

# The Economic Impact of Artificial Intelligence in China And US

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**Abstract.** Given the recent rise and popularity of ChatGPT along with many working robots and technology in general many questions have been raised. There is an ongoing concern about the security and privacy of society, whether AI will have complete control of it. Many different flaws and problems with the AI industry may initially be the concern of many: however, this paper is here to say those issues are not addressable without the innovation and the help of experts in the “AI arms race” as it has been labelled. The sudden surge that China has approached the industry as well as the already dominant US expertise creates a tense and desperate attempt to obtain superiority. Although the industry may be looked down upon as a breach of privacy, many big companies have invested large sums of money to develop the newest cutting-edge technology and aims to help economic growth through the production of AI. Jobs are being threatened through the development of the AI industry and the US and China are trying to mitigate the impacts whilst also finding the new talent and innovation necessary to move forward.

**Keywords:** Artificial Intelligence, innovation, security, privacy.

## 1. Introduction

In this paper, the goal is to clearly establish how the industry of Artificial Intelligence (AI) is on the rise: whilst the two leaders in the industry in China and the US are both hoping to achieve superiority. The scope of view and the way the pattern of trade will largely be dependent on the development of Artificial Intelligence technology. This paper aims to compare development in AI in China and the United States by examining the state of the industry at present, its policies, and its outlook. The incentive to control geopolitics and economics with the result of winning the competitive arms race has become enough of a reason to enter a fully-fledged Artificial Intelligence arms race. Recently in an interview the Chief Executive Officer (CEO) of Google said that “AI is one of the most profound things people are working on as humanity”. This quote in itself shows people the rise of AI and the use it can be towards sustaining society. The revolutionising part of AI is how much it can affect human lives: the way it can process data and output it is far superior to any human capabilities. The original dreams of autonomous cars and virtual assistances have become a reality and humanity seems to be benefitting from it. Machine learning, as it is described has enabled computers to learn and analyses data effectively and efficiently. The rise of machine learning makes the possibility of finding cures for diseases or other things much more possible given humanity has the technology to help people. Although currently AI does not have a human’s conscience there are some concerns that developing feelings and a genuine conscience may prove to be humanity’s downfall. Inevitably, many people are worried about the rise of AI and the effect it has not only on labour jobs or any other type but also for the privacy and safety of the world population. The artificial intelligence industry is dominated by the USA and China, as is with many up-and-coming industries. When purely talking about the idea of technology between the two powerhouses, many might say that the US has the upper hand and have a slightly more advanced area for this industry. However, many also understand the rising power that is China; given its huge population and industrious workforce will it be able to overthrow the kings of technology? The purpose of this paper is to show not only the current state of development in both the global powerhouses but also the impact of AI on the employment and labour market. Also, the impact of technology and AI could have on not only the medicine industry but the entirety of economies and how much it can contribute to a country’s Gross Domestic Product (GDP) especially given the tight competition between the United States and China.

However, the competitiveness, the drivers and other impacts that the arms race can have on the global markets and the individual enterprises of the US and China.

## **2. Background**

### **2.1. Introducing the Industry**

The technology industry and further the AI industry is very varied in opinions across the globe. Many people will ask the same questions of whether AI will become smart enough to eventually overthrow humans or in the nearer future: whether they will replace teachers or other jobs and possibly reinvent the modern world. For many, the race that has been labelled the “AI arms race” [1] and will apparently be one of the keys turning points in modern history. The threat that AI poses along with the impact on all different types of industry and job opportunities is large in that it will transform how the world works. Google CEO Sundar Pichai has said previously that “AI is one of the most profound things people are working on as humanity. It’s more profound than fire or electricity.” [2] Although humankind has made life much more convenient through the development of technology and AI, there are flaws in the development of them. The main concern of society is the national security and the possibility that the AI may form a conscience: and inevitably possibly trying to overthrow its creators.

### **2.2. AI in China**

In China, technology itself has found a huge rise and has become essential for the Chinese middle class and all throughout China. Furthermore, becoming the global leader in e-commerce, mobile payments and gaming: China are looking to make advancements on the US in the AI industry as well. As it stands, China are well known for producing a lot of AI technology but no big innovations yet. However, there are plans for lots of money to be pumped into the development of AI. Specifically, in terms of artificial intelligence projects \$15 billion is planned to be spent on projects by China, which is an increase of nearly 50% in just two years. [3] China’s rise in the industry has been considerable and unnoticed by the US, with one source saying that there is a high chance of China dominating the industry if the US does not act and provide incentives. One of China’s poorest provinces, Guizhou, achieved one of the highest annual GDP growth rates in the nation because of big data development and although it may not directly be Artificial Intelligence, it is the technology industry that is the main focus. [4] This data is applicable to the AI industry as well because this sort of growth is being achieved in the artificial intelligence industry as well. A proposal coming through in 2018 was that Chinese tech firms listed in overseas stock markets should return to the Chinese stock markets.

### **2.3. AI in US**

The US is the current leader in the global AI industry. It has got the most technological and AI innovation and has the world’s leading organisations that work on AI. Big and rich companies such as Google and Meta have joined in the race to create AI technology. The goal of such companies is to have a major say and be a major play in an industry that is expected to reach upwards of 118\$ billion by 2025. [5] Some experts say that the US will continue to lead the global AI industry and that for the next decade it will maintain its lead in enterprise software.[1] However, the threat of China is imminent and thus, Silicon Valley is trying to push to recruit the top very small percentile of people to encourage innovation. [1] Jeff Bezos has used AI effectively in making Amazon a successful business and the company’s algorithms and process are behind how they make prime members use lucrative sums of money. In a different industry, the defence systems and the use of AI powered drones are becoming more common. The use of AI powered drones has been used in wars as carriers or being used to analyse data from satellites or the success of stealth systems such as the F-35. [1] The research and development in the US or China will determine which country has the advantage in the AI arms race. The Trump administration’s approach to ABC (known as AI, Big data and Cloud computing) was based on national security and added economic security as part of national security.

In May 2018, Trump's administration released a fact sheet showing the efforts being made in the AI industry. However, in comparison to China, America's AI policies are less articulate and clear. [4] Trump's confrontational approach to dealing with the Artificial Intelligence sector as well as the technology sector as a whole has resulted in the banning of Huawei for example from operating in the United States.

## 2.4. Differences

Currently the US is the leader in the AI industry with major tech companies investing heavily in research and development. However, China is a close second and is not backing down with investments and money being spent. In 2021, China spent \$10.38 billion on AI development and have many more other investments planned.[3] Both have their leading information technology companies, for China it is the BATs (Baidu, Alibaba and Tencent) and for the US it is the FAANGs (Facebook, Amazon, Apple, Netflix and Google). They are betting their R & D budgets on the AI revolution. Purely in the years 2010 – 2015, the United States investments increased by 4 percent annually; but in contrast, China's hastened quicker and therefore had an annual growth rate of 18 percent over the same time period. [4] In many industries China has already not only caught up with the US but completely taken the top spot and become the unchallenged leader in certain industries. In the fintech, drones and 5G industries for example, China has taken the lead. The threat and possible unease that comes from this is that China is not just having an economic boom or a surge in the technology sector but also the US are simply giving up in some of the races in industry. The real question is whether they will give up on the AI arms race. [1] Another difference that separates the competition and approach of the two superpowers is the supposed "willingness" to give their information and personal data. The ratio of the US is evenly split between those who are willing to share or not share. In contrast, five in six are willing to give their data: which comes as a surprise to lots of American companies and government. [6] In the same way, the United States often prioritise the value of privacy over security and thus makes it difficult to collect and analyse data: in the US it is also common to be suspicious of the government and distrust authorities. The consequence of the distrust that the American public shows is that AI cannot make adequate advancements to keep in competition with China and thus is predicted to experience some problems in the future. The security of the USA is threatened by the people's reluctance to share information and policies put in place and therefore the big IT companies such as Apple or Google are unable to make progress in their research.

## 3. Investments and Policies

### 3.1. FAANG vs BAT

The two big groups of companies the FAANG and the BAT are both heavily involving and contesting the industry. With that being said AI is not necessarily an industry that has a lot of support from the government in China. China has driven large sums of money in R&D for AI and has successfully entered the "arms race" in AI. China has especially gained lots of traction on the research front in that Chinese institutions have been producing 4.5 times as many papers than American institutions since 2010, and many more than the US, India, UK and Germany combined (all of whom are some of the leading countries in AI). [6] Moreover, China is leading (perhaps unsurprisingly) in the security and geopolitics sector: specifically, surveillance, autonomy, and object detection. China has invested \$31.7billion in the first half of 2018 which makes up almost 75% of the global total of 43.5 billion. [7] Even though China's investment and money poured into the industry may be high, the US still have the most advanced technology and AI industry. However, previously in earlier years the US were clearly investing the most money in the industry and that is how they have gained the title of having the best technology and AI industry in the world. The global venture capital investment throughout the years 2008-2017 has been dominated and occupied by the US. However, with China's plans to increase investments in an attempt to gain dominance of the industry, the US could soon be toppled of the leader in Global Venture Capital investments in the industry [7].

### 3.2. Patents

Patents are also a good way of showing how well a country is doing in terms of investments and getting projects to start. China has reportedly overtaken the US on this front and leads many to think that China is very quickly going to completely take over the industry in the future. [8] The top 3 spots were occupied by the US in IBM, Microsoft and Google respectively but the rise from China was for the top 50 spots China had increased from 8 to 19 in the years 2016 to 2018. In Kai-Fu Lee's book *AI Superpowers*, he explains the viewpoint of China on the AI industry. He states that President Xi Jinping had a personal reaction to the defeat of China's GO world champion, to an AI. Thus, Xi Jinping set specific targets for 2020 and 2025 that put China on a path to dominating the industry and other technology industries by 2030. Within 12 months of Xi's targets being set and the rollout of the plans: Chinese AI startup investments had overtaken investments in American AI startups. By 2018, 2.5 times more patents had been filed in China than in the US in AI technology. And in 2020, China graduated 3 times as many computer scientists as the US. [1] In a paper published in 2020, it stated that of the twenty most valuable internet companies in the world: only two of them were Chinese. However, with the surge in technology and the huge incentives that the government and specifically Xi Jinping has invested into the industry, in 2020 nine were Chinese. [1] Despite the growth in the technology this year they only have six in the top 20 and a two more in 21st and 23rd places. [9] Nonetheless, it is clear that China's growth in the technology and AI industry as a whole is not only exponential but a threat to the United States. In addition, of the "Seven Giants of the AI age", that being Google, Amazon, Facebook (Meta), Microsoft, Baidu, Alibaba and Tencent are shared across the two superpowers. [1]

### 3.3. Policies

In terms of broader policies that have the interest of the people in mind the US differs from China. For example, the United States' policies mainly revolve around national security: which contrasts China, who emphasises a balance of economic development and political stability. China's national security and political security inevitably has led to the quick success and evolution of AI in China. With lots of growth and bright plans for the future, one of China's policies is to obtain cyber-sovereignty. In contrast, the US emphasise the importance of economic stability, national security and Research and development.[4] An example of the research and development sector of AI being an important part of the US' policies is of the top 1000 computer scientists, China had only 0.5% of that of the United States in 2018. [4]

## 4. Impact on GDP and Geopolitics

### 4.1. Productivity Enhancement

By including AI into daily life: cost of living, cost savings and many other benefits emerge and there is economic growth as well. Another way that the GDP of a country could be impacted is through what is known as intelligence augmentation: this is the idea that some systems aim to complement human thinking capabilities and therefore enhance the productivity of human work. An example of this might be a game like chess which may be interpreted and played by some computers. However, with the inclusion of a human brain, a weaker computer has the capacity to beat a stronger computer. [10]

### 4.2. Competitiveness in the Industry

Can lead to foreign investment and increased exports and therefore new product development and economic growth. In a source it shows the participation of individual countries at an AI conference: specifically, the AAAI conference which is the Association for the advancement of artificial intelligence. The participation of this AI conference indicates that China is slowly escalating its influence throughout the industry. Furthermore, the graph shows the United States' participation has

dwindled and thus it is becoming clear that the United States are losing complete control of the industry – even though they still have the majority share of participation at the conference. From a United States standpoint, the graph is quite threatening and dangerous to the AI and dominance that the US would like to have. In contrast, these statistics for China are encouraging and hopefully should spark innovation in the industry [11].

#### **4.3. Impact on Medicine Industry**

AI in medicine, with the more developed AI and the better technology there could be technological advancements in medical research. The help of AI can improve innovation as well as possibly finding revolutionary cures for things like cancer. From a source on the applications of artificial intelligence in covid there is an image discussing the ways in which using AI in the research and determination of whether someone is infected is quicker. In the example, a patient with COVID-19 symptoms could be assessed with more haste in the AI based approach: with many more steps having to be taken in the conventional approach. In addition to this the process that the AI based approach took produce higher accuracy and reduce time taken and complexity. [12] AI is being used in a way to enhance and support the medicine industry along with discovering cures for deadly diseases like cancer. An example of this might be when an AI-approached program attempted to find whether lymph node cells were cancerous or not it found it had a 7.5% error rate. In contrast, a human by themselves would have a 3.5% error rate; however, when the human and the AI worked in tandem with each other they managed to produce a much lower error rate of 0.5% and therefore an 85% reduction in error rate. [10] These stats not only show the successes that humans and AI can have when working together, but also shows how, with the right research and development, the error rate can reach 0 and eventually AI can help innovate and create new cures for currently chronic illnesses like cancer.

#### **4.4. Digital Economy**

Digital economies and its activities already make up 21.6%, 30% and 15.5% of the GDP in the US, China and globally respectively, depending on how broad one might want to define a digital economy. (2019 digital economy report, United Nations) [13] The way that AI is linked to a digital economy is that AI can be used to analyse and process large amounts of data and making predictions on data. The helpful use of AI in analysing data can increase growth of a digital economy and help create business models. A digital economy also places an emphasis on experiences for consumers. By using AI chatbots among other Ai powered virtual assistants, customers are helped fully in the digital realm. With the help of AI and digital economy, technological firms such as Google or Apple have the capability to learn about consumer preferences and use such knowledge in advertisements among other business activities. However, the risk of this is the same as the concern the US government has of AI: that being the data privacy of the public and the need for intellectual property protection (IP) [13].

### **5. International Companies and Competitiveness**

The Chinese government in itself has placed a strong emphasis on AI development and provides significant funding and incentives for domestic companies to invest in the AI industry. An example of China's digital economy building and that having an impact on the domination of the AI industry is Baidu. Baidu was a grassroots entrepreneur company that was not state owned. However, given the Chinese government has effectively gained control over many of these AI focused and digital companies including Alibaba, an e-commerce firm, Baidu, a search engine and Tencent: a Chinese social media platform and the world's largest game company. With the consumer side of technology already being dominated by the big three of BAT and aided by the Chinese government's blocking of American companies such as Google as well as Meta and Twitter. With this success in technology and the Chinese government's support, each member of BAT has been labelled a national champion of AI by the Chinese government. [4] The impact of the competitiveness of the AI industry is that it

can have a huge impact on international macroeconomics. By leading or dominating the AI industry, one country could easily accelerate and create a successful trade surplus, in services mainly. Implications of a growing Chinese economy could have a negative impact on the US labour markets. The Chinese economy overtaking the US economy meaning it will weaken the dollar and inevitably might repatriate manufacturing jobs in the US [11].

### 5.1. Risks and Challenges

When Trump was in office there was a certain amount of tension between the two sides and currently with the newly started Russia-Ukraine war relations have gotten slightly worse. The collaboration between the two leaders in the industry has decreased and competition is at its all-time high. From a USA standpoint, Trump's statements about AI have not been cooperative with companies and in some ways could be labelled as rhetorical. [1] In contrast with the Chinese government, who have made laws and regulations as well as giving funds or supporting the AI arms race: President XI's attempts of leading the AI charge and dominating the industry are clear. The threat to the USA is that China, specifically President XI, has put out targets that incentivize China's 15 largest cities to compete in deploying sensors in highway systems, that will inevitably help with driverless cars. [1] It has been labelled a "technological arms race" in that the two sides are competing for the dominance in the industry. However, both sides have poured lots of money and future investments look possible. The close competition between the two sides has sparked little collaboration and is possibly something that needs to be worked on. The label itself is not just a problem but since it is an arms race and collaboration is limited; the exchange of knowledge and the development of global solutions may be delayed. The problem that both sides seem to differ on opinion on are ethical concerns. Recently, the TikTok CEO Shou Zi Chew was required to face a panel of federal lawmakers. This is just the start of a fight on the data protection and the ethical views of the countries. The problems of data privacy, bias and AI's impact in making decisions is very scary because of the magnitude of its power. Given the success and following that TikTok has received it seems inevitable for some that AI could produce even more and gain as much if not more of a following through such means. There is a problem in the pentagon: the defence industry is transforming, and it could be due to AI development. With the tensions and defence budgets being increased with the geopolitical tensions and the Russia-Ukraine war, guided missiles systems have become a weapon emphasised in modern warfare. Therefore, given AI control and help direct guided missiles the developments that China may make could threaten the already shaky international relations; as well as shifting the global balance of power. [11] The Trump administration itself centred its approach on national security and therefore gave the Pentagon \$716 Billion for 2019. The Department of Defence spent \$7.4Billion on ABC (AI, Big data and Cloud Computing) in 2017 and of which the USA has stressed that AI will be the focus in its military dominance. [4] On the other hand, China have poured lots of money into investing into the AI sector, however, there is a risk of overinvestment, overcapacity or lots of wasted money in the industry.

## 6. Conclusion

United States of America has a consensus global influence and advancement in the AI industry; however, given the rapid growth and policies that the Chinese government along with multiple leading companies (BAT), China poses a realistic threat to the throne that the US currently sits on. Given China has a population of over four times the USA it seems there is no question China will have the largest market for domestic market. Many experts are predicting the United States to lead the industry in the next few years but possibly be taken over in the near future. On the other hand, with new policies and more clarity made in the goals and targets of the government in the industry, the US could maintain a lead. With China's significant economic development in the past few years, it is clear that there is a huge chance their share in the AI industry will increase. However, with the boom in the economy and with the investments that the government have initiated, there have been

fake AI firms, and such projects have frustrated investors. In the future, for China to become the leader in the industry they must not just focus on BAT investments but also on the smaller companies that are aiming to make themselves known in the market. R&D investments are at a very high annual growth rate and therefore many experts predict that China has a high chance of taking over the US in AI superiority. As a knowledge emphasized industry with lots of different privacy issues, the AI industry must develop good policies that meet the needs of both the public and the data driven technology industry. Trade policies could be changed because of the AI industry and which country leads globally in it. In order for the USA to maintain leadership in this industry it must deal with the problems such as the immigration policies that reduce recruitment of talent in foreign countries: this can be mitigated through adopting immigration policies. The USA also needs to start launching research and development (R&D) programs and projects in the industry because China has lots of investments in this sector of AI. There is a talent shortage in the US because many AI companies are moving abroad and therefore the US government needs to make the USA a more appealing place for AI company headquarters. In conclusion, AI could play a role in many different industries ranging from medicine to business models. This paper has found that the two leading superpowers in this industry, namely the United States and China, are in many different battles for superiority. An “arms race” from a military perspective, some might say it is to gain dominance in international trade and whoever controls the AI industry has control of services. Others say that no matter the leader in the industry there is always the threat of human extinction because of the threat of a conscious AI. However, at present, the United States leads the industry in terms of advancement but with the investments of China and the exponential growth in Alibaba and in patents published, China could easily takeover the AI industry in the near future.

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