

Chapter Six: The Global Status of Artificial Intelligence

The perception of AI as an innovative and influential means is well expressed by Russian president Vladimir Putin who said, “AI is the future, not only for Russia, but for all of humanity . . . it has tremendous opportunities, but also threats that are difficult to predict. Whoever becomes a leader in this field will be the ruler of the world.”¹¹¹ Indeed, it is evident that countries have internalized this warning and are creating a cohesive strategy in the field. This chapter will review the field of AI in several leading countries, as a basis for discussing possible international implications and for assessing Israel’s relative position in this context.

The United States

The United States is one of the leaders in the civilian and security development of AI. In October 2016, the Obama administration published a report on the future of AI.¹¹² Since 2017, the United States has been working to formulate a comprehensive strategy for AI with the Trump administration. In December 2017, President Trump signed a national security strategy that set American leadership in new technologies, including AI, as a national goal. The stated objectives were to improve the understanding of the government agencies of the prominent trends in the field; increase collaboration with industry and academia; use existing expertise in civilian research and development and existing resources in the private sector for national security applications; and achieve again the surprise factor by developing new technological areas.¹¹³

The national defense strategy also highlights the commitment of the US Department of Defense to investing in military applications in the areas of autonomy, AI, and machine learning, along with the use of groundbreaking commercial technologies, to maintain the US competitive military advantage.¹¹⁴

It should be noted that the United States is also the world leader in autonomous weapon systems and swarm warfare technologies.

In June 2018, the Joint AI Center (JAIC) was established in the US Department of Defense to coordinate efforts of AI development, implementation, and use. The JAIC also serves as a focal point for advancing AI in the United States. In addition, in February 2019, the Department of Defense released an AI strategy that focused on harnessing technologies in the field to promote national security and prosperity. This strategy seeks to achieve some of the goals determined in 2017, which include improving collaboration with the private sector, academia, and global allies in addition to new goals such as striving for US leadership in terms of the safety and ethics of military use of AI.¹¹⁵ This emphasis on safety and ethics resulted from the thunderous criticism of leaders, various organizations—including human rights organizations—and employees of technology companies regarding US development policy in general and certain companies and entities—including Google—in particular within the framework of cooperation with the Department of Defense.

On February 11, 2019, the Trump administration announced the American AI Initiative, which aims to implement a broad strategy to promote and protect national AI technology, through collaboration between government, the private sector, academia, the public, and international partnerships.¹¹⁶

The Department of Defense's spending in 2016 on developing AI was \$600 million, which increased by more than \$800 million the following year.¹¹⁷ According to the Department of Defense, it intends to invest \$2 billion to promote AI projects from 2018 to 2023.¹¹⁸ This is a budget that is relatively large for what may be perceived as a "single technological field." The budget for 2020 reveals a great deal of investment in the field, which reflects the administration's relating to AI as highly important.¹¹⁹ It has been argued, however, that budgeting is still insufficient for the development, and use of such technology, and the budgetary obstacle may lead to technological inferiority with respect to other nations, notably China, that are seeking to achieve leadership in the field.¹²⁰

Moreover, the administration and the military are having difficulty recruiting the private sector to the national effort. This is especially problematic given that the United States could emerge as the leader in this field due to the actions of commercial companies, from which the Department of Defense

purchases products and adapts them appropriately to military needs. This differs from previous periods when the Department of Defense carried out advanced developments, which then moved to the civilian sphere.¹²¹ The problem lies in the different standards of the private sector and the military. Many companies choose to avoid doing business with the Department of Defense because of the complexity of the military procurement process. Commercial companies are also concerned about the intellectual property of software and rights to data.¹²² In addition, the Department of Defense has difficulty recruiting and training personnel, as it cannot provide the optimal working conditions and high salaries of the private sector.¹²³

The ethical issue of developing AI technologies for the defense sector also poses difficulty in recruiting the private sector. Some companies refuse to cooperate with the Department of Defense, due to concerns that the military and government will use AI for espionage or in weapons.¹²⁴ A prominent example is the protest of the Google employees, which led the company to end its contract with the Department of Defense over the prestigious Project Maven.¹²⁵ As part of this project, the Department of Defense employed AI developed by Google to interpret videos taken by drones. Google employees were concerned that this would lead to the use of AWS (which are able to commit lethal action without human input). Some even resigned from the project.¹²⁶

The difficulty of collaboration between civilian companies and the Department of Defense has been said to relate to the “distance” between the Silicon Valley and Washington, DC. Most of the leading AI companies are situated in San Francisco, which is geographically far from Washington, DC. This statement relates not only to geographical distance but also to gaps in perceptions and culture between both the government and military corridors and the management and employees of the technology companies. This creates a weakness in the American ecosystem compared to other countries, including Israel and China, where cooperation between government officials and the private business sector is relatively widespread.¹²⁷

China

China is the most prominent competitor besides the United States in the struggle to lead the global field of AI. China has several organized programs comprising its overall strategy in the field. According to the Next Generation

AI Development Plan, China regards AI as a “strategic technology,” which has become the focus of international competition and is crucial to the military and economic futures of any country.¹²⁸ As part of this international competition, China aims to lead the field by 2030.¹²⁹ Based on an analysis of meeting past goals in areas of defense technology, China likely will allocate significant resources and possibly even take aggressive actions to meet this goal.

The total budgetary investment in the research and development of AI in China, which is not made public, is estimated to be billions of dollars at the minimum. Some estimate that China’s future investments will reach 150 billion dollars, but it is unclear how much will come from the government and how much from industry.¹³⁰

The Chinese ecosystem differs from that of the United States and gives China a significant advantage. Few boundaries exist between the private sector, academia and research, the military, and the government. Consequently, the Chinese government has access to research, development, and implementation of AI outside the public sector, and it can prioritize and guide these processes as it needs. Its ability to harness all the different sectors to achieve national goals enables it to rapidly reduce and overcome its technical disadvantage, and to develop technological independence so that it will not have to rely on Western developments.¹³¹ In addition, the fact that China is not committed to the rights of the individual like Western democracies has enabled China over the years to collect data and information about its citizens.¹³² This gives it a considerable advantage, given the importance of data needed for “training” AI systems.

However, this advantage is also China’s weakness. China has difficulty recruiting experts and companies from around the world, because of their concerns about cooperation, particularly in terms of the theft of algorithms and information,¹³³ as well as of the ethical implications of using AI technology. In addition, China’s hardware and software are technologically poor compared to those of the United States, and it lacks talented human resources for research and development.¹³⁴

As part of its attempt to cope with these challenges, China also operates in the economic realm, investing large sums in American AI companies (a move that generated a counter-reaction from the Trump administration, which blocked Chinese acquisition of a chip production company vital to this

technology).¹³⁵ China is also working to acquire companies in developing countries, to increase technological control in the field and to constitute an alternative to US technology and services for various clients.¹³⁶

Russia

Although historically, Russia had been considered a superpower in the field of military technology, leading in certain areas (aerial defense systems, for example), since the “revolution in military affairs” (RMA) of the 1990s and the breakdown of the Soviet bloc, Russia has struggled to restore its past glory. Its military industries now lag behind China and the United States, such as in the field of drones, leading Russia to seek collaborations or opportunities for acquiring knowledge, for which it is willing to pay high prices.¹³⁷

Russia’s leadership under Putin, nonetheless, has recognized the importance of AI for its economic and defense power. During 2019, Russia decided to formulate a national strategy for AI,¹³⁸ with initiatives and programs designed to promote AI development preceding the decision.¹³⁹ By 2030, Russia has planned to replace about 30 percent of its military forces with autonomous robots and remote-controlled systems.¹⁴⁰ However, according to the Russians, humans will still make the decisions about the use of lethal weapons.¹⁴¹

As part of its efforts to close the gap with other powers and to enable advanced development and extensive use of AI, the Russian government established the Foundation for Advanced Studies.¹⁴² Its central activities include standardization for developing AI in four main areas—image identification, speech recognition, control of autonomous military systems, and support information for the operating loop (the activation loop) of weapon systems.¹⁴³ Furthermore, the Russian army began researching a variety of applications of AI, with an emphasis on autonomous and semi-autonomous weapons, and plans to implement AI in land, naval, and aerial vehicles and to develop swarms. Russian military experts have also expressed interest in integrating AI in cruise missiles, unmanned systems, electronic warfare, and cybersecurity and to create a “target library” that will help the systems identify targets and improve their navigational ability.¹⁴⁴ Russia also used AI applications for propaganda and espionage, as well as in its information operations against the United States and its allies.¹⁴⁵

Despite its aspirations, Russia’s weakness in the field of AI is mainly rooted in the quality of its industry and academia, which is poor compared

to the world's leading countries; Russia ranked only twentieth in the world in the number of startup companies in the field, while AI research in the Russian academic sector is quite small compared to other countries, and especially to that of the leading powers.¹⁴⁶ In addition, Russia has made budget cuts beginning in 2017, which have continued since.¹⁴⁷ As of 2019, the state investment in AI is believed to be only about \$12.5 million.¹⁴⁸

Unlike China, Russia does not have a strong or high-quality ecosystem, despite having a centralized regime. In 2010, Prime Minister Dmitri Medvedev established a Russian version of Silicon Valley—the Skolkovo Technopark—designed to encourage entrepreneurship and develop new technologies. By 2015, the complex had attracted approximately 30,000 workers. Large US companies like Microsoft, IBM, and Intel also invested in the Technopark. Corruption and over-involvement of the state, however, caused many investors to abandon it and move to other countries in Europe. The approach of the Russian government that free information endangers the state's political and national security—along with the extensive corruption and lack of protection of private property—does not create a fruitful environment for technological entrepreneurship and hinders the development of AI technology.¹⁴⁹ According to estimates presented to the US Congress, these obstacles make it difficult for Russia to reach its objectives and to position itself as a leader in the field.¹⁵⁰

There are assessments, however, that Russia could successfully lead in narrow areas of AI, especially those related to national security.¹⁵¹ If Russia is able to resolve organizational issues related to its ecosystem, it could make considerable progress in implementing AI, despite its lack of adequate financing and investment.¹⁵² For example, a company connected to the army has a project in the field of AI, which includes about 30 private companies, the Russian Academy of Sciences, and various universities, and is likely the largest public-private project in Russia.¹⁵³ However, these optimistic assessments are dubious, because Russian researchers have difficulty collaborating with colleagues from the West because of security concerns and censorship by the Russian security forces. In addition, companies have little incentive to invest in Russia, out of concern that the state could take control of developments in the field of AI, while Russia would face losing its talent, as it did in the case of the Skolkovo Technopark.¹⁵⁴

Europe: France, Germany, and Britain

The European Commission promotes a European-wide concept of developing AI, which is seen as improving the lives of Europe's citizens in security and economic terms. Cooperation between the EU states should firmly put them at the forefront of the technological revolution, ensuring both competitiveness in the field and conditions for development and use of AI according to "European values."¹⁵⁵

In April 2018, 25 European countries met and signed a declaration of cooperation on AI, alongside the national initiatives of several EU member states.¹⁵⁶ In addition, the European Union presented a strategic AI plan, which focused less on the development or security aspects and more on the civilian or "soft" aspects of the field, including the promoting of technological and industrial capabilities; coping with the socioeconomic changes that AI could cause; and creating a framework for appropriate ethical and legal use of the technology.¹⁵⁷

The European Union faces several challenges in promoting this policy, including a budgetary one that relates to the high investments required of the countries involved and from their private sectors.¹⁵⁸ As of 2019, three EU states—France, Germany, and Britain—have formed more than 50 percent of the AI market in Europe, with Britain leading by a considerable gap. At the beginning of 2020, it is unclear how Britain's leaving the European Union will affect this issue. Even before Britain's exit, however, only three European states led in the field of AI.¹⁵⁹

France formulated its policy in the field of AI in the Villani Report of 2018, which called for a focus on four sectors: health, transportation, environment, and security and defense. The report also gave rise to a national strategy for AI, which sought to position France as one of the five leading countries in the field and the leader of AI in Europe. France's strategy emphasizes the importance of the ethical and moral aspects of AI.¹⁶⁰ Between 2014 and 2019, France invested more than 1.85 billion dollars to promote research in AI.¹⁶¹ According to President Macron, up to the end of his term in office in 2022, the government will invest 1.5 billion euros in promoting research and development, encouraging initiatives, and collecting data.¹⁶²

France's strong points are in AI development related to the health system and autonomous vehicles. France is aware that it needs greater capacity and is working to attract foreign researchers.¹⁶³ In regards to security, the Villani

Report acknowledges that using AI to preserve France's status—both in relation to its allies and adversaries—is unavoidable; however, according to statements by senior government officials and the French industry, France intends to involve humans in the use of autonomous weapons.¹⁶⁴





Germany adopted a national strategy for AI in November 2018 and allocated about three billion euros for research and development in the field. The German strategy has three main goals: (1) positioning Germany and Europe as a leader in the development and use of technology, while ensuring the future competitiveness of Germany compared to its competitors; (2) ensuring the responsible use and development of AI to serve the interests of society; and (3) implementing AI in the context of extensive social dialogue and political activities.¹⁶⁵ Germany has worked to promote cooperation with other countries in the field, including France and even China, which invests heavily in German companies and has improved the technological relations between the two countries. Germany's advantage is in the automotive industry and the field of industrial robotics.¹⁶⁶

Britain, which left the European Union at the beginning of 2020, manages several government initiatives that are researching and planning for the use of AI. Although Britain recognizes that it will not be able to compete with powers such as the United States or China in terms of financing or providing skilled human resources, it seeks to employ the ethical use of AI as the focus of Britain's competitive advantage over the other countries.¹⁶⁷ The British national policy focuses on the fields of entrepreneurship and economics. In the AI Sector Deal of April 2018, the British government pledged to support AI and invest a billion euros in the industry.

According to the AI Sector Deal, the government must cooperate with the academic and research community, industry, and end users to ensure access to the necessary skills in the field. Usually cooperation between these parties begins with the study of basic, non-controversial security applications, which can serve as a basis for extensive military use in the future (e.g., the hackathon, which is organized by British Science and Technology Laboratory and the US Air Force Research Laboratory, for developing autonomous aerial systems for fire relief). But it seems that Britain, as elsewhere in the world, suffers from a skills gap, and thus it must invest in education to develop and attract a talented workforce.¹⁶⁸

The British Defense Ministry report of December 2018 includes a commitment to expand the use of AI to cope with both military threats and changing warfare. One of the military programs in the field is the Autonomy Program, which explores the new technologies that could have the greatest military impact and operates in the field of developing algorithms, AI, machine learning, and the next generation of autonomous military systems. One of the most covert developments in the field is the “BAE Systems Taranis” drone, also known as the “Raptor,” which is operated and manually controlled remotely by a pilot but has an autonomous flight mode.¹⁶⁹

Table 2. Comparative summary of AI in other countries

	 United States	 China	 Russia	 European Countries
Is there a national plan and what type?	There is a national plan, and other policy papers address it as well. The plan is comprehensive in approach, addressing both civilian and security aspects.	China has some policy documents that together constitute a comprehensive strategic plan, addressing both security and civilian aspects.	Although there is no national program at the time of this writing, the Russian government began to formulate one during 2019.	Some countries have a national plan for the field, while others have only a few initiatives. The statement of cooperation of 25 EU countries reflects the EU policy, which emphasizes the civilian and economic aspects of AI.
Budget	The budget is estimated in the billions of dollars, but according to some assessments, it is insufficient and can lead to a technological deficit.	According to some of the assessments, China has budgeted about 150 billion dollars. Even if the budget is lower, China's financial investment is still the greatest.	Russia has cut its budget since 2017; the budget for the field is estimated to be 12.5 million dollars.	The budget depends on the investments of the EU countries and its private sectors, which could challenge the development and research of AI, since the countries have different levels of investment in AI.
Ecosystem	The challenges are in mobilizing the civilian market to cooperate with the army and the government, given the ethical, economic, and technical difficulties.	Given the nature of the regime in China, there are almost no boundaries between the private market, academia, the army, and the government; thus the state's ability to harness the entire ecosystem for this purpose is practically limitless.	The quality of industry and academia in the field is poor, when compared to other countries. Intense political involvement, widespread corruption, and the negative attitude toward free information make creating a productive and effective ecosystem difficult.	There is a gap between the national level and the European level. Although the importance of creating a quality ecosystem at both levels is recognized, it is not clear whether it has been successful.