

AI Revolution: Job Displacement, Creation, and Skill Transitions in the Labor Market

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Abstract: In recent years, AI (artificial intelligence) has already become the most debatable topic among societies. One issue, or anxiety, has risen from this historical revolution: same as what had happened in the last two times, the AI revolution could lead to an inevitable unemployment and structural overturn in societies, frightening people with the severe consequences of losing their jobs. This paper aimed to further investigate the change in society caused by AI revolution by viewing the latest datas, reports, and essays that also focused on the study of AI revolution. Admitting the forecoming unemployment and job transition, this paper found that, different from the traditional transition of demanding jobs and skills, artificial intelligence replaces some occupations, but it creates new employment opportunities for some non-professional or low-level labor forces. This paper has also found that AI mainly replaces some STEM occupations, such as big data processors, and some occupations involving simple interactions, such as online customer service representatives. Therefore, this paper also discussed the specific types of skill demanded in the future.

Keywords: AI revolution, Job displacement, Skill transition, Generative AI, Societal issues

1. Introduction of AI and AI revolution

Learning, thinking, and creating are traditionally regarded as exclusive attributes of human beings. Since computers had been invented from last century, no one could imagine that computers are capable to learn, think, and create. Ada Lovelace, one of the most important figures in the history of computing, once claimed, “The machine does not pretend to create anything, it can only perform tasks according to whatever instructions we can give”, whose perspective could be generalized to scientists at that time. However, nowadays, AI has ready been globally popularized, and people utilize it as a prioritized asisstant for their needs, like face recognition and generated content.

1.1. Definition of AI

Artificial intelligence, simply named AI, refers to the simulation of human intelligence in machines that are programmed to think, learn, and create tasks typically requiring human cognition. This includes abilities like problem-solving, decision-making, language processing, pattern recognition, and even perception. AI can be classified as two main characteristics: Narrow AI (traditional one) and General AI, where General AI could be subdivided as PGC, OGC, UGC, and AIGC. In the following paragraph, this article is going to study the traditional AI/ML and the Gen AI (mainly AIGC).

1.2. Traditional AI

Traditional artificial intelligence and machine learning, a subset of AI where systems learn from data and improve over time without being explicitly programmed, are typically the basic and primary form of order-based demand fulfillment system. They usually focus on solving specific tasks using rules, logic, or statistical model and typically produce predefined outputs based on the data it is given. There are four types of traditional application of AI/ML: recommender systems, autonomous driving, anomaly detection, and predictive modeling.

1.2.1. Recommender systems

A recommender system is a type of AI system designed to suggest relevant content and items to users based on various factors, including past behavior, preferences, and collaborative patterns. This system is usually applied to the online services. For examples, YouTube, a globally popular online video platform, suggests videos based on watch history, likes, subscriptions, and user interactions with other videos, combining collaborative filtering with content-based filtering; Amazon, a famous online shopping platform, recommends products based on customers' past purchases, browsing history, and what similar customers have bought. It uses a hybrid system combining collaborative filtering and content-based filtering.

1.2.2. Autonomous driving

An autonomous driving artificial intelligence technically refers to the artificial intelligence systems that enable a vehicle to navigate and control itself without human intervention. These systems rely on a combination of hardware (such as sensors, cameras, LiDAR, and radar) and sophisticated software to perceive the environment, make decisions, and control the vehicle's movements. The goal is to achieve full autonomy, meaning the car can handle all driving tasks, including navigation, decision-making, and safety, across various environments and conditions.

1.2.3. Anomaly detection

Anomaly detection refers to the use of artificial intelligence techniques to identify patterns or behaviors that deviate significantly from what is expected or normal within a given data set. These deviations are referred to as anomalies or outliers. Anomaly detection is crucial in various applications like fraud detection, network security, manufacturing quality control, and monitoring systems for unusual behaviors that could indicate errors, faults, or malicious activities.

1.2.4. Predictive modeling

Predictive modeling refers to the use of artificial intelligence and machine learning techniques to build models that can predict future outcomes or behaviors based on historical data. Predictive modeling aims to forecast unknown future events by identifying patterns, trends, and relationships in past data. It's widely used across various industries for decision-making, optimization, and risk management. Its basics of working is similar with the recommender system, but this one focuses more on forecasting (usually a value or a set of data) rather than suggesting (usually a list of options).

1.3. Generative AI

Gen AI (generative artificial intelligence). Gen AI can generate new contents based on user's orders. According to the types of content it generates, Gen AI can be classified as text generating, images and videos generating, and LLM-driven Agentic framework.

1.3.1. Text generating AI

Text generating AI refers to artificial intelligence systems that are designed to produce human-like text based on given input. These models use large datasets to learn the patterns, structures, and nuances of language. They are typically built using advanced machine learning techniques, especially deep learning, and are trained on vast amounts of text data to understand grammar, context, and various linguistic aspects. The best and most well-known example would be Open AI's ChatGPT. It works by predicting the next word or sequence of words based on the input it receive, allowing it to generate coherent and contextually appropriate responses, essays, stories, dialogue, and more.

1.3.2. Images and videos generating AI

Images and videos generating AI refers to artificial intelligence models that are designed to create visual content, such as images and videos, either from scratch or by transforming existing content. These models typically rely on deep learning techniques, particularly those involving generative models such as Generative Adversarial Networks (GANs) or Diffusion Models, to generate realistic or artistic visuals.

1.3.3. LLM-driven Agentic framework

LLM-driven Agentic framework refers to a system that combines a Large Language Model (LLM), such as GPT or other advanced language models, with agentic capabilities—the ability to act autonomously, make decisions, and achieve specific goals. In this context, "agentic" refers to the system's capacity to not only process and understand information but also perform tasks, interact with environments, and adapt based on feedback, much like an autonomous agent. This AI model is relatively new and immature, and it functions a different way as other Gen AI model does. Rather than accumulation of data, LLM-driven Agentic framework enables autonomous decision-making and goal-oriented behavior. It doesn't just generate text or content but acts on behalf of a user or system by setting goals, planning actions, and adapting to feedback.

2. The change in labor market caused by AI

Instead of being significantly amazed by the massive improvement of productivity, people actually concern about the potentially impending unemployment, especially for low-skilled workers, as more jobs replaced by AI. Fittingly, the reason why people may regard AI this way could be empirical conjecture: AI Revolution could be the same as Industrial Revolution and Information Revolution. However, they misclassified, and AI Revolution is different from Industrial Revolution and Information Revolution. In fact, during AI revolution, the replacement of some low-skilled jobs coexists with the emerge of some new jobs requiring less skills.

2.1. Traditionally theoretical frameworks

Before further illustrating this statement, we should learn about the traditional theoretical frameworks regarding tech innovation.

2.1.1. Creative destruction

Creative destruction describes a dynamic phenomenon in the process of economic development. It emphasizes that the emergence of new technologies, new modes of production or new business models will constantly disrupt old economic structures while creating new ones.

2.1.2. Skill-based technological change

Skill-based technological change refers to a certain social bias in the direction and impact of technological development and innovation. This bias may be reflected in different social groups, classes, regions or cultures, and have different degrees of influence on various aspects of society, such as economy, politics and culture.

2.1.3. Conclusion regarding the AI revolution

These two concepts describe possible phenomena or problems caused by the advances in technology. For the SBTC, it indicates that computer-related technological change leads to a widening of the wage differences between groups who are more or less likely to use a computer on the job [1]. The arise of computers promotes the gap between high-skilled and low-skilled employees, strengthening the polarization between the rich and the poor to some extent. However, when we are attempting to understand the change of the society and labor market caused by AI, the same opinion towards computers seems to be obsolete. Indeed, the popularization of AI among social classes is much more common. There, some of the jobs are replaced, and some of the jobs emerge. Eventually, these changes will lead to economic growth and social progression as proved by the history.

3. The transition of jobs and skills

Following graph is cited from a report conducted by Mckinsey Company.

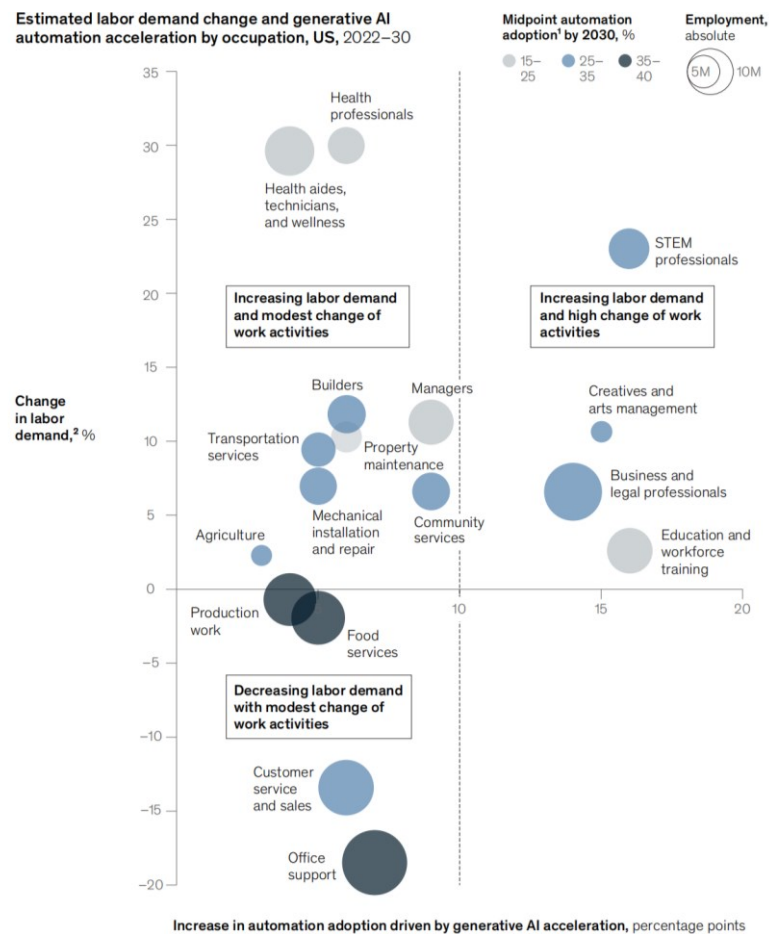


Figure 1: Estimated labor demand change and generative AI automation acceleration by occupation, US, 2022–30 [2]

Generative AI accelerates automation, and by 2030, up to 30% of work activities in the US economy could be automated [3]. Office support, customer service, food service and production jobs are particularly affected, and these jobs involve a lot of repetitive tasks, data collection and basic data processing, and which are easily replaced by automated systems.

3.1. Job creation

While generative AI will lead to job displacement, there are still growth opportunities in some job categories. The health care industry is booming due to an aging population; With the digitalization of the economy and the promotion of related laws, the demand for technical talents in STEM fields continues to grow; The transport services and construction sectors benefited from e-commerce development and investment in infrastructure projects, respectively. In addition, the demand for jobs related to the development, maintenance and management of AI technology will also increase. Then, new jobs, universally do not require professional knowledge in specific field but relatively low-skilled one, emerge rapidly, and some representatives are Prompt Engineer, Synthetic Data Creator, AI Ethical Reviewer, and AI-powered Designer.

3.1.1. Prompt engineers

Prompt engineers use prompt engineering techniques to develop and optimize prompts to efficiently use language models (LMs) for a wide variety of applications and research topics. Prompt engineering skills help to better understand the capabilities and limitations of large language models (LLMs). In other words, prompt engineer is classified as a category of new jobs will need human workers to teach AI systems how they should perform [4].

3.1.2. Synthetic data creators

Synthetic data creators are the people who design and elaborate synthetic datas usually for AI training uses. Synthetic data is artificially generated data compared with data based on actual events, but it's not "fake" data. It replicates the properties of real data without the troubles of capturing it, such as confidentiality, low-volume, or expensive-to-validate. With synthetic data, it's easier and less costly to train AI models.

3.1.3. AI ethical reviewer

AI ethical reviewers' main work is to audit AI systems and algorithms, assessing their compliance with ethical principles, including fairness, transparency, interpretability, and privacy protection. In AI recruitment systems, reviewers need to check whether algorithms are biased against specific genders or races. They ensure that AI adheres to privacy regulations like the General Data Protection Regulation (GDPR) during the processes of data collection, storage, and usage, avoiding data breaches and abuse. They also monitor the potential risks of AI technology applications in various industries, such as the safety risks of autonomous vehicles and the misdiagnosis risks of medical AI, propose improvement suggestions, and supervise their implementation.

3.1.4. AI-powered designers

AI-powered designers are the job that requires, on top of the existing professional knowledge base, having solid professional skills in areas such as graphic design, UI/UX design and product design. It also demands a mastery of fundamental knowledge like design principles, color theory and layout. In addition, one should be proficient in using various AI design tools, such as MidJourney, DALL-E 3 and Adobe Firefly, for image generation and design assistance. Meanwhile, an understanding of the

basic principles of AI algorithms is necessary to utilize AI tools and technologies to support the design work.

3.2. New skills requirement

With the application of automation and AI technologies, the demand for social-emotional skills and technical skills will increase significantly in the future labor market. Therefore, people need to craft new skills to adapt well in the Gen-AI era.

3.2.1. Social-emotional skills

Social-emotional skills are becoming more and more important. According to a report, Future Of Job Reports 2023, published on World Economic Forum, the core skills required by companies top 10 is completed by two attitudes relating to working with others—empathy and active listening and leadership and social influence – and quality control [4]. The ability to interact with others and serve others' feelings is particularly demanding when AI overshadows human intelligence to some extent. Therefore, the new skills requirement should cover the capability of empathy and people skills.

3.2.2. New technical skills

Technical skills intimately associate with particular jobs about AI, as shown in the previous section. Jobs like prompt engineers require employees to possess strong communication skills---you need very precise, logical human language for prompt engineering; Jobs like synthetic data creators require employees to be creative enough for content creation; Jobs like AI ethical reviewers needed to thoroughly and comprehensively understand the ethical considerations. Besides, the technical skills for AI using and foundational knowledge are commonly required among AI industry.

3.2.3. The combination of skills

However, both the social-emotional and technical skills are required when working in certain industry; abilities like lifelong learning also matter. For examples, in healthcare, practitioners need not only social-emotional skills, but also the use of digital systems; In the STEM field, the continuous development of technology requires practitioners to continuously learn new technical skills. Those who move from low-paying, declining occupations, with the ability to interact with people and operate digital systems, have more and better career options.

4. Considerations of AI using

The implement and usage of AI still remains considerations and challenges. When institutions attempt to practice it, they usually encounter issues of copyright, ethnics, and society.

4.1. Copyright

For copyright, the burning and recent news was that New York Times sued OpenAI and Microsoft over A.I. use of copyrighted work on Dec.27, 2023 [5]. The lawsuit, filed in Federal District Court in Manhattan, contends that millions of articles published by The Times were used to train automated chatbots that now compete with the news outlet as a source of reliable information. There comes to the question, the user of OpenAI could also learn the completed news published on NY times by asking ChatGPT without subscribing NY times' service, which definitely will be a loss for NY times. However, others would support the idea that the train of AI has nothing to do with the

instructions posted by the user; accordingly, the users, instead of OpenAI and Microsoft, should undertake the possible compensation to NY times.

4.2. Ethical problems

Ethical problems also confront the flexible development of AI. We hardly determine who should be responsible for the aggressive or even racist responses given by AI during dialogues.

4.3. Societal problems

If AI expresses discrimination and curses, which makes the user feel uncomfortable, the company could be accused, but the company might also not intend to do this. One frightening dialogue happened recently between AI and human was reported on Wednesday 20 November 2024 10:14, UK: Google's AI chatbot Gemini tells user to “please die” and “you are a waste of time and resources” [6]. Although there have been restrictions to the aggressive responses of AI, Gemini still expressed such curses. The last one possible issue is about the society. Some of the jobs will be certainly replaced by AI, and unemployment of those workers could trigger a series of social issues: some of the drivers replaced by autonomous vehicles might march on the street to threaten the auto company. Therefore, AI could also cause social unrest.

5. Conclusion

The productivity revolution led by AI has had a significant impact on society. Through analyzing the development history of AI and the existing data support, this paper focuses on analyzing the types of occupations replaced by AI, the new occupations born as a result of artificial intelligence, and the new skills required to adapt to the changes in occupations. Our main finding, which demarcates this paper from other scholars, is as follow: Different from previous productivity revolutions, while artificial intelligence replaces some occupations, it creates new employment opportunities for some non-professional or low-level labor forces. We have also found that AI mainly replaces some STEM occupations, such as big data processors, and some occupations involving simple interactions, such as online customer service representatives. We have also explored the specific types of occupations created by AI and the corresponding required skills.

6. Outlook

AI could create a transition of labor and skills demanded in the market, and every economy in the world should involve in facing such challenges, or seizing the opportunities. For individuals, it is necessary to learn those skills demanded in the AI era, and stay sanguine toward the future society; companies should adopt into the AI transition, considering train their workforce for these new skills; governments should focus on the education reformation related to these new skills and ethical AI development; policymakers could implement regulations to ensure AI will equally benefit the society while addressing concerns mentioned.

In the future, due to the new demand of skills and occupations, a large number of non-professional or low-level labor forces will step onto the social stage with the assistance of artificial intelligence. However, regardless of how society may be transformed by artificial intelligence, all components of society will make appropriate adjustments in response to these changes. Eventually, a state of societal balance will be achieved, and everyone will find their proper place in this new social landscape.

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