists in the field of AI (see Fig. 8). The boxplot was built using the Python Matplotlib library and the Seaborn library based on it. This graph illustrates the distribution of salaries for various AI-related IT positions in different industries. The X-axis (Industry) shows industries such as Healthcare, Manufacturing, Education, Retail, Finance, and Technology. Salary levels are shown on

the Y-axis (Salary). Different colors indicate positions in the field of artificial intelligence—Natural Language Processing Engineer, Data Scientist, Deep Learning Engineer, AI Engineer, Machine Learning Scientist, AI Researcher.



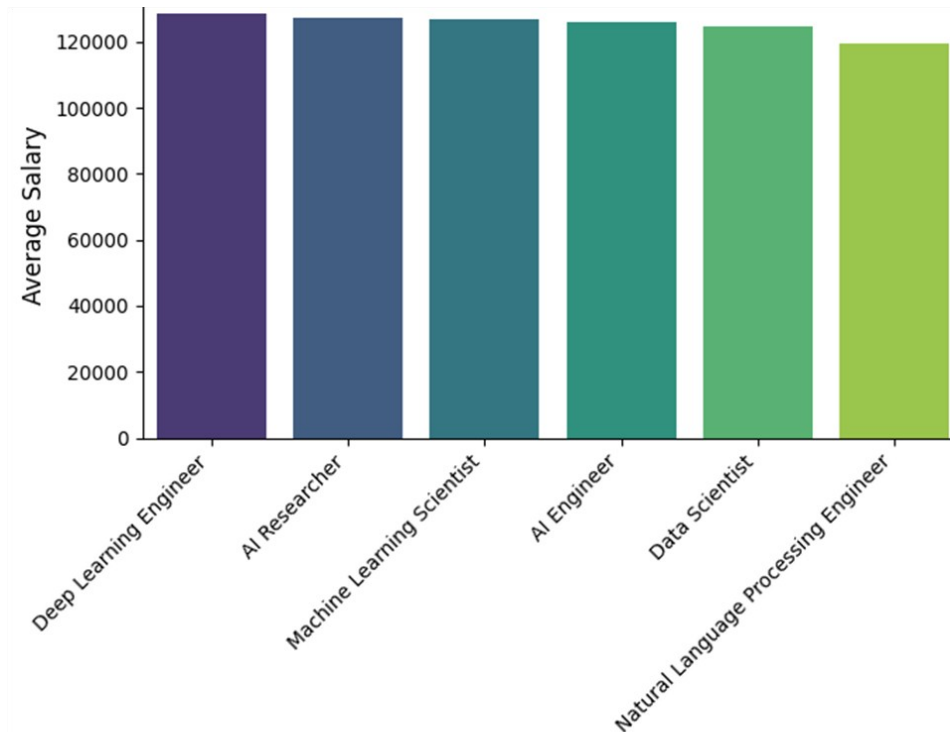
**Figure 8:** Distribution of salaries for the offered vacancies in the industries that required IT specialists in the field of AI (based on the summary data of 2020–2024)

According to the results in Fig. 8, the Technology sector has the widest range of salaries. Particularly high salaries are observed in labor market requests for Data Scientist and Deep Learning Engineer specialists. Salaries of Machine Learning Scientist specialists are slightly lower than in other industries. In the Healthcare industry, Machine Learning Scientist specialists are offered one of the highest average salaries. However, there is significant variability in salaries offered in Healthcare for most roles. In Education, salaries are lower compared to other industries, particularly for AI Engineer positions. In Finance, salaries are relatively high and more sustainable, especially for Natural Language Processing Engineer and Deep Learning Engineer. The Retail industry is characterized by relatively uniform salaries. In Manufacturing, the salaries offered are varied, but without obvious peaks, and the roles are more variable.

According to the analysis (Fig. 8), we can note that the Technology and Healthcare industries have the highest salaries offered for IT specialists in the AI field. The lowest salary offers were observed in Education and Retail. Data Scientist, Deep Learning Engineer, and NLP Engineer positions have the highest top quartiles of salaries in most industries. AI Researcher salaries in all the industries analyzed have a large variation, but the median is not always high.

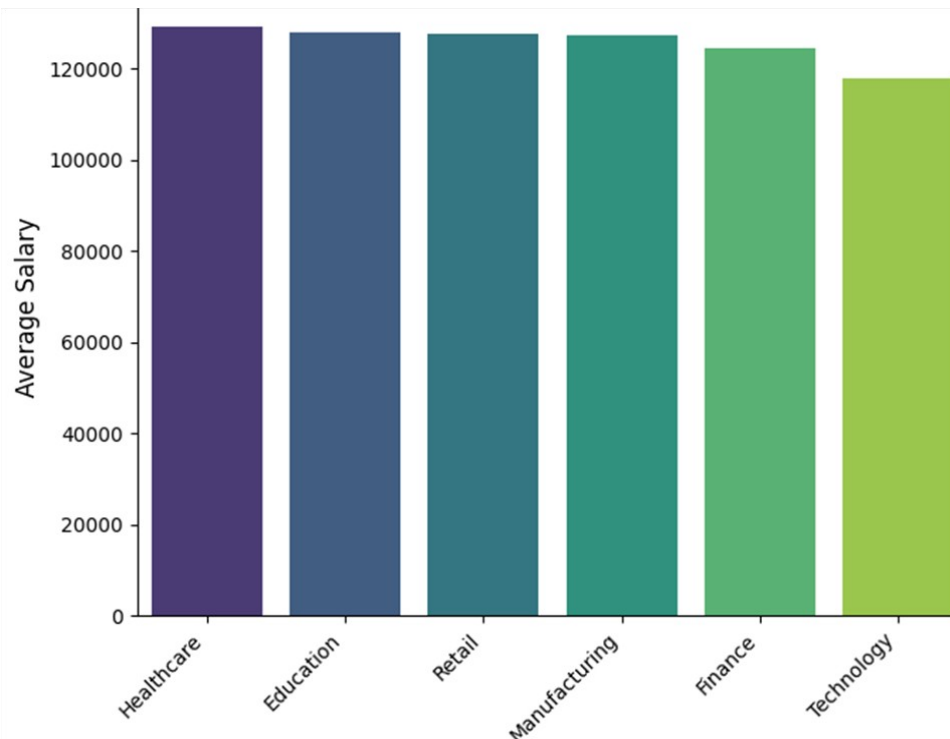
In Figs. 9–11, we show the average salary of AI IT specialists according to their job title, Industry sector and location of the company, based on the summary data of 2020–2024. As you can see from the histograms, the average salary is distributed fairly evenly and is above \$120 thousand per year. The salary indicator for Deep Learning Engineer specialists is slightly higher. It is slightly lower for NLP Engineers (Fig. 9).





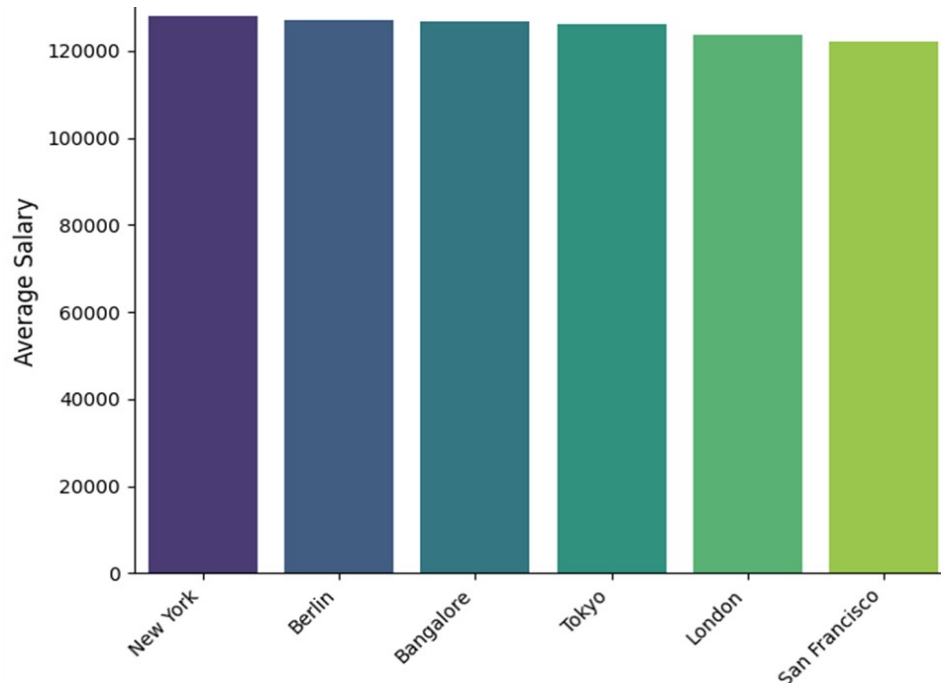
**Figure 9:** Distribution of the Average Salary by Job Title, which required IT specialists in the field of AI (according to the summary data of 2020–2024)

Fig. 10 shows that by industry, the average salary is above \$120 thousand per year for all industries except for the technology industry. It is the highest in the healthcare sector.



**Figure 10:** Distribution of the Average Salary by Industry, which required IT specialists in the field of AI (according to the summary data of 2020–2024)

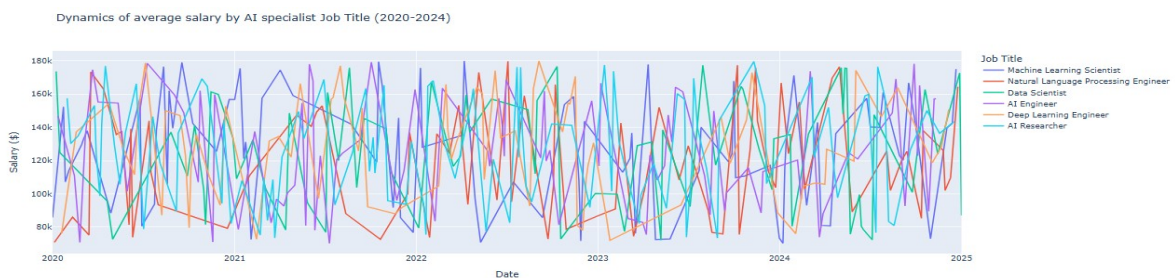
By location, there is also relative homogeneity in average salaries, with the highest average salary in New York and the lowest in San Francisco (Fig. 11).



**Figure 11:** Distribution of the Average Salary by Location, which required IT specialists in the field of AI (according to the summary data of 2020–2024)

Fig. 12 shows the dynamics of the average salary for IT specialists in AI from 2020 to 2024. The X-axis (horizontal) shows the time period from the beginning of 2020 to the end of 2024. The Y-axis (vertical) shows the average salary in US dollars (\$) in the range of approximately \$60,000 to \$180,000. The most characteristic feature is the extremely high volatility of salaries for all these positions, with significant fluctuations in average salaries over short periods. This can be explained by several factors, such as the immaturity of the AI labor market. The AI labor market is relatively new and rapidly developing, and therefore labor prices can be volatile.

For all positions, there is a similar salary range with occasional peaks that can reach \$180,000 and dips to around \$70,000–\$80,000. AI Engineer and Machine Learning Scientist have some of the highest peaks, as their salary values reach the \$180,000 upper limit more often than others. Data Scientist and Natural Language Processing Engineer also show high volatility and reach high salary values. However, their minimum values are slightly higher than those of other positions. There are also significant fluctuations in the salaries of Deep Learning Engineer and AI Researcher. Their dynamics are similar to the others, which indicates a general market trend. It can be seen that some positions have cyclical peaks and troughs, but their regularity is not clear and may be related to the data collection methodology or seasonality in the labor market. At the same time, it is difficult to identify clear long-term trends from this graph. For all of these positions, there are high salary values with frequent and significant fluctuations. This indicates a constant demand for these specialists, but also indicates that the market may be sensitive to various factors.



**Figure 12:** Dynamics of average salary by AI specialist position based on summary data for 2020–2024)

For a more thorough analysis of the labor market data of IT specialists in the field of AI, we used the K-Means cluster analysis method. To apply this method, the text data was pre-processed with One-Hot Encoding. Finding the optimal number of clusters was done using the Elbow and Silhouette methods. It was found that the optimal number of clusters is 4. Data clustering is performed by Industry and Skills, which will determine the characteristics of the labor market for IT specialists in the field of AI, namely the demand for relevant skills in different industries. This is important for both future IT workers and their professional training. The characteristics of each cluster are presented in Table 1 and Fig. 13.

**Table 1**

Results of cluster analysis of the labor market data of IT specialists in the field of AI using the K-Means data clustering method (based on summary data for 2020-2024)

Clusters characteristics	Clusters			
	Cluster 0	Cluster 1	Cluster 2	Cluster 3
Number of records	60	235	100	105
Distribution Industry	Healthcare—17, Manufacturing—12, Retail—12, Finance—8, Education—6, Technology—5	Manufacturing—54, Finance—42, Retail—37, Technology—36, Healthcare—33, Education—33	Technology—21, Healthcare—17, Education—17, Manufacturing—16, Retail—15, Finance—14	Technology—24, Education—19, Retail—17, Finance—16, Healthcare—16, Manufacturing—13
Distribution Skills	NLP—60, Big Data—16, Machine Learning—12, PyTorch—11, TensorFlow—11, Machine Learning—10, Python—10, Computer Vision—10, Deep Learning—9, Data Analysis—9, Computer Vision—8, Data Analysis—8, PyTorch—7, Deep Learning—6, Python—6, Big Data—5, TensorFlow—4	PyTorch—1, Big Data—64, Deep Learning—51, TensorFlow—49, Machine Learning—47, NLP—46, Python—42, Data Analysis—40, Computer Vision—37, PyTorch—34, Deep Learning—32, Big Data—32, TensorFlow—31, Deep Learning—31, Computer Vision—31, Machine Learning—28, Python—27, Data Analysis—26, Big Data—23, TensorFlow—19, PyTorch—17	Machine Learning—56, Computer Vision—44, Python—27, Data Analysis—23, NLP—22, PyTorch—19, Big Data—18, Deep Learning—18, TensorFlow—17, Data Analysis—16, PyTorch—14, Deep Learning—14, TensorFlow—14, Big Data—11, Computer Vision—10, NLP—9, Machine Learning—9, Python—8, Computer Vision—6, Machine Learning—3	Data Analysis—53, Python—52, TensorFlow—33, NLP—25, Deep Learning—25, Big Data—24, Machine Learning—23, PyTorch—23, Computer Vision—9, PyTorch—16, Machine Learning—15, Deep Learning—13, Computer Vision—13, NLP—12, Data Analysis—9, Python—8, TensorFlow—8, Data Analysis—8, Python—7, Big Data—5
Distribution Job Title	Natural Language Processing Engineer—15, Data Scientist—13, AI Researcher—10,	AI Researcher—50, Machine Learning Scientist—46, AI Engineer—46, Deep Learning Engineer—39,	AI Engineer—22, AI Researcher—21, Data Scientist—17, Natural Language Processing Engineer—15,	Machine Learning Scientist—22, AI Researcher—21, Natural Language Processing Engineer—18,

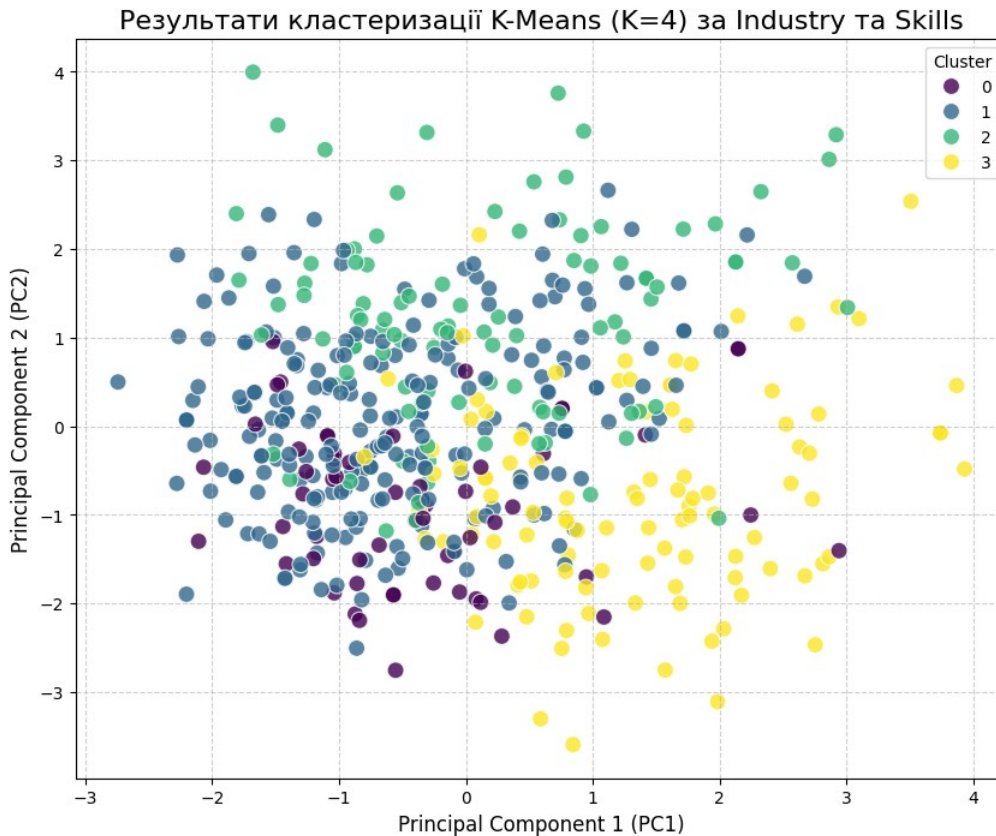
	Machine Learning Scientist—8, Deep Learning Engineer—8, AI Engineer—6	Data Scientist—30, Natural Language Processing Engineer—24	Machine Learning Scientist—13, Deep Learning Engineer—12	Deep Learning Engineer—17, AI Engineer—14, Data Scientist—13
Distribution Location	Location New York—13, Tokyo—11, Bangalore—10, London—9, San Francisco—9, Berlin—8	London—43, Bangalore—41, New York—40, San Francisco—38, Tokyo—37, Berlin—36	Bangalore—22, New York—20, London—18, Berlin—16, Tokyo—13, San Francisco—11	San Francisco—23, London—19, New York—17, Bangalore—16, Berlin—15, Tokyo—15
Average salary for the year, \$	129879.43	124640.44	125425.88	125726.64

The content of Cluster 0 is 60 data instances, which is a relatively small cluster in terms of volume. The most represented industries in it are Healthcare, Manufacturing, Retail. These are quite diverse industries. The dominant cluster in Skills is ‘NLP’ (60 instances). Also represented are ‘Big Data’, ‘Machine Learning’, ‘PyTorch’, ‘TensorFlow’, ‘Python’, ‘Computer Vision’, ‘Deep Learning’, ‘Data Analysis’. The presence of ‘NLP’ (60 instances) and ‘Big Data’ (16 instances) may indicate that these skills are key to defining this cluster. Job Title: Natural Language Processing Engineer, Data Scientist, AI Researcher. This corresponds to the dominant skill of NLP. Average salary: \$129879.43 per year. Cluster 0 brings together professionals who focus on natural language processing (NLP), often in combination with other modern AI/ML and data processing technologies. They can work in different industries, but their main specialization is focused on NLP.

Cluster 1 has 235 records. This is the largest cluster. It is characterized by Industry: Manufacturing, Finance, Retail, Technology, Healthcare, Education. This cluster is diverse in terms of industries. No one industry is dominant. The cluster contains many skills, indicating a wide range of specializations: ‘PyTorch’ (71), ‘Big Data’ (64), ‘Deep Learning’ (51), ‘TensorFlow’ (49), ‘Machine Learning’ (47), ‘NLP’ (46), ‘Python’ (42), ‘Data Analysis’ (40), ‘Computer Vision’ (37). The job titles of Cluster 1 are as follows: AI Researcher, Machine Learning Scientist, AI Engineer. These are high-tech, universal AI/ML/Data Science roles. The average salary is \$124640.44 per year. Cluster 1 represents a general group of AI/Machine Learning/Data Science professionals with a wide range of skills (Python, Deep Learning, ML, Big Data, etc.) and working in many different industries. Its large size may indicate that this is a “core” group or that it combines profiles that do not have too many specific commonalities beyond a basic AI/ML skill set.

Cluster 2 has 100 records. It is characterized by Industry: Technology, Healthcare, Education, Manufacturing, Retail, Finance. Again, it has a wide distribution of industries. Cluster 2 is characterized by the following set of Skills: ‘Machine Learning’ (56), ‘Computer Vision’ (44). These two skills dominate. Other skills (Python, Data Analysis, NLP, PyTorch) are also present, but less pronounced. The main job titles are AI Engineer, AI Researcher, and Data Scientist. The average salary is \$125425.88 per year. Cluster 2 probably represents machine learning and computer vision specialists. They can also work in various industries where these technologies are applied.

Cluster 3 contains 105 records. Main industries: Technology, Education, Retail, Finance, Healthcare, Manufacturing. This is another cluster with a diverse industry distribution. The key skills of the cluster are ‘Data Analysis’ (53), ‘Python’ (52). Also present are the skills of ‘TensorFlow’, ‘NLP’, ‘Deep Learning’, ‘Big Data’, ‘Machine Learning’, ‘PyTorch’, ‘Computer Vision’. The cluster is characterized by the following Job Titles: Machine Learning Scientist, AI Researcher, Natural Language Processing Engineer. The average salary for this cluster is \$125726.64 per year. Cluster 3 focuses on data analytics and Python programming specialists, who are likely to also know other AI/ML areas. This can be a cluster of ‘general’ analysts or developers who use Python for various data science tasks.



**Figure 13:** Results of clustering the labor market data of IT specialists in the field of AI by K-Means cluster analysis (K=4) by Industry and Skills

The resulting clusters are formed mainly around dominant skills, while the industrial distribution in many clusters is fairly even. This may mean that skills are a stronger predictor of cluster formation than industry. That is, specialists with a certain set of skills often work in different industries. The distribution of Industry is fairly even and may not have strong enough correlations with specific skill sets to form clusters based solely on industry. Cluster 0 is clearly distinguished by NLP skills. Cluster 2 is distinguished by Machine Learning and Computer Vision skills. Cluster 3 is distinguished by Data Analysis and Python skills. Cluster 1 (the largest) is more general, representing a broad group of AI/ML professionals with diverse but not highly specialized skills.

## Conclusion

The rapid development of AI technologies has triggered significant transformations in the global labor market, especially in the field of IT professionals. The analysis of statistics for 2020–2024 revealed extreme volatility of average salaries in all analyzed AI IT professions. This indicates a dynamic, but not yet fully mature market. Despite the lack of clear long-term growth or decline trends, average salaries remain high, often reaching \$180,000 per year. If we talk about the current state of AI development and related professions that are quite popular and in demand in the modern labor market, they include: Machine Learning Engineer, Computer Vision Engineer, NLP Engineer, AI Software Developer, AI Product Manager, AI Researcher, etc.

According to the analysis, the most popular professions are AI Researcher, Machine Learning Scientist, and AI Engineer. This emphasizes the demand for specialists capable of developing and implementing advanced AI solutions. Manufacturing and Technology dominate among the industries that need AI specialists the most, while Technology and Healthcare are the leaders in terms of salaries. Important skills for the AI labor market are PyTorch, NLP, Machine Learning, Deep Learning, and Big Data, which indicate the key requirements for modern specialists.

Cluster analysis using the K-Means method revealed that skills are a stronger factor in the formation of clusters of specialists than industry affiliation, as specialists with certain skill sets often work in different sectors of the economy. This emphasizes the importance of continuous development and re-qualification for AI IT professionals to remain competitive in an ever-evolving market.

Thus, the labor market for AI IT specialists is one of the most dynamic and promising, offering high salaries and significant opportunities for professional growth, while requiring high adaptability and readiness for lifelong learning.

## Declaration on Generative AI

While preparing this work, the authors used the AI programs Grammarly Pro to correct text grammar and Strike Plagiarism to search for possible plagiarism. After using this tool, the authors reviewed and edited the content as needed and took full responsibility for the publication's content.

## References

- [1] Z. Shao, et al., Tracing the Evolution of AI in the Past Decade and Forecasting the Emerging Trends, *Expert Systems with Applications* (2022) 209:118221. doi:10.1016/j.eswa.2022.118221
- [2] Grand View Research, Inc. Global Artificial Intelligence Market Size & Outlook, 2025. URL: <https://www.grandviewresearch.com/horizon/outlook/artificial-intelligence-market-size/global>
- [3] U. Amani, Top AI Statistics and Trends for Analytics, 2025. URL: <https://www.thoughtspot.com/data-trends/ai/ai-statistics-and-trends>
- [4] O. Mykhaylova, et al., Person-of-Interest Detection on Mobile Forensics Data—AI-Driven Roadmap, in: *Cybersecurity Providing in Information and Telecommunication Systems, CPITS*, vol. 3654 (2024) 239–251.
- [5] V. Buhas, et al., AI-Driven Sentiment Analysis in Social Media Content, in: *Digital Economy Concepts and Technologies Workshop, DECaT*, vol. 3665 (2024) 12–21.
- [6] J. Liu, K. Chen, W. Lyu, Embracing Artificial Intelligence in the Labour Market: The Case of Statistics, *Humanities Social Sci. Commun.* 11(1:1112) (2024). doi:10.1057/s41599-024-03557-6
- [7] D. Ather, et al., Analyzing Trends, Skills Demand, and Salary Prediction in the AI and ML Job Market, in: *International Conference on Intelligent & Innovative Practices in Engineering & Management (IIPEM)*, 2024. doi:10.1109/IIPEM62726.2024.10925738
- [8] A. Coetzer, et al., The Impact of Generative AI on Creative Professionals in Marketing: A Systematic Review and Practical Framework, in: *4<sup>th</sup> Int. Conf. on Society 5.0*, vol. 2173, 2025. doi:10.1007/978-3-031-71412-2\_6
- [9] P. Refolo, et al., Ethical, Legal, and Social Assessment of AI-based Technologies for Prevention and Diagnosis of Rare Diseases in Health Technology Assessment Processes, *Healthcare*, 13(7) (2025) 829. doi:10.3390/healthcare13070829
- [10] M. S. Alkhazaleh, et al., Postmodern AI: A New Vision of Man's Relationship with Technology, *Studies in Media and Communication*, 13(2) (2025). doi:10.11114/smc.v13i2.7435
- [11] V. M. Fedorets, et al., Cognitive Aspects of Interaction in the "Human–Artificial Intelligence" System, in: *J. Physics: Conference Series*, vol. 2871(1), 2024. doi:10.1088/1742-6596/2871/1/012023
- [12] D. Ghosh, et al., AI-Exposure and Labour Market: A Systematic Literature Review on Estimations, Validations, and Perceptions, *Manag. Rev. Quarterly* 75 (2025) 677–704. doi:10.1007/s11301-023-00393-x
- [13] N. Salari, et al., Impacts of Generative Artificial Intelligence on the Future of Labor Market: A Systematic Review, *Computers in Human Behavior Reports*, 18 (2025) 100652. doi:10.1016/j.chbr.2025.100652

- [14] C. D. C.Lima, et al., Generative AI Impact on the Future of Work: Insights from Software, in: Development IEEE International Conference on Systems, Man, and Cybernetics, SMC 2024, 2024. doi:10.1109/SMC54092.2024.10831787
- [15] C. Wang, D. Jiao, Impact of Artificial Intelligence on the Labor Income Distribution: Labor Substitution or Production Upgrading?, Finance Research Letters, 73 (2025) 106674. doi:10.1016/j.frl.2024.106674
- [16] Global Technology Solutions Pvt Ltd, 2025. URL: <https://gts.ai/>
- [17] M. Adamantis, V. Sokolov, P. Skladannyi, Evaluation of State-of-the-Art Machine Learning Smart Contract Vulnerability Detection Method, Advances in Computer Science for Engineering and Education VII, vol. 242 (2025) 53–65. doi:10.1007/978-3-031-84228-3\_5
- [18] V. Zhebka, et al., Methodology for Predicting Failures in a Smart Home based on Machine Learning Methods, in: Cybersecurity Providing in Information and Telecommunication Systems, CPITS, vol. 3654 (2024) 322–332.
- [19] V. Buhas, et al., Using Machine Learning Techniques to Increase the Effectiveness of Cybersecurity, in: Cybersecurity Providing in Information and Telecommunication Systems, vol. 3188, no. 2 (2021) 273–281.
- [20] Chapter 4: Economy, 2025. Artificial Intelligence Index Report 2025. Stanford University. URL: <https://hai.stanford.edu/ai-index/2025-ai-index-report>