

Artificial Intelligence and Future Work

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Abstract: With the rapid development of technology, artificial intelligence (AI) is no longer a concept in science fiction but has become a part of our daily life and work. Also, the wide application of AI technology will have a profound impact on our future work, so in this paper, we discuss the impact of AI on the future work. Starting from the emergence, development and rise of AI, the functions of AI and its main features are introduced. Then, it analyses the mechanism of AI's impact on the job market, including the substitution of traditional jobs by automation, the emergence of new occupational fields, and the diversity of works and changes in the choice of employment modes, etc. It also combines specific occupations with targeted analyses of the impact of AI on various industries, about what new jobs have been created, how integration with traditional occupations can be achieved, and the new requirements for workers' skills. On this basis, in view of the changes in the job market, occupations and skills requirements of AI, corresponding opinions, suggestions and countermeasures are put forward in terms of the formulation of government policies, the adjustment of education and training tasks as well as the personal career planning of practitioners, so as to guide people to get ready for the work of the future.

Keywords: Artificial Intelligence; Future work; Job market; Replacement of traditional occupations; Emergence of new occupations; Specific skill; Government policy; Education and training; Personal career planning.

1. Introduction

Nowadays, with the rapid development of technology, artificial intelligence is no longer a concept in science fiction, but has become a real part of our daily life and work. From initial realization to widespread adoption, artificial intelligence has experienced a remarkable growth and even more penetration into people's work. AI, as a cross-disciplinary science, empowers machines to be able to learn, understand, reason and perform tasks in a way that mimics human intelligence. From intelligent assistants, personalized recommendation systems, autonomous driving technology, to medical diagnostic tools, there is hardly any field that is free from its influence. On the one hand, Artificial intelligence, with its outstanding innovativeness and intelligence, significantly broadens new career fields, creates new employment opportunities, enriches employment methods, and provides better choices for people's careers. However, in comparison with human labor, for its significant advantages of lower cost and higher accuracy, artificial intelligence is being chosen by more and more production operations which leads to a big negative impact on the job market. Therefore, the question about how to face the impact of AI on the further work and learn to co-exist with AI has become critical.

2. Overview of Artificial Intelligence

Understanding the development and mechanisms of artificial intelligence should be the first step in solving AI problems. Even though the history of artificial intelligence can be dated back to the middle of the last century, its early development was relatively slow due to the technical limitations. It only in recent years, with the explosion of computing power and the rise of big data, allowing artificial intelligence to flourish and solve more complex problems. Machine learning and deep learning are two important parts of the AI field, with the former enabling computer to learn from data and improve automatically, and the latter using deep neural networks to process and analyze complex data,

enabling AI to process large-scale datasets and extract patterns and features from them to make intelligent decisions [1]. With the complementary use of both, AI has been widely used and has made great achievements in various fields so far.

How to define the artificial intelligence is also not an easy question, which changes time to time with the research moves forward and the development of the technology. We can simply define the artificial intelligence as an intelligent software that embodies human-like brain functions, or if we look at it from a hardware perspective, AI can be understood as a robot that carries out the decisions made by the artificial intelligence engine behind it. And regarding the classification of AI, there are different classifications based on different standards, but I am going to cite the "capability-based" division of AI in this paper, according to which AI is divided into three levels, narrow artificial intelligence (ANI), general artificial intelligence (AGI), and the super artificial intelligence (ASI). ANI can mimic humans to perform specific tasks, however, cannot perform tasks that have not been programmed beforehand, therefore they cannot perform unprecedented tasks. AGI can be trained to learn, understand, and perform functions like a normal human being. These systems will have a wide range of functionality across different domains and will be able to react and improvise like a human being when confronted with unprecedented scenarios. This type of AI has currently no real examples exist, but a lot of progress has been made. ASI will be the most powerful form of intelligence on the planet and it can perform all tasks better than humans because of its extraordinary data processing, memory and decision-making abilities. However, some researchers worry about that the emergence of ASI will reach an uncontrollable stage that will lead to unimaginable changes in human civilization [2].

ANI is the only form of artificial intelligence in which humans have had partial success to date. It is an artificial intelligence that excels at performing single tasks, such as playing chess, making buying recommendations, sales and weather forecasting; some intelligence, such as translation engines, though very sophisticated, belongs to the narrow AI

either; self-driving car technology is also considered a narrow AI, or more accurately, a synergy of several narrow forms of AI. Although narrow AI can only work in very limited environments and cannot take on tasks that are outside its domain, even sometimes be referred to as "weak AI", this does not mean that narrow AI is inefficient. On the contrary, it is very good at handling everyday tasks, both physical and cognitive, thus, narrow AI is replacing, or has already replaced, many human jobs.

3. Impact of Artificial Intelligence

3.1. Impact on the Job Market

Having talked about the basic overview of AI, how then will AI impact the job market? First of all, the impact of AI on employment demand is significant yet controversial. ÷ Acemoglu and Restrepo's groundbreaking study used the International Federation of Robotics' information on the total number of robots adopted in each sector to estimate the impact of robots on

the employment situation in the United States from 1993-2007, comparing employment in 722 regions with local automation levels, and found that: for every one robot added, six jobs are lost [3]. However, on the other side, it has been argued that the efficiency benefits triggered by intelligent equipment may also in some cases lead to greater labour demand. Studies have shown that a 1 percentage point increase in the current level of automation in a factory raises employment by 0.25 per cent in 2 years and 0.4 per cent in 10 years [4]. It is easy to understand the substitution effect, as machines replace human labour to carry out work. But what is to be understood about the positive relationship between the level of automation and employment? One explanation is that the level of automation improves the competitiveness of the firm, which increases the market share of its products and needs to expand its scale of production and hire more employees. However, the feasibility of the explanation is not such perfect. This positive relationship between the level of automation and employment described above is analyzed from the point of view of a single firm, which employs more people as a result of expanding its scale of production, but when a country as a whole is viewed, it is unlikely that every firm will be able to increase its market share due to the general stability of the total market, unless the country is constantly expanding its international markets.

However, putting aside the impact of AI on the total demand of the job market, there is no doubt that the development of AI will create new jobs, since the "boundary stretching effect" of technological change. Boundary stretching refers to the expansion of the boundaries of the social work task as a result of the integration of certain technological innovations into the economy and society [5]. As the core driving force of the new round of industrial change, AI continues to penetrate into the economy and society, giving rise to new products, new technologies, new business and new industries. In terms of the entire economy and society, the development, proliferation and application of AI-related technologies can bring about the rise of new industries and new sectors, and thus the expansion of industrial boundaries. As far as social production tasks are concerned, AI expands the range of tasks that can be accomplished by humans by continuously extending human physical and intellectual capabilities, and the upper boundaries of production tasks of the whole society or

industry can be expanded, and the original tasks that are difficult to be achieved by human labour can be achieved under the auspices of AI technological innovations, so that new tasks will be created. From the enterprise or industry level, artificial intelligence will help us expand new business, open up new markets and generate new products.

The rise of artificial intelligence will also drive diversity in future career fields and changes in employment patterns. Individuals will have more opportunities to choose cross-disciplinary jobs, creating more possibilities for innovation and interdisciplinary. For example, data scientists may find work in a variety of fields such as healthcare, finance, media, etc., as data analysis is in demand in almost all industries. In addition, the forms in which people work will also change. With the widespread use of artificial intelligence and the widespread availability of the internet, people's work will no longer be limited by geography, and there will be an increase in the number of freelancers and teleworkers, who will be able to provide services to clients across the globe. Nowadays, career development is experiencing new trends, on the one hand, companies are more inclined to hire temporary workers to keep up with the rapid changes in the market, and employers will be more likely to join various project teams to work on different tasks and clients. Another emerging trend is the entrepreneurial spirit fueled by technological advances, with people trying to realize their creative and business visions by creating their own companies, and more people actively participating in the field of entrepreneurship and innovation, thus also shaping new career paths.

Some of the other impacts of AI on the job market are also noteworthy. British economist Alan Manning and others have found that the phenomenon of "employment polarisation", whereby employment is aggregated towards high and low skills, began to emerge in Europe at the end of the twentieth century, forming a "dumbbell-shaped" employment structure [6]. In response to this phenomenon, some scholars have proposed "task-biased technological change", which makes a pioneering distinction between routine and non-routine tasks, and points out that intelligent technologies can be substitutes for routine tasks and good complements for non-routine tasks, and that intermediate-skilled personnel are often engaged in routine production tasks. Furthermore, AI will also promote labor mobility. Automation has a substitution effect on the labour force engaged in routine production tasks, but the result of the substitution effect does not push this segment of the labour force out of the labour market altogether, but rather into other sectors such as services. Therefore, AI could help shift labor from secondary to tertiary sectors.

3.2. Impact on the Employment Position

Aside from the impact on the broader job market, what impact does AI have on employment position individually? Indeed, the fear that machines will destroy human jobs has been around for a long time. As early as 1589, when the stocking-knitting machine was invented, the laboring classes were unusually frightened of its consequences. Since the 1930s, economists have been concerned about technological unemployment, with Keynes writing in 1930, "We are being infected with a new disease, the name of which may not yet be known to some readers, but which will be heard frequently in the years to come, and that is technological unemployment [7]." Since then, a number of economists have researched this question. So for the time being, which industries and professions will be most affected by AI? At the end of 2022,

ChatGPT, a large language modeling AI technology, was introduced, impacting high-income and highly educated workers and triggering a hot debate on the topic of "machines replacing humans". On 19 July 2023, the National Development Research Institute of Peking University (NDRI), in conjunction with a third-party recruitment agency, released a professional analysis report, focusing on the analysis of the recruitment agency's desensitized job demand, job seekers' CV delivery data, as well as the questionnaire survey of job seekers and other multifaceted data over the five-year period from January 2018 to April 2023, and constructed for the first time an AI Impact Index for various occupations in China. The report shows that the 20 occupations with the highest impact index include finance/auditing/taxation, translation, sales operations, etc. The common feature of these occupations is that the work tasks contain more text processing, data collection and collation, etc., and these knowledge-based work tasks are the strengths of the large language model AI. While the 20 occupations with the lowest impact index include community/residential/domestic services, cooking/cuisine/food research and development, transport services, and hospitals/medical/nursing care, which share the common characteristic of having to deal more directly with people in the course of providing services. The report also gathered different views from the workforce on how AI will affect the jobs they hold in the next one to five years, with a higher proportion of respondents believing that the jobs they hold will be replaced by AI (nearly 50%) than those who believe that AI will boost their careers (more than 30%) [8]. And examples of AI replacing the human workforce are also playing out in reality. On 1 May 2023, the CEO of IBM Arvind Krishna revealed the shocking news in a media interview that "hiring in back-office functions such as human resources, which employs roughly 26,000 workers in non-customer-facing roles, will be suspended or slowed. Over the next five years, 30 per cent of these jobs will be replaced by artificial intelligence and automation, which means that about 7,800 people will lose their jobs at the company [9]." In another related report, Amazon Fires HR in Bulk, Replaces Human Recruiters With AI, Amazon has been trying to develop an automated applicant assessment system that will determine which candidates have the most potential to succeed, and then those candidates will be fast-tracked to office buildings and warehouses for interviews, and the software can also match the applicant's CV with Amazon employees currently working in the same type of position, to better help the recruitment tasks more efficiently [10].

However, while AI continues to replace the human labour force, on the other hand, the continuous development and application of AI technology has given rise to a number of emerging professions. On 23 September 2023, the World Economic Forum's latest publication, Jobs of Tomorrow: Large Language Models and Jobs, states that there will be a spurt of employment opportunities in the following three key areas: artificial intelligence training, interpretation and maintenance [11]. From the upstream and downstream of the AI industry chain, will be around the following categories of demand for the formation of new jobs. The first category is data, which is also known as the "AI's food" for training AI requires a large amount of data. At this level, people can pay more attention to high-quality data labelling industry, at present, the global data labelling industry has been about a few billion U.S. dollars in market size. The second is the chip industry, with the AI requirements for computing power and

chip scene needs, a series of special chips will be born, such as implantable chips, edge AI chips, portable chips, etc. will play a role in different scenarios. The third is the model level, many large manufacturers have released their own large model, which is very different with the traditional AI model, therefore, the market will have a great demand for large model learning and training talents. And the last one is the application layer, which is to achieve commercial realization through AI technology, such as toB and toC realization. Overall, the above analysis shows that the entire AI industry chain has a large market, and practitioners can combine their own professionalism, ability and interest to choose the appropriate track to expand employment channels [12]. In addition, there is also another emerging profession closely related to AI that is very popular, which is called "prompt engineer". This profession was created as a result of the inability of AI to unify with humans. Even though AI will have a very powerful general ability after training, it sometimes can not satisfy the users. For example, due to the inappropriate questioning of the user, the output of the big model is not the result that the users want, which is not a problem of the ability of the big model itself, but a problem of the use of it. Thus, in order to solve these problems, cueing engineers is required. Unlike algorithm engineers who need to understand the underlying logic of the model, cueing engineers are mainly responsible for aligning the cognitive ability of machines with that of humans, and building bridges between the two sides. Furthermore, the application of AI technology has also given rise to some other new service-oriented occupations, such as smart home installers and AI product salesmen, which are mainly involved in the sales, installation and maintenance of AI products.

In addition to the two scenarios of the replacement of traditional occupations and the creation of new ones, there is also a very important scenario of the convergence of AI with traditional occupations. We can deepen our standing of this combination by going through some examples. In the healthcare industry, AI can help doctors make treatment decisions by analyzing huge amounts of medical data and identifying the condition and cause of the patient's illness, as well as help doctors perform smart surgeries to reduce surgery time and risk. In the education industry, AI can provide teachers with targeted teaching suggestions by analyzing students' learning data to understand their learning styles and abilities, as well as provide students with virtual educational resources so that they can learn at any time and any place. In the financial industry, AI can identify potential risks and opportunities by analyzing huge amounts of financial data, helping investors with their investment strategies, financial companies to strengthen their internal management and regulatory authorities to carry out supervision effectively.

3.3. New Requirements for Employers' Vocational Skills

Undoubtedly, the major technological change of AI will challenge our vocational skills. So then let us take a look at what kind of vocational skills we should have in order to better adapt to the AI era, divided into two categories: "producers of AI products" and "practitioners of traditional occupations integrating AI products".

For the producers of AI products, the main professional skills required include language programming skills, data analysis skills, computer vision and image processing skills, and a strong mathematical foundation, etc. If we look at it from

a job perspective, it includes AI architects, machine learning engineers, data scientists, business intelligence developers and software development project managers. From a management point of view, AI producers also need to have the ability to discover market demand, not only to be able to capture and tap market demand, but also to be able to lead and stimulate market demand, to provide services for production and life with excellent AI products, and to help people to improve their labour efficiency and quality of life.

As for practitioners of traditional careers fusing AI products, the following competencies are important: Firstly, the ability to understand the AI products relevant to the career position is required in order to target the tools needed, such as the Amazon automated job seeker assessment system, which is mentioned earlier, is a typical application of AI products for HR positions. Secondly, practitioners are required to fully understand the functions, features and applicable scenarios of the AI tools so as to make better use of them. For instance, if we need to process a large amount of text data, we can use natural language processing tools, while if we want to recognize and classify images, we have to choose computer vision tools. Thirdly, the practitioners should also have the ability to adjust the settings and parameters of the tools appropriately. For example, when using machine reads Latino tools, we should adjust parameters such as the language of translation, vocabulary size and translation quality in order to obtain more accurate and natural translation results. And the last one is the ability to integrate and synergies different tools to meet more complex and diverse needs.

In addition, AI also requires us to think innovatively on a continuous basis. Many of the jobs of the future are closely linked to digital and intelligence, requiring us to be able to interact effectively with digital tools and technologies to maximize their potential. As AI can handle routine tasks, higher demands will also be placed on creativity and innovation, therefore, problem solving, designing new products, and coming up with innovative ideas will become highly important career skills. At the same time, the rapid development of technology requires us to keep learning and updating our skills to adapt to the ever-changing work environment.

4. How to Deal with Artificial Intelligence

4.1. State of the Artificial Intelligence-Humanity Balance

Technological revolutions arise from fundamental innovations that produce a "general-purpose technology" that will change the entire economy, which has three basic characteristics: first, they generate a large number of sub-waves of innovation; second, they are improved over time, leading to a reduction in costs for the user; and third, they are ubiquitous, spreading to all sectors of economic life [13]. To sum up, AI, with respect to its versatility, has demonstrated its strong substitution ability in many fields. However, on the other hand, there are still limitations to the realization of machines replacing human labour in the full sense, such as the lack of creativity and interpersonal skills. Researches show that when considering the heterogeneity of tasks in the profession, only 9% of workers in the United States are at greater than 70% risk of automation [14]. Or, on the level of social value, the replacement of human labour by machines also requires balanced and careful consideration.

But in any case, since the AI-driven changes in the job market are already happening, we need to prepare for both the present and the future. Therefore, in order to adapt to this change, the following are suggestions and countermeasures from three perspectives: government policies, education and training, and individual career planning.

4.2. Social Value Judgement and Government Policy Guidance

Even though Acemoglu and Restrepo argue that the substitution effect of industrial robots on labor is stronger than the complementary effect, the validity of this view may take a long time to be verified by facts. However, from a prudent point of view, it is necessary for the government to make some preparations in advance.

Firstly, technological progress should be appropriately channeled. While technological progress is unstoppable, the pace and direction can be chosen and lead. The government can establish laws and regulations to strength the supervision of AI technology, standardize its direction of development and scope of application, and avoid its excessive impact on traditional industries and the job market [15]. The government can also encourage enterprises and individuals to invest in the field of AI thought funding, taxation and reducing administrative approvals, thereby creating more job opportunities.

The second is to promote the optimization and mobility of human resources. The government can increase investment in vocational education and training to improve the professional skills and comprehensive quality of human resources so that they can better adapt to the job market in the era of artificial intelligence. Vigorous efforts have been made to develop the tertiary sector and to guide more of the labour force to move from the secondary to the tertiary sector [16]. At the same time, the government can also promote cross-regional mobility of talents through policy formulation and adjustments, so as to enhance the matching of supply and demand on a wider scale.

Thirdly, income distribution should be reasonably regulated and basic livelihood security should be strengthened. Thirdly, income distribution should be reasonably regulated and basic livelihood security should be strengthened. The primary purpose of employment is to ensure a stable livelihood. Even if a higher unemployment rate is brought about because of the impact of technological progress, if the unemployed can still obtain the necessary necessities of life through a reasonable distribution method, then the same function of employment has been fulfilled. There is a similar analysis in the preface of the book *The Wealth of Nations*. Its main example is that among the fishing and hunting peoples of the barbaric period, even if all those who have the ability to work, work hard, such a community is still very poor, on the contrary, in the civilized and developed countries, because of technological advances, the whole society produces a very rich raw product of labour to the extent that all the people in the society are adequately supplied, even the lowest. In other words, after technological advancement, the supply of goods will certainly become more abundant. Therefore, as long as there is a reasonable distribution policy, even if technological advancement brings about a higher unemployment rate, we can still cope with it [17].

4.3. Educate and Train to Help Human Adapt to The New Job Market in The Age of AI

As mentioned earlier, with the development of AI technology, a number of new careers are emerging. For example, there is a high market demand for occupations such as AI engineers, data analysts, and human-computer interaction designers, which require a high level of skills and knowledge. The government, educational institutions and enterprises should strengthen their cooperation and work together to develop education and training programmers adapted to emerging occupations in order to meet the demand for talents. At the same time, some traditional occupations need to be transformed and repositioned to meet new market demands by learning new skills and knowledge. So how could education and training help people adapt to the job market in the era of AI? The first is to establish a training system for AI-related skills which include knowledge of AI algorithms, machine learning, big data analysis and so on. Training institutions also need to combine these skills with those in other fields in order to train employable people with comprehensive skills. Secondly, occupational skill needs need to be reassessed. The development of AI technology will also lead to changes in the demand for many vocational skills, and education and training providers will need to make timely assessments of the new demand and adjust their training programs and directions to meet the changing market needs. Thirdly, the concept of “lifelong learning” should be promoted. Artificial intelligence technologies will have a lasting and far-reaching impact, therefore, it is important to encourage people to continue to learn and update their knowledge, which can be achieved by providing workers with e-learning, online courses and personalized learning programs. Fourthly, the cooperation between industries should be strengthened. Education and training providers need to work with industry to understand market demand and job trends, therefore, it can help education and training providers to develop more specific and practical training programs to better meet market demand.

Here, it worth to mention the issue of sharing the expenditure on vocational training costs. Enterprises, as market players and employers, naturally have to provide the support of necessary training fees for their employees. However, if we rely solely on the investment from enterprises, the incentive for enterprises to invest in training will be greatly reduced in view of the losses suffered due to staff turnover, therefore, I would like to suggest that the government should also increase its investment in training through subsidies and other forms of assistance, so as to jointly promote the formation of human capital in society. Becker in his 1964 book “human capital”, has such an elaboration about the problem of training and cost: he divided training into general training and special training. General training, that is, employees receive training to obtain knowledge, skills, not only useful to the enterprise, but also useful to other enterprises, this type of training, if the enterprise to bear all the costs, the enterprise may be due to staff turnover and loss; special training, mainly for the enhancement of the enterprise's productivity of the specialized training, due to the majority of the benefits of this type of training belongs to the enterprise to be trained, the enterprise is more willing to pay for it. Training related to AI technology, on the other hand, tends to be more of a general technology training, so sharing the cost through government subsidies is very important in

guiding the enthusiasm of enterprises for training [18].

4.4. Personal Self-Improvement and Career Planning

In an era where competition in the workplace has become fiercer, personal self-improvement and career planning have become increasingly important. In order to adapt to the intergenerational job mobility [19] and the job market in the age of artificial intelligence, we need to keep learning to update our knowledge and skills to keep up with the times. In fact, artificial intelligence, as a general technology, permeates every aspect of our careers, no matter whether we are in manufacturing, services, engineering, journalism, creative arts, or law, we may all need to leverage AI technology to provide us with better services. Therefore, we can not think of AI as just something for techies to learn about, but it is relevant to everyone — though of course, the content and depth of learning is different for different groups of people. For those who aspire to become experts in artificial intelligence engineering technology, it is necessary to systematically learn language programming, model design, data analysis, algorithmic reasoning and other knowledge, also a long-term planning is needed. For those practitioners who regularly use AI products for their work, it is important to develop a keen market awareness, keep track of cutting-edge AI products, and effectively integrate the products into traditional occupations and positions. As for those whose original jobs are likely to be replaced by AI, they should make early preparations to cope with the situation, like taking part in vocational training, upgrading their labour skills, so that to be get ready to look for new jobs.

In addition, the ethical and privacy issues posed by AI need to be taken seriously and managed better. On the one hand, the incorrect use of AI will raise relevant ethical issues [20], for example, recruitment of AI may lead to unequal hiring opportunities due to gender or racial bias in the training data. On the other hand privacy issues also raise concerns as AI systems can collect and analyze personal data without permission. Therefore, the government should adopt proactive policies to address the ethical and social issues posed by AI, including ensuring that privacy regulations are enforced, regulating the use of AI systems, and developing ethical guidelines to guide AI development and application. The role of governments is to promote AI technological innovations while ensuring that they do not harm society.

5. Conclusion

The impact on employment and the labour market is expanding and deepening as a result of the ongoing development and application of artificial intelligence technologies. Challenges and opportunities lie ahead. We need to pay sustained and in-depth attention to and study the impact of AI on the job market, occupations and skills demand, think ahead, plan ahead, formulate corresponding policies and measures to respond to technological changes, and achieve positive interaction and co-development between AI and human beings. Only in this way can we better meet the challenges of the AI era, capture opportunities and achieve sustainable economic and social development.

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