



**World Digital
Technology Academy**

Generative AI Talent Development Framework

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DigiBridge



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World Digital Technology Academy (WDTA)

WDTA is a new international research NGO established in Geneva, Switzerland, in April 2023, committed to becoming a leader in global digital technology innovation. Peter Major, Vice Chair and the 19th and 24th Chair of the United Nations Commission on Science and Technology for Development, is the Co-Founder and Honorary Chairman of WDTA, while the other Co-Founder is Academician Yale Li, a renowned international expert in digital technology and security. Supporting the United Nations framework, WDTA upholds the core principle of “Speed, Safety, Sharing” (3S). WDTA aims to expedite the establishment of norms and standards in the digital domain, lead innovation and research in digital technology, foster international collaboration, and stay at the forefront of technological advancements.

WDTA's 3S Philosophy

Speed: Research and innovation in digital technology must be agile and swift. The establishment of rules and standards in the digital domain should match the pace of technological development.

Safety: While advancing digital technology, due attention must be given to security and trustworthiness. Research and innovation in digital technology must mitigate security risks.

Sharing: The digital era necessitates global cooperation. WDTA, as a collaborative platform for research and innovation, ensures that no one is left behind and is committed to building a global community of destiny in the digital age.

WDTA's Vision

A global leader in digital technology innovation.



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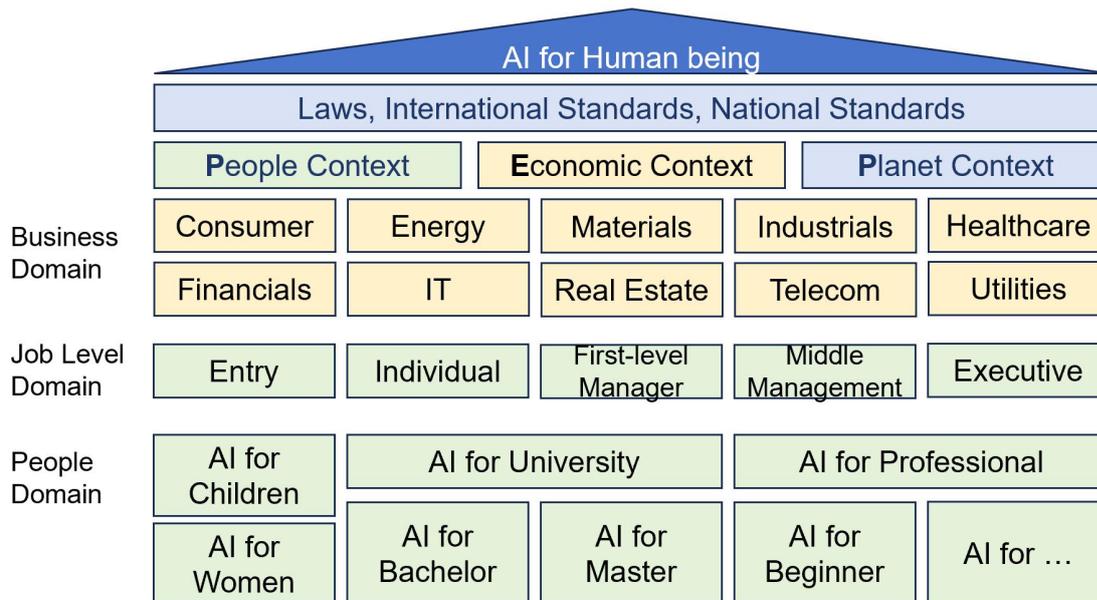


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Executive summary

In recent years, the capabilities of artificial intelligence have improved rapidly, and application scenarios have also become rapidly popular, gradually penetrating into people's work and life. Whether it's automatic translation on smartphones, autonomous driving in cars, and other features that meet consumer demands and expectations, the application scenarios of artificial intelligence are becoming more and more extensive.



Generative AI applications like ChatGPT, GitHub Copilot, Stable Diffusion, and others have quickly captured the attention and imagination of people around the world, thanks to their wide range of utility – almost anyone can use them to communicate and create – as well as more natural human-machine conversations. Even, the latest generative AI applications can perform a range of routine tasks in an employee's job, such as the classification of data, the generation of business reports, and even automated test code generation. A wide range of stakeholders are grappling with the impact of generative AI on business and society, and more people need to understand and participate, so as to form a consensus on the scope of AI capabilities, how to use it, application scenarios, and constraints, and truly "AI for Human being".

The rapid development of artificial intelligence has a wide and far-reaching impact on "People, the Economic, and the Planet" (PEP).

The first is the impact on the economy. Overall, the application of AI technology will boost productivity, which in turn will boost economic growth. Many business research institutions have made predictions on the impact of AI on the economy, and the main forecast indicators include GDP growth rate, market size, labor productivity, industry growth rate, etc. Most major business research institutions believe that, overall, countries around the world will benefit from AI and achieve significant economic growth. By 2030, AI will boost annual global GDP growth by about 12%. Among them, the automotive industry, transportation and logistics, manufacturing,



healthcare and life sciences, enterprise software and other industries will benefit more broadly. Taking the healthcare industry as an example, the frontier exploration of artificial intelligence, its development and advancement can help solve global medical frontier problems, such as the research of cancer treatment drugs using artificial intelligence and the analysis of the effectiveness of medical measures for Alzheimer's disease. News reports show that AI has reached or even surpassed the average of radiologists in terms of CT image-based disease diagnosis¹.

The impact of AI on all walks of life will be significant and far-reaching.

According to a McKinsey report [1], generative AI, through four types of value scenarios: customer operations, marketing and sales, software engineering, and R&D, is expected to contribute about \$7 trillion in value to the global economy. In China, around 50% of jobs are expected to be automated by 2030, which means that about 200 million workers (equivalent to 30% of China's entire workforce) will have to transform or upgrade their skills. Therefore, it is more urgent for practitioners from all walks of life to understand and use AI, and to master new skills and improve work efficiency in a digital and intelligent way.

As generative AI continues to evolve, businesses and workers must adapt and use it efficiently. Organizations must embrace the AI evolution and redefine jobs and develop new skills around the potential of generative AI. Similarly, workers must embrace lifelong learning and actively improve their skills in order to continue to thrive in an AI-enabled future.

The work ahead will also require us to re-examine the current education system. The talent of the future must be digitally literate to fully harness generative AI and related technologies. At the same time, it is important to focus on developing students' problem-solving skills and critical thinking, rather than simply memorizing knowledge.

Employees in different positions also have different concerns and demands for AI.

Practitioners in basic positions need to pay attention to whether their jobs can be easily replaced by AI and quickly develop their digital skills, ordinary employees need to continuously understand whether there are intelligent and automated means to improve their work efficiency, and managers at all levels need to optimize their organizational structure, explore AI practices, and improve operational efficiency around business transformation and skill transformation. Senior managers need to cultivate a global vision, be guided by business goals, expand AI scenarios, and innovate digital products and services to better serve customers and improve customer satisfaction.

Students of different ages and stages of growth need to master different AI capabilities.

¹ How AI is Transforming the Field of Radiology

<https://hbr.org/sponsored/2023/09/how-ai-is-transforming-the-field-of-radiology>



For K-12 students, it is important to understand the basic ideas of computers, understand common algorithms, understand the use scenarios of AI, and understand the impact on society. AI is impacting everyone, but only a small percentage of people today have the ability to decide how to design or implement it. Making AI accessible and inclusive through K-12 education ultimately helps create a more inclusive and equitable future.

For students at the tertiary level, in the era of generative AI, the dissemination of knowledge is still important, but it is even more important to cultivate interdisciplinary talents who have a deep understanding of AI theory and practice, and can not only develop cutting-edge research in the field of AI, but also be able to implement it in engineering.

One of the prominent challenges in this process is the rapid development of generative AI technology. ChatGPT was released in November 2022. Four months later, OpenAI released a new large language model called GPT-4, and text generation and conversational capabilities have improved by leaps and bounds. Similarly, Anthropic's generative AI Claude has seen a more than 10x increase in the number of input text tokens responded to in two months.

All of us are still at the beginning of our journey to understand the capabilities, prospects, and application of generative AI. This journey may be tortuous, thorny, potentially conflicting or unpleasant, but it is more important for all of us to work together to open up a beautiful new world of AI with an open and inclusive vision, a positive and upward attitude, and a mutual and friendly mind.

1. The development and application trend of AI

A look back at the four eras of the Industrial Revolution that have been experienced in human history. The first industrial revolution began in the 60s of the 18th century, with the invention and application of the steam engine as its typical symbol. The second industrial revolution began in the late 60s of the 19th century, with the invention of the first automated assembly line as its typical symbol. The third industrial revolution began in the forties and fifties of the 20th century, with the invention of the Internet and the popularization of computers as its typical symbols.

Today's world has entered the era of the Fourth Industrial Revolution.

The Fourth Industrial Revolution, which brings together **artificial intelligence (AI), robotics, the Internet of Things (IoT), 3D printing, genetic engineering, quantum computing,** and other technologies, will dramatically change the way people work, live, and play, and even the way the world does business.



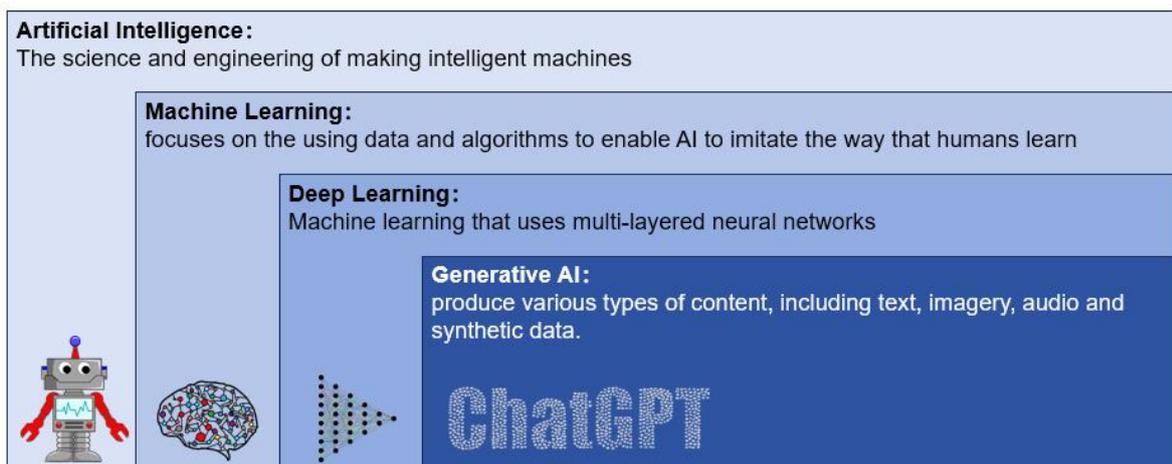
1.1 Research progress and application exploration of AI

In 1950, Alan Mathison Turing proposed the "**Turing test**" (a test to test whether machines can exhibit intelligence indistinguishable from humans), and the idea of making machines intelligent began to enter people's field of vision.

In 1956, the term **Artificial Intelligence (AI)** was officially used at Dartmouth College's Summer Symposium on Artificial Intelligence. This is the first discussion on artificial intelligence in human history, marking the birth of the discipline of artificial intelligence.

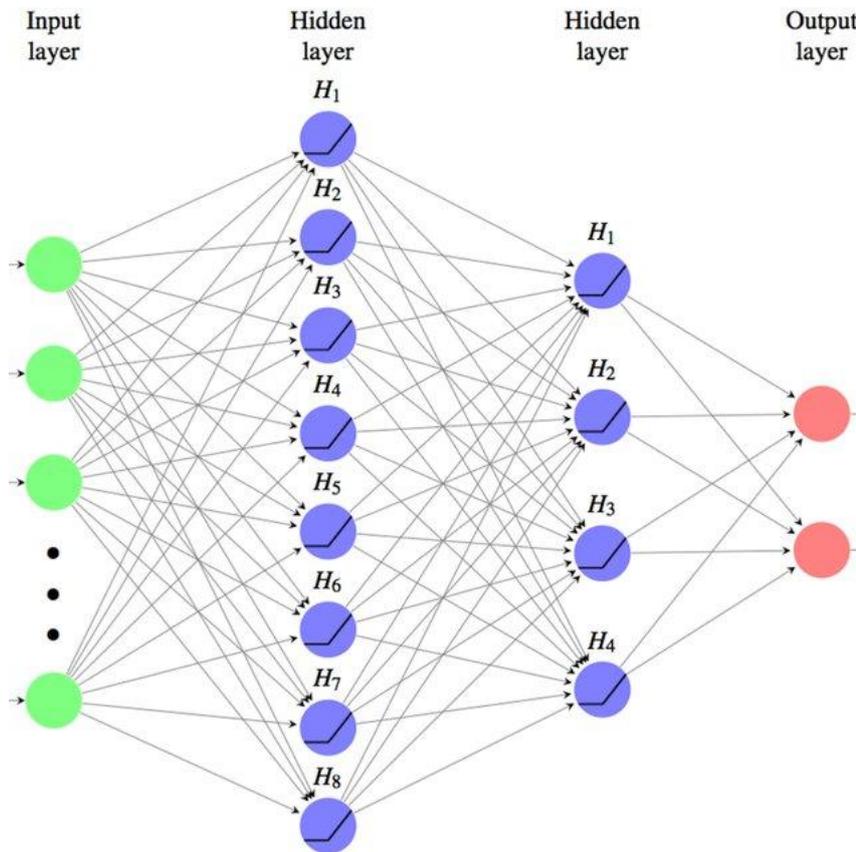
Since its birth, the field of artificial intelligence has not been smooth sailing, and there have been peaks and troughs at different stages.

In 1959, Arthur Samuel defined a clear concept of **Machine Learning**: Field of study that gives computers the ability to learn without being explicitly programmed.



In 2006, Geoffrey Hinton, a professor at the University of Toronto, Canada, a master in the field of machine learning, and the father of neural networks, and his student Ruslan Salakhutdinov published an article in the top academic journal *Science*, which proposed a solution to the gradient vanishing problem in **deep network training**: unsupervised pre-training initializes the weights + fine-tunes the supervised training. Stanford University, New York University, and the University of Montreal in Canada have become important centers for deep learning research, thus starting a wave of deep learning in academia and industry.

The concept of **deep learning** originates from the study of artificial neural networks, and its essence is to use multiple hidden layer network structures to learn the higher-order representation of the intrinsic information of the data through a large number of vector calculations.



In 2016, AlphaGo played a human-machine battle against Go world champion and professional nine-dan player Lee Sedol and won 4-1 on aggregate. AlphaGo is a Go AI program that works primarily on the principle of "**deep learning**".

1.2 The rise and popularity of generative AI

In 2020, OpenAI developed GPT-3, a text generation AI with 175 billion parameters of a natural language deep learning model that is 100 times higher than the previous version GPT-2, and which has been pre-trained with nearly 0.5 trillion words to achieve state-of-the-art performance on multiple NLP task benchmarks (answering, translating, writing articles).

In 2023, AI technology has made rapid progress, especially in the field of generative AI, leading a technological revolution. According to McKinsey's annual survey, 79% of respondents said they had been exposed to generative AI, and 22% of them confirmed that they had started using it routinely.

Up to now, among the application scenarios of artificial intelligence, those with rapid development, wide application and optimistic prospects are the first to recommend use cases based on natural language processing.



Natural language processing (NLP), the goal is to enable computers to understand and generate natural language text and extract useful information from it. Projections show that the amount of data created worldwide will grow **exponentially**². In 2025, the amount of data created will reach 175 zettabytes (1 zettabyte = 2^{70} b). In 2030, the amount of data created could reach 612 zettabytes, and in 2035, the amount of data could skyrocket to 2142 zettabytes. A large percentage of this data will be human-readable text. As a result, the ability to automate analysis, understanding, and even generation will greatly improve the efficiency of text processing and even business activities.

2. The impact of AI continues to grow

The rapid development of AI, especially generative AI, has had a broad and profound impact on people, the economy, and the environment.

2.1 People dimension

The vigorous development of AI will affect practitioners in all walks of life.

AI and robots may replace human workers in many roles, but not every job is created equal. According to PwC3, the first wave of automation will replace only a small number of jobs (about 3%), but by the mid-2030s, this proportion will increase to 30%. Jobs in the transportation sector are at greater risk, while jobs that require social, emotional, and artistic skills are less at risk. Pessimists believe that AI will indeed cause mass unemployment of human workers, and some possible solutions such as "basic income" and "AI value distribution system" have even begun to be discussed. Optimists believe that AI will create new jobs while replacing some of them, without causing mass unemployment. For example, in the second industrial revolution, the invention and popularization of the automobile took away the jobs of coachmen, but also created jobs for drivers and car mechanics.

The cooperation between people and AI is more likely to be the general trend of employment in the future.

It must be acknowledged that AI is fundamentally different from the transformative technologies of the past. Steam engines, electricity, and computers are more likely to replace humans in manual work and tedious and repetitive file tasks, while AI is able to take over human work in cognitive tasks, such as analysis, understanding, and decision-making, and the completion of these tasks seems to challenge the status of human beings as "spirits of all things" to a certain extent. Fortunately, at present, it is not yet known when the day will come when the general

² <https://www.statista.com/chart/17727/global-data-creation-forecasts/>

³ <https://www.pwccn.com/zh/services/issues-based/upskilling.html>



artificial intelligence that can fully replace humans to complete various tasks will appear.

2.2 Economic dimension

A September 2018 McKinsey report modeled the impact of AI on the global economy and made two key conclusions:

- **AI has great potential to contribute to global economic activity;**
- **AI has the potential to widen the gap between countries, companies, and workers.**

PwC's 2018 report, *The Macroeconomic Impact of AI*, estimates that global GDP will grow to \$114 trillion by 2030 on a baseline growth trend. Considering the development of AI, global GDP is expected to be 14% higher than this figure, which means that AI is expected to bring an additional \$15.7 trillion to global GDP. The report also predicts that the economies of China and North America will benefit the most from AI technology – AI will contribute 26.1% and 14.5% of GDP in China and the United States, respectively, in 2030.

As more and more work can be done by AI and the value of the wealth it creates, how to distribute this wealth fairly and effectively is also a question worth pondering for policymakers and economists. In such a possible unearned future, economic development may require a new paradigm that has never been seen before.

2.3 Planet Dimensions

The United Nations has called climate change "the defining crisis of our time" ⁴. Considering the role of AI technologies in the climate crisis has become a priority. Key mitigation pathways to avert a global environmental catastrophe include reducing emissions to zero by mid-21st century and limiting global average warming to 1.5°C. All companies will be under pressure to reduce their carbon footprint and minimize their impact on the environment. The mass adoption of AI can be a double-edged sword in this regard.

In late 2019, researchers at the University of Massachusetts Amherst estimated that the carbon footprint of training a single large language model was equivalent to about 300,000 kilograms of carbon dioxide emissions, equivalent to 125 round-trip flights between New York and Beijing. AI computing power, and all the infrastructure needed to support and deliver them, such as cloud networks and edge devices, requires more and more power and resources.

At the same time, AI technologies can help reduce the impact of the climate crisis, for example in smart grid design, developing low-emission infrastructure, and simulating climate change predictions. This technology has the potential to help companies understand how to build products, services, and infrastructure in a more energy-efficient way by identifying sources of

⁴ The Climate Crisis – A Race We Can Win <https://www.un.org/en/un75/climate-crisis-race-we-can-win>



waste and inefficiencies. Ongoing efforts to implement more green and renewable energy-powered infrastructure are also part of the push to deliver more sustainable AI.

AI can also be a driver of sustainability in other industries and areas of operations – for example, computer vision is used in conjunction with satellite imagery to identify deforestation and illegal logging activities in tropical rainforests, as well as illegal fishing activities in the ocean that affect biodiversity. The deployment of AI initiatives has the potential to solve some of the most pressing problems facing our planet – and not just to increase corporate profits.

3. The risks and challenges of AI

According to a 2023 ISACA survey⁵ of more than 2,300 digital trust professionals, 57% of respondents are very concerned about generative AI being misused by attackers, and 69% believe that attackers are more capable of applying AI than defenders (professionals in the organization's digital trust field).

According to the report, there are five key risks associated with the misuse of AI:

- the spread of misinformation/disinformation;
- invasion of privacy;
- Social Engineering;
- Infringement of intellectual property rights;
- Impacting existing positions in the organization.

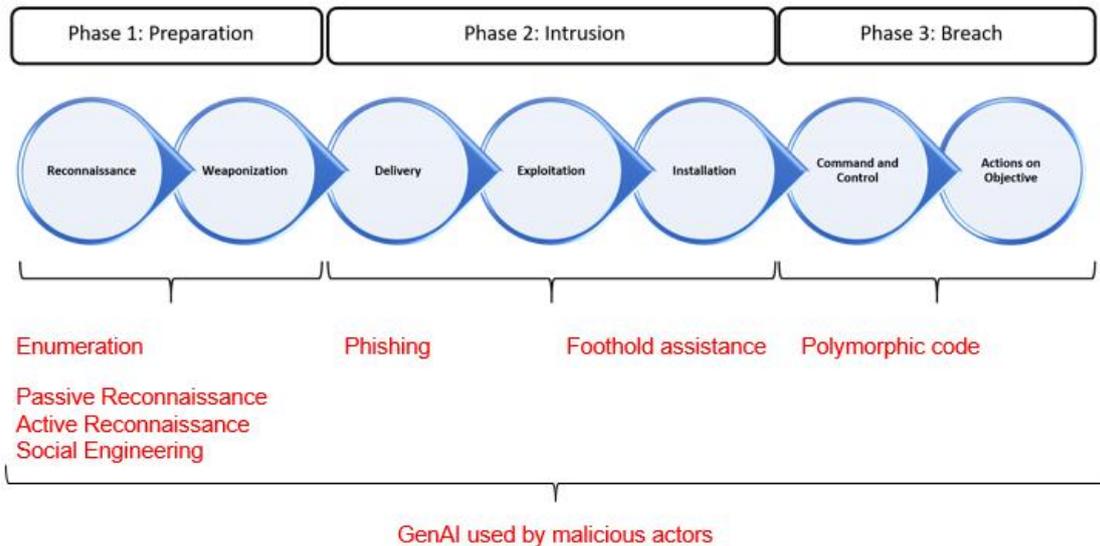
3.1 Cyber Security Risks

Generative AI can enrich an attacker's arsenal, automating the attack process, making the attack path more complex, and the attack more stealthy. CSA's "Security Implications of ChatGPT" white paper [3] describes 5 scenarios for generative AI to be used in cyberattacks. Specifically, generative AI has the potential to play a role at each stage of the Cyber Kill Chain.

⁵ ISACA Survey: Generative AI Training, Formal Policies in Short Supply for Most Organizations
<https://www.isaca.org/resources/news-and-trends/newsletters/atisaca/2023/volume-43/generative-ai-training-formal-policies-in-short-supply-for-most-organizations>



The Cyber Kill Chain



As AI becomes more powerful and accessible, so does the potential for AI abuse at various stages of cyberattacks.

In the attack preparation phase, attackers can use generative AI capabilities to perform active reconnaissance, such as directly probing target systems or networks to find vulnerabilities associated with specific technologies or platforms. Attackers may also perform passive reconnaissance, gathering information without directly interacting with the target system or network, and correlating analysis.

During the attack implementation phase, an attacker may use generative AI to automatically discover vulnerabilities or simplify the process of exploiting vulnerabilities or weaknesses to gain unauthorized access. Once established, attackers can further infiltrate the system, gather information, escalate privileges, or launch additional attacks to achieve their goals.

After a successful attack, the attacker may use polymorphic code or other means to bypass the detection of existing network firewalls or anti-virus software, so as to facilitate further lateral movement, privilege escalation, data theft and other attacks.

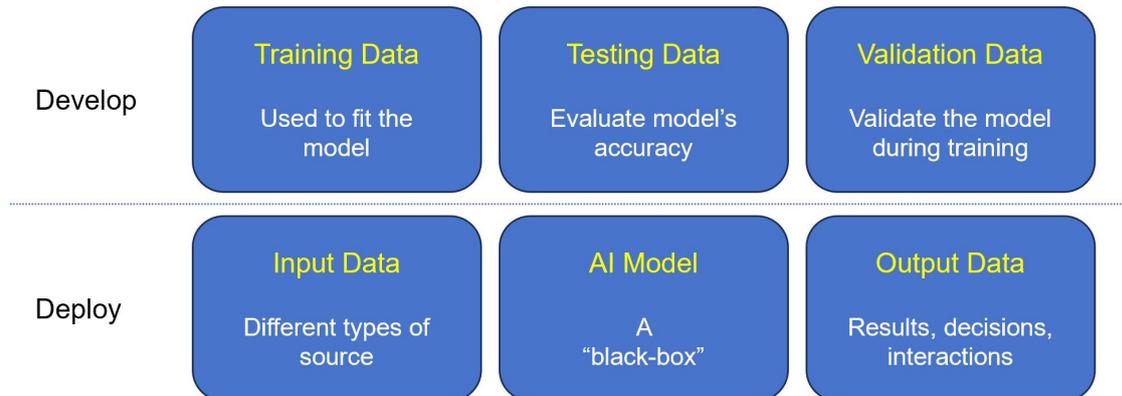
By studying how attackers can leverage generative AI, defenders can raise awareness of potential threats and emphasize the need for strong security measures and responsible AI development.

3.2 Privacy Risks

If left unchecked, generative AI and other AI technologies could severely erode individuals' privacy and other fundamental rights. Large amounts of personal data, including sensitive data, are already being used to train and develop AI applications. The variety of ways in which data is collected and processed further complicates the challenge of AI data.



At all stages of the AI life cycle, the collection, use, and transmission of personal privacy data may be involved.



For example, AI's training data and the model itself, which may include publicly accessible data scraped or extracted from third-party websites and social media. A paper⁶ published by Google, Stanford University, UC Berkeley, and others states that personal information (names, phone numbers) can be found in the dataset used for training by selecting and batching Prompts.

People often use speech recognition, text-based writing tools, and other common AI applications that can cause their own private data breaches. Individuals are faced with increasing electronic surveillance in the workplace. Emotion detection and facial recognition applications also continue to grow.

On the legal side, the implementation of the EU AI Act will have a significant impact on the development of AI technology. The bill takes a risk-based approach, imposing varying levels of regulation on different types of AI applications. This will force companies to reevaluate their AI projects, especially those that are classified as high-risk. The bill is expected to strengthen the protection of data use and privacy, impacting the operating model and revenue streams of AI companies. Fines are strict, and compliance costs can be very high.

3.3 Risks of Ethics and Prejudice

The output of AI, especially that of generative AI, carries ethical and bias risks.

Early concerns were the risks of algorithmic bias and fairness. On June 28, 2015, Google Photos' image auto-tagging feature incorrectly identified Jacky Alcine and friends as "gorillas" because they were Black. The reason for this is that the dataset used in which the system was trained contained very few African American photos. COMPAS is a widely used commercial procedure in U.S. courts to assess the likelihood that a defendant will become a repeat offender. In 2016, ProPublica's Julia Angwin found that COMPAS exhibited racial bias, although the program did not inform the defendants of their race.

⁶ Extracting Training Data from Large Language Models <https://arxiv.org/abs/2012.07805>



Deep learning models, as a kind of "black box", have a large number of nonlinear relationships between inputs and outputs, making it difficult to interpret the results of the output, which carries the risk of transparency. For example, an AI system that identifies skin diseases can actually easily classify an image with a ruler as "cancer"⁷, since pictures of malignant tumors often contain a ruler to show the proportions. When performing real-world decisions based on AI-based output, users need to be extremely concerned about whether anyone will be offended or harmed by the algorithm's decision. Many laws, regulations and regulatory requirements, such as the EU's GDPR, also reflect this principle.

Personalized search by search engines, content pushes on social media, and targeted advertising on shopping sites are designed to maximize user engagement, but at the same time they carry the risk of "filter bubbles"⁸. Users will be more likely to browse and interact with digital content that aligns with their opinions, cultural backgrounds, and ideologies, and will rarely see different facts, opinions, or comments.

Beginning in 2022, generative AI began to create images, audio, video, and text that were indistinguishable from real photos, audio recordings, movies, or human writing. Bad actors have the potential to use this technology to create a lot of misinformation or propaganda.

3.4 Copyright Risk

The rapid development of AI technology has brought a series of legal challenges, particularly on copyright and commercial licensing issues. For example, companies such as OpenAI, Microsoft and Meta use vast amounts of data from the web when developing their generative AI models, which often contain copyrighted works, sparking concerns and legal disputes among copyright holders.

According to a report in the New York Times⁹, some fiction writers, social media operators, news organizations, and actors, among others, have objected to the unauthorized use of their data by artificial intelligence. Companies including Reddit want to charge a fee for data access to AI, while some other protesters have even filed lawsuits against AI companies.

In some countries and regions, the principles of "fair use" are usually relied upon to defend the use of copyrighted content in AI model training. For example, fair use is an exception to U.S. copyright law that allows use without the copyright owner's permission, provided certain conditions are met, such as use, nature, quantity, and market impact. However, the applicability of this principle in the field of AI is still controversial. For example, Microsoft and GitHub are facing lawsuits over the use of unauthorized open-source code by their code generation tool, CoPilot.

⁷ Christian, Brian (2020). The Alignment Problem: Machine learning and human values. W. W. Norton & Company. ISBN 978-0-393-86833-3. OCLC 1233266753.

⁸ Filter Bubble https://en.wikipedia.org/wiki/Filter_bubble

⁹ <https://www.nytimes.com/2023/07/15/technology/artificial-intelligence-models-chat-data.html>



In 2024, we may see some court rulings on whether the use of copyrighted content when training generative AI models like GPT4 and Midjourney infringes intellectual property rights. However, litigation and controversy regarding this risk can be protracted and require industry-wide attention.

4. Laws, regulations and standards of various countries around the world

The global focus on AI security is growing rapidly. Governments around the world are actively exploring how to effectively regulate this emerging technology. Countries such as the United States, China, and the United Kingdom have all taken landmark actions in AI regulation.

The U.S. government issued an executive order in 2023 to advance the development and implementation of trustworthy AI. The order clarifies the strategic direction of the United States in AI governance and emphasizes the importance of an ethical and legal framework for AI. In addition, the United States has also cooperated with other countries, such as the International AI Safety Summit hosted by the United Kingdom, and signed the **Bletchley Park Declaration**¹⁰ with a number of countries to promote international cooperation and standards development.

China is also tightening regulations on AI applications and data security. The Chinese government has emphasized its concern about the ethical and social impact of AI technology, while also actively promoting the application of AI technology in economic and social development.

After Brexit, the UK began to develop its own AI regulation policy, trying to find a balance between promoting technological innovation and safeguarding the public interest. The UK's strategy focuses on supporting the growth of the AI industry while ensuring the sustainable and ethical development of the technology.

AI Index's analysis¹¹ of the legislative records of 127 countries shows that the number of bills that contain "artificial intelligence" that have passed into law has increased from 1 in 2016 to 37 in 2022. An analysis of parliamentary records on AI in 81 countries similarly shows that the number of references to AI in the global legislative process has increased by almost 6.5 times since 2016.

¹⁰ <https://www.gov.uk/government/publications/ai-safety-summit-2023-the-bletchley-declaration>

¹¹ "Measuring trends in Artificial Intelligence" <https://aiindex.stanford.edu/report/>



4.1 EU AI Act

The EU AI Act is a landmark piece of legislation that was adopted by the European Parliament on June 24, 2023, and officially entered into a tripartite consultation between the European Commission, the Parliament and the Member States to determine the final version of the bill. The bill is expected to come into force in the first half of 2024. The Act aims to provide a comprehensive legal framework for AI systems developed, sold, distributed and deployed within the EU. The bill features a risk-based approach to classifying AI systems and imposing appropriate regulatory measures based on different risk levels.

The bill classifies AI systems into four categories: unacceptable risk, high risk, limited risk, and minimal risk. AI systems with unacceptable risks will be banned, such as applications that violate basic human rights. High-risk AI systems, such as those used for critical infrastructure and the processing of sensitive personal data, will need to undergo rigorous compliance assessments and compliance checks. AI systems with limited and minimal risk face fewer regulatory requirements.

For high-risk AI systems, the bill requires companies to ensure data quality, maintain detailed technical documentation, conduct human rights impact assessments, and ensure transparency in operations. In addition, the bill imposes hefty fines of up to €30 million or 6% of global turnover on companies that violate the regulations, which is a significant financial risk for businesses.

The global impact of the bill will be significant. Similar to the GDPR, the bill will have extraterritorial effects, affecting all international companies that provide products or services in the EU. Companies must adapt their products and services to comply with the new regulations, which can lead to increased compliance costs, especially for developers and suppliers of high-risk AI systems.

Overall, the EU AI Act is expected to have a profound impact on the development of AI technology on a global scale, promote the responsible use and sustainable development of AI technology, and provide a reference model for global AI regulation.

4.2 AI regulation in the United States

As of January 2024, 16 U.S. states have passed laws covering the use of AI¹², and a number of other state legislatures are in the legislative process.

The White House has released a blueprint for an AI bill of rights. Meanwhile, leaders at Microsoft, Google, and OpenAI have all called for AI regulations in the United States, while the U.S. Chamber of Commerce, which often opposes business regulation, has called on Congress to

¹²

<https://www.cio.com/article/2081885/the-complex-patchwork-of-us-ai-regulation-has-already-arrived.html>



protect human rights and national security as AI use expands.

California is a major focus for businesses because of its population and the size of its economy. Senate Bill 1047, introduced in the California Legislature in February, requires AI products to be tested for safety before they are released and requires protection against safety harm to derived models.

Connecticut lawmakers are considering Senate Bill 2, which would require organizations deploying AI to make corresponding "high-risk" decisions to develop risk management policies. The comprehensive SB 2 will also require organizations deploying AI to take reasonable steps to protect state residents from algorithmic discrimination, and require companies using AI to notify affected people when AI tools make major decisions.

The proliferation of state laws regulating AI may lead businesses to carefully choose their deployment strategies with an eye toward compliance, particularly transparency, ethical use, and privacy protections.

4.3 International Cooperation

International cooperation is essential in promoting AI security. Due to the transnational nature of AI technology and its potential global impact, the efforts of a single country may not be enough to address all challenges. International cooperation can help establish common standards and principles, facilitate information sharing, and coordinate regulatory measures to effectively address cross-border issues posed by AI, such as data privacy, algorithmic bias, and security risks. For example, agencies such as the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) are working on AI standards development, which can contribute to harmonized regulation and technical harmonization on a global scale.

5. Application of AI in vertical industries

McKinsey's latest annual global survey¹³ on the state of AI confirms the explosive growth of generative artificial intelligence (Gen AI) tools. Artificial intelligence has risen from the topic of technical people to the focus of company leaders. Nearly a quarter of executives surveyed said they are personally using AI tools for their work. More than a quarter of respondents from companies using AI said AI is on the board's agenda. In addition, 40% of respondents said that their organizations will increase their overall investment in AI due to advancements in AI.

¹³ McKinsey Global Survey: <https://www.mckinsey.com/featured-insights/mckinsey-global-surveys>



5.1 Consumer Industry

The explosive growth of generative AI-based "agents" will cover every consumer need and business scenario. The application of large models based on multimodality is one of the potential growth points. AI voice interaction, as a more natural and convenient way of technical interaction, will not only be more integrated into people's lives, but also will become the core of new productivity tools.

5.2 Medical Industry

Generative AI can play a role in pharmaceuticals, medical products, and even disease diagnosis, chronic disease control, and more.

A McKinsey AI research report [1] states that generative AI could have a significant impact on the pharmaceutical and medical products industry by participating in drug development, accounting for 2.6% to 4.5% of the industry's annual revenue, or \$60 billion to \$110 billion per year.

In the not-too-distant future, AI may also assist patients in making basic analytical diagnoses, providing recommendations on health issues, and helping healthcare professionals make decisions or improve work efficiency. This is especially helpful in developing countries and regions, where many populations do not have access to the health care they need.

5.3 Agriculture

With the development of agricultural automation, AI will also play a more important role in agricultural development. Broadly speaking, the application scenarios of AI in the agricultural field can cover the entire flow from production planning to terminal sales.

With the help of AI analysis of historical data and current trends before agricultural production begins, producers can predict market demand and then plan specific crops and planting scales, which can avoid disjointed production and marketing, resulting in economic losses and waste of agricultural products.

In agricultural production, planting strategies can be optimized based on factors such as greenhouse temperature, planting density, irrigation and fertilization, based on factors such as heat, ventilation and carbon dioxide levels.

After the crops are harvested, computer vision technology can efficiently carry out pre-sales quality inspection and classification of agricultural products, and can also use big data to analyze market conditions, which can help the operation of agricultural product e-commerce and guide enterprises to formulate more flexible and accurate sales strategies.



AI can also be used to improve crop varieties, such as screening and improving crop genes to improve taste, enhance insect resistance, and increase yields.

5.4 Manufacturing

Large-scale automated industrial production is the foundation of modern civilization and the basic guarantee of our way of life. AI can also take automated production a step further by automatically detecting the production environment, predicting possible failures, optimizing supply chains and production processes, dynamically adjusting output by analyzing market demand, enabling rapid customization of industrial products, and ultimately making industrial production smarter. That's exactly what AI is all about.

In the era of Industry 4.0, the Industrial Internet of Things will create a huge amount of data that needs to be analyzed, and at the same time, producers will need to respond to the production process in a timely and efficient manner. AI will play a pivotal role in such processes. For example, when optimizing logistics and supply chains, AI can dynamically adjust based on information such as market, road conditions, and weather. If there is a delay in delivery due to weather, the production department can also adjust production priorities in a timely manner to maximize efficiency.

5.5 Customer Services

While AI is revolutionizing agriculture and industry, it is natural that the service industry will not be missed, especially those that handle repetitive tasks, such as accounting, customer service, and consulting. As intelligent agents become more and more empathetic, we may no longer need to call human service when we call customer service in the future. Intelligent customer service is one of the most concerned and promising AI applications, and has been put into practical application by many enterprises, Google has even launched an AI-based Contact Center AI Platform¹⁴. According to Gartner, 85% of customer interactions will be managed by machines by 2020.

5.6 Financial Industry

In the financial sector, the application of artificial intelligence technology will also be further promoted. At present, AI technology has been widely used in the financial industry, including risk assessment, customer management, investment decision-making, etc. In the future, with the continuous advancement of artificial intelligence technology, its application in the financial field will be more intelligent and efficient, so as to provide people with better financial services.

¹⁴

<https://www.cmswire.com/customer-experience/google-says-it-reimagines-contact-center-customer-experience-with-new-solution/>



6. Goals of AI education

AI, as a key force driving the Fourth Industrial Revolution, is having an increasingly significant impact on the world economy.

For business leaders, better business growth can be achieved through the creation of new business forms, the provision of new digital services, and the improvement of labor productivity and operational efficiency.

For practitioners from all walks of life, it is very important for individuals and organizations to understand AI, use AI, master new skills, improve work efficiency, and better complete work tasks in a digital and intelligent way.

In the AI era, a large number of new jobs will be created: AI product managers, AI ethics experts, AI interaction designers, AI creative engineers, AI prompt engineers, AI evaluators, etc. Practitioners who dare to transform their business, embrace the future, and devote themselves to the wave of AI hope to become trendsetters in the new era.

For students who are still in the higher education stage, the value of traditional information acquisition and knowledge accumulation will gradually weaken in the era of large models, and the comprehensive ability to understand and solve business problems will become more and more important. This requires interdisciplinary talents who understand the basic theories and algorithms of AI, can engage in cutting-edge research and technological breakthroughs in the field, and can combine AI to do engineering implementation and industrial transformation. Looking to the future, the ability to ask key questions in the field of study will be key to differentiating thinkers from practitioners.

For K-12 youth, there is a high probability that they will be exposed to a new work environment and business model when they get to work. It is important to understand the basic ideas of computers, understand common algorithms, understand the use scenarios of AI, and understand the impact on society in advance. The ability to analyze, design, implement, and use AI should not remain in the hands of a few. Inclusive and ubiquitous AI can help create a more inclusive and equitable future.

In the dimension of "AI at the service of education", some changes are also taking place. Artificial intelligence is accelerating the integration of information technology and education. AI-based education improves the quality, efficiency, and equity of education, creating value for students, teachers, and the education system. Potential use cases include intelligent adaptive learning systems that truly "teach students according to their needs" and provide timely, personalized plans, tasks, guidance, or feedback to each learner.



6.1 For Industry Leaders in Digital Transformation

AI technology has become a top focus for Fortune 500 companies, and boards and management teams across industries are busy studying what this new technology means for enterprise businesses.

Forbes¹⁵ predicts that in 2024, it will be common for large enterprises to have a "Chief AI Officer" (CAIO) to lead their company's AI strategies and initiatives. This trend is similar to what happened a decade ago when cloud computing took off, when companies set up a "chief cloud officer."

U. S. President Joe Biden's executive order on AI requires every federal government agency to appoint a chief AI officer, which means that in the short term, the U.S. government will hire more than 400 new chief AI officers. This trend will become more and more evident in the corporate world as government departments move similarly in the field of AI. According to analysis, the number of "chief AI officer" positions on LinkedIn has grown from about 250 in 2020 to about 781 in April 2024.

Typical job responsibilities at a CAIO include:

- Provide AI leadership to effectively integrate AI capabilities into the business.
- Responsible for the company's AI strategy and alignment of business objectives.
- Transform and upgrade existing IT infrastructure for AI transformation.
- Works with CTO to advise internal and external clients on technology maturity.
- Work with the CFO to ensure the commercial viability of AI initiatives.

For the company, the appointment of a chief AI officer helps to show a good image of the company that values AI and promotes digital transformation. Internally, CAIO needs to fully collaborate with upstream and downstream related roles, give full play to its value in the long run, and be guided by business goals, expand AI scenarios, and innovate digital products and services to better serve customers and improve customer satisfaction.

6.2 For Digital Transformation Practitioners

The digital transformation of various industries, as well as the investment and innovation of AI, can be analyzed from the following six key areas ("DICEST") to extract the maximum value from the business. Among them, **DIST** plays an important role in the large-scale adoption of artificial intelligence. Adapting to **compliance** requirements and **ecosystem** collaboration are two key areas that form the basis of a company's go-to-market strategy.

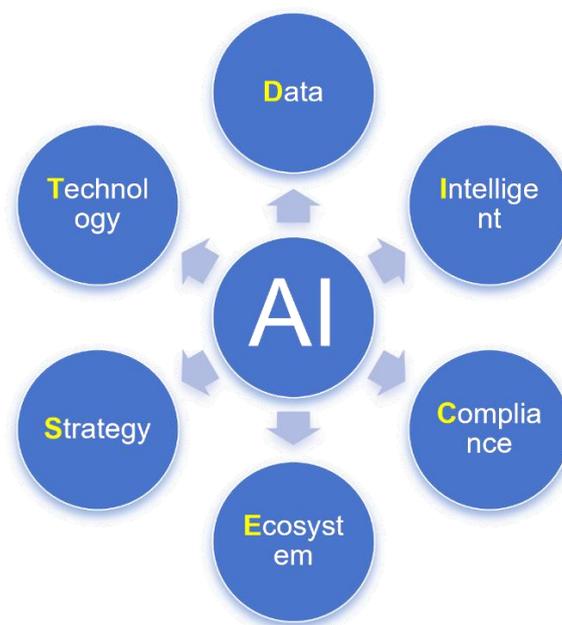
The first is **Data**. Digital transformation and artificial intelligence are both data-based.

¹⁵ 10 AI Predictions For 2024, Forbes



High-quality data must be reliable, accessible, usable, and secure. Enterprises should integrate data flows, establish data dictionaries, and establish data governance processes based on their own business to make better use of artificial intelligence.

The second is “**Intelligent**”. The success or failure of an enterprise's AI project depends on the cooperation between practitioners in the business field and experts in the AI field. Accurately proposing problems in the business field and "translating" them into AI solutions requires practitioners in the business field to understand the professional knowledge of AI to a certain extent, and AI experts need to gradually develop good management and communication skills, and at the same time gradually become familiar with the business and understand the demands of the business. For most companies, it is neither economical nor possible to replace the majority of employees who do not meet the requirements of the AI era. Therefore, it is extremely necessary to train existing employees in AI skills to improve the productivity of enterprises.



As companies invest in AI and expect to reap the benefits, they also need to be aware of general and industry-specific laws, regulations, and regulatory requirements.

For upstream and downstream parties in vertical fields, they can cooperate and define and optimize new business standards or protocols, so as to better coordinate development and seize the development opportunities of artificial intelligence.

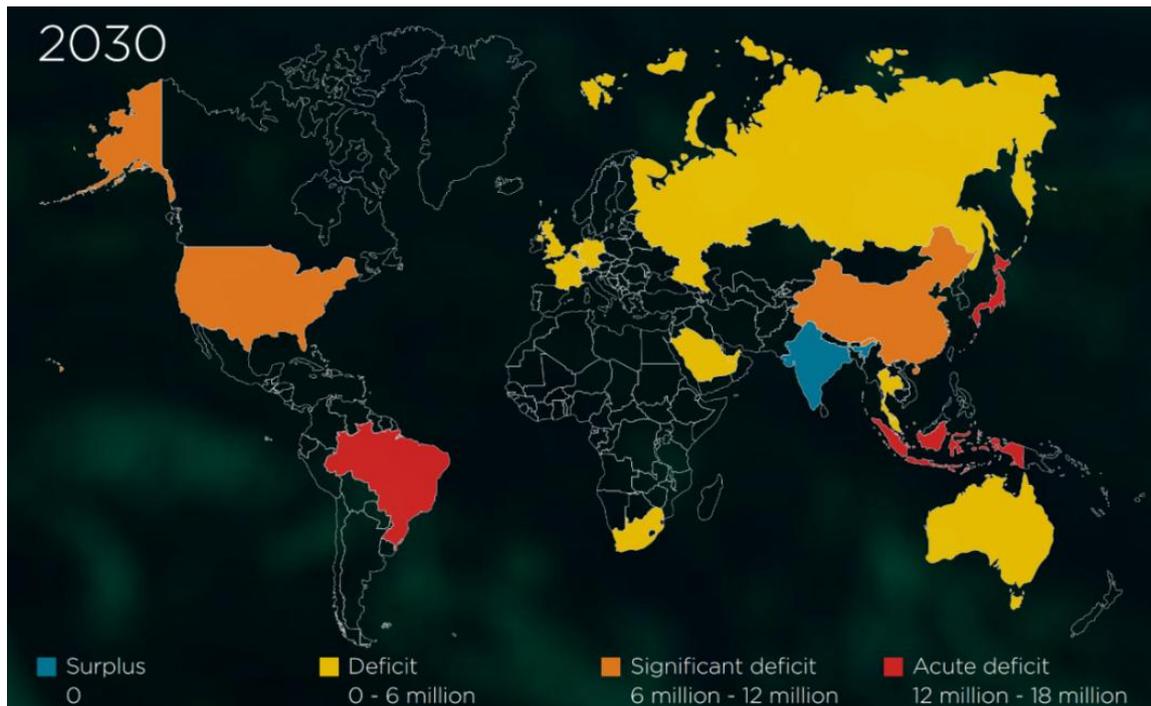
Technology maturity and enterprise strategic planning are also necessary for digital transformation and AI investment and innovation.

The value and importance of the above six factors vary slightly for different industries. For example, in the healthcare and life sciences industries, regulatory requirements need to be taken into account.



6.3 Existing positions: Embrace AI transformation and improve capabilities

According to the World Economic Forum, the worldwide labor skills shortage is predicted to reach 4.3 million workers and roughly \$450 billion in unrealized output by 2030 – and that’s in the technology, media and telecommunications (“TMT”) sector alone.



As we prepare for the future, it is imperative to bring our current workforce along with us. Effective reskilling programs are in high demand by anxious workers. A recent study found that 38% of employees believe their skill set is redundant now or will be in the next four to five years.

The Wall Street Journal recently reported¹⁶ that many reskilling efforts fail because companies do not know how to reskill employees or what skills are even needed. By the time the issue is identified, it may be too late. Today's business leaders should pay more attention to this area.

We need to collectively consider ways to bridge the widening skills gap. Fortunately, there is no shortage of capable individuals to meet future talent needs. However, it will require collaboration among businesses, governments, and academia, with a sense of urgency, to create opportunities

¹⁶

<https://www.wsj.com/articles/the-answer-to-your-companys-hiring-problem-might-be-right-under-your-nose-11555689542>



for current and future talent worldwide.

As mentioned above, for the existing types of jobs, seizing the opportunity in the wave of AI change, improving capabilities, can better adapt to business transformation, and create greater value for individuals, organizations, and even society.

Take, for example, the application of AI to the software development life cycle.

Gartner predicts that by 2027¹⁷, 70% of developers will use AI-based coding tools, up from less than 10% in September 2023. The industry has developed best practices in the following areas for practitioners to refer to and adopt.

Use generative AI to write and understand software code.

Specialized generative AI code generation tools, such as GitHub Copilot, Amazon CodeWhisperer, and Google Codey, can be evaluated and selected in a focused manner.

General-purpose large language models (LLMs), such as ChatGPT and Google Bard, require careful trade-offs. This includes the risk of leakage of prompts and code.

AI code generation assistant plug-in in the IDE environment to speed up coding and building.

Through conversational interactions, AI can translate the rough sketches of software requirements and interface designs from developers into actual applications.

Deploy AI-powered coding tools.

OpenAI's ChatGPT offers the ability to convert programming languages. That is, converting a piece of code from one programming language into another. It's quick and easy, but it requires careful analysis for accuracy.

Use generative AI to explain, detect, and measure technical debt and its impact.

Technical debt stems from various trade-offs in software application architecture, design, and development. Some of these designs may not be applicable to today's realities and therefore become technical debt. Generative AI can be used to detect and measure the source of technical debt, and visualize the impact, risk, and effort required for remediation.

Use AI to meet user expectations for AI products and services.

User experience (UX) designers deliver products based on users' growing expectations for AI-driven products and services. It is still worth paying attention to whether the interface based

¹⁷ Set Up Now for AI to Augment Software Development

<https://www.gartner.com/en/articles/set-up-now-for-ai-to-augment-software-development>



on conversation prompts will become the mainstream of human-computer interaction.

6.4 New Jobs in the AI Era: Embracing the Future

As AI continues to permeate industries, we can observe two employment trends:

- AI upskilling refers to the process of learning new skills and knowledge related to AI to improve one's job performance or career prospects;
- **New AI jobs are emerging;**

According to a World Economic Forum white paper Jobs of Tomorrow: Large Language Models and Jobs¹⁸, several kinds of jobs, “**trainers**”, “**explainers**” and “**sustainers**”, will be created with the spread of generative AI.

Trainers are mainly the people developing AI. This includes engineers and scientists working on the large language models (LLMs) on which generative AI tools such as ChatGPT depend. But specific roles in this area don't just belong to programmers designing more efficient algorithms. Electrical engineers could see a rising number of opportunities thanks to demand for customized microchips to train and run LLMs, the Jobs of Tomorrow report says.

While trainers are doing the behind-the-scenes work on AI, explainers will be the people making AI easy to use for members of the public. **Explainers** will design the interfaces that enable people to interact with AI. They can be thought of as “user experience designers” for LLMs.

Explainers could be involved in making LLMs work with different kinds of user inputs. Some may work with typed commands, while others will respond to the spoken voice. Other explainer work could involve creating LLMs tailored to particular tasks. This could lead to the development of personalized AI assistants, tutors or coaches.

Sustainers will essentially make sure that AI systems are being used in the best way possible. There are likely to be three main types of sustainers, according to the World Economic Forum report: content creators, data curators, and ethics and governance specialists.

Specifically, the rise of generative AI can create the following jobs.

¹⁸ <https://www.weforum.org/agenda/2023/09/jobs-ai-will-create/>



Jobs emerging from the adoption of large language models



Large language models (LLMs) will transform collaboration between humans and AI, reshaping job roles. While outcomes remain uncertain, potential new job areas could emerge with LLM adoption.



AI Model and Prompt Engineers



Interface and Interaction Designers



AI Content Creators



Data Curators and Trainers



Ethics and Governance Specialists

6.5 Higher education (Education ^ AI)

The rapid development of artificial intelligence, especially generative AI, will reshape the education system and the learning experience.

The impact of AI on the education industry can even be described as a "power effect".

In terms of the size of the teaching object, from 2010 to 2021, the number of graduates from U.S. universities specializing in AI almost doubled to 19.1%, according to research by Stanford HAI. As the impact of generative AI on the labor market becomes apparent, the number of higher education graduates working in AI-related jobs will grow exponentially.

In terms of the opening of AI majors, take Chinese universities as an example. In 2018, Nanjing University took the lead in opening the first complete undergraduate education and training system for artificial intelligence in China. In just a few years, a total of 470 colleges and universities have offered artificial intelligence majors, which is an emerging popular major.

In terms of the effect of AI-empowered education, AI can relieve teachers from heavy daily management work, better focus on students' learning, and achieve better teaching results. A



Microsoft study¹⁹ found that 99.4% of educators believe that AI will play an important role in a school's competitiveness, and even 15% believe that AI is a "rule changer."

However, we should also note that the potential of technological automation is gradually increasing, the needs of the labor market are changing, and the pace of workforce transformation is accelerating. What will the future of work look like in terms of occupations and skills, what does it mean for workers' career planning, and can a degree certificate not only serve as proof of knowledge and learning skills, but also be more suitable and adapt to the expectations of society, society and employers in the AI era?

The World Economic Forum [2] agrees: "In almost all industries, the impact of technological and other changes is reducing the shelf life of employees' existing skills." Unless we act today to evolve it, there will be a shortage of talent to manage, shape and lead the change that is underway. Companies will need to put talent development and future employee strategies at the forefront and center of development. Businesses are no longer passive consumers of human capital. They need a new mindset to meet their talent needs. ”

Therefore, the cultivation of talents in higher education, especially the cultivation of professional talents, also requires the active participation of enterprises to avoid the disconnection of knowledge and skills with society, and better cope with the great challenges for the workforce in the era of generative AI.

6.6 K-12: Understanding and Using AI

At present, courses related to artificial intelligence are usually offered at the higher education or professional education level. However, as AI becomes more widespread, it is becoming increasingly necessary to offer courses in AI at the K-12 level.

Interest in K-12 AI and computer science education is growing in every country and region around the world.

According to research by Stanford HAI, in 2021, U.S. students took a total of 181,040 AP computer science exams, a 1.0% increase from the previous year. Since 2007, the number of AP computer science exams has increased by a factor of 9. As of 2021, 11 countries, including Belgium, China, and South Korea, have officially approved and implemented K-12 AI curricula.

6.7 Inclusive Education: Deepen understanding and avoid misunderstandings

Inclusive AI education should be provided by AI researchers and industry experts in cooperation

¹⁹ <https://www.technologyreview.com/2020/03/04/905535/unleashing-the-power-of-ai-for-education/>



with communities and educational institutions in a free and public interest manner. It's best to include both online and hands-on sessions. Let more people understand the capabilities, application scenarios, best practices and limitations of AI, and potential risks. If the public has access to accurate information about AI, suspicion and distrust will be reduced, which will help promote the development of the AI industry.

7. Industry practices in AI education

A number of well-known Internet vendors, AI service providers and infrastructure providers, as well as well-known universities and research institutes, provide AI education, training and certification courses at different levels, different scopes, and different target audiences.

7.1 Amazon AI Ready

AWS research found that:

- 73% of companies say hiring AI talent is a top priority, but three-quarters of them say they can't meet the demand for AI talent.
- If employees are equipped with AI skills, their salary levels can increase by 47%.
- AI will become an integral part of the way business is done, with 93% of businesses expecting AI solutions to be deployed across their organization in the next 5 years.

That's why AWS launched an online training program called 'AI Ready'²⁰ in late 2023 to equip technical and non-technical people with the necessary AI knowledge and skills to meet the challenges of the AI talent shortage. The plan aims to provide free artificial intelligence (AI) skills training to 2 million people worldwide by 2025.

The "AI Ready" project consists of three initiatives:

- Centered on 8 free AI online courses, with a focus on the field of generative artificial intelligence (Gen AI), targeting technical and related workers;
- partnered with Udacity, an online learning platform, to launch a new Amazon Web Services (AWS) Gen AI scholarship;
- Collaborate with <http://Code.org> to help students understand Gen AI.

²⁰ <https://www.aboutamazon.com/news/aws/aws-free-ai-skills-training-courses>



7.2 Microsoft AI Learning Hub

Microsoft offers an AI education platform²¹ designed to provide business leaders, AI practitioners, developers, and engineers with AI-related training and courses to upskill and drive successful AI transformation.

Microsoft provides different training and learning content based on the different needs of the organization.

For business leaders, for example, Microsoft provides the knowledge and resources to facilitate the adoption of AI in enterprise organizations. The curriculum covers things like strategic planning, implementation strategies, and scalability, and is tailored to different industries such as health, finance, retail, manufacturing.

Depending on the role in the organization, Microsoft also offers customized training and learning content.

For developers, for example, Microsoft offers comprehensive training courses on building AI solutions and applications. For IT specialists, Microsoft offers training courses on how to deploy, implement, manage, and maintain the infrastructure for AI solutions.

Based on different AI technology fields, there are also different training systems.

For example, deployment and customization based on Azure OpenAI, efficiency improvements in content creation based on Copilot for Microsoft 365, and even responsible generative AI.

Microsoft is also actively leveraging the power of industry and community to integrate resources, connect networks, and promote innovation.

8. References

[1] McKinsey. The economic potential of generative AI: The next productivity frontier. June 2023.

[2] “The Future of Jobs”, World Economic Forum, Jan. 2016

[3] Security Implications of ChatGPT. Cloud Security Alliance. Feb. 2023

²¹ <https://learn.microsoft.com/en-us/ai/>

