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Artificial Intelligence and Policy: A Review at the Outset of 2020

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Among the rapid technological changes marking the contemporary era is the notable leap in the development of artificial intelligence applications that pertain to many areas of life, and hence the need to formulate policy in the field. Recent years have seen a major increase in policy research in the context of computing technology and artificial intelligence. Studies deal with a range of fields such as security and international affairs, arms races and the balance of power, cyber, ethics, and more. A number of leading research institutes in the world have already published studies and policy papers in the field, as have universities, government entities, and even commercial groups. While Israel is a leader in artificial intelligence development, its policy research in the field is relatively limited. This article contends that despite the difficulty for policy research to keep up with the pace of technology development, in part because of budgeting difficulties, it is clear that the field is fertile ground for ongoing research regarding the challenges and opportunities that demand personal, social, political, and international preparation.

In the current era, technological changes occur at the fastest pace in history, influencing countries, businesses, and people. In recent years, a notable leap has been made in the development of artificial intelligence applications that pertain to many areas of life, and hence the need to formulate policies that concern issues affected by this technology. This has prompted the emergence of many policy studies in the context of artificial intelligence and computing technologies that draw from different perceptions and approaches. This review looks at some of these studies and examines the trends in artificial intelligence policy research at the outset of 2020.

Artificial Intelligence is a subset of computer science, which initially was a subset of higher mathematics. According to one accepted definition, artificial intelligence is a "programmed ability to process information" (Launchbury, 2017), but a more widespread definition is "the science of making machines do things that would require intelligence if done by men" (Geist & Lohn, 2018). This ability could have far reaching effects on numerous levels, including personal, social, state, and of course, international. In view of the understanding of the importance of this technology and its inherent capabilities, some have even argued that an arms race has recently been launched in the field between different countries, led by the United States and China (Pecotic, 2019). In fact, it seems most world leaders have already realized the importance of the field, and are willing to invest in it to try to create or maintain their national leaderships in the field, and thus in the international arena. This is evident, for example, in Russian President Vladimir Putin's statement: "Whoever becomes the leader in this sphere will become the ruler of the world" (Sayler & Hoadley, 2019).

After a long period of reduced funding and lack of progress in artificial intelligence research —what has become known as an "artificial intelligence winter"—there is a renaissance in the field, thanks to advances in computer science research and technological changes in hardware and software and in computing and communications, as well as the emergence of new fields such as cloud computing and big data. Along with advances in artificial intelligence, there has also been progress in related subsets such as multi-layered neural networks and deep learning. Today, deep learning is seen as almost synonymous with artificial intelligence, as many applications are based on this paradigm.

Deep learning algorithms seek to mimic cognitive human tasks by recognizing patterns about them through analysis of large amounts of related data. The algorithm "trains" on existing data and creates its own statistical model so that it can perform the same task in the future on new, unfamiliar data (Sayler & Hoadley, 2019). The difficulty raised by the use of artificial intelligence stems, inter alia, from the fact that artificial intelligence algorithms are in effect "black boxes"—we cannot reproduce the process taking place within them and understand why they have recommended a particular decision rather than another. This element is problematic in cases where we want to allow artificial intelligence to take actions that have far reaching consequences, such as in the security field. This becomes increasingly important as more artificial intelligence-based applications emerge from the confines of the computer into the "real world," such as advanced robotics and autonomous cars.

Parallel to the development of the technology, publications, reports, and research on the impact of artificial intelligence on a wide range of areas of life are increasingly common, with some of these studies initiated by countries themselves and aimed at helping to shape policy in the field. The purpose of this review is to introduce readers to current developments in the field of artificial intelligence policy research.

The Global Impact of Artificial Intelligence

According to various studies, the list of fields in which artificial intelligence has a global impact is only growing. They include:

International relations and security: The development of artificial intelligence affects international relations and global security, as well as arms races and arms control. Technological developments such as autonomous weapon systems have sparked discussions in international forums about their use and how they could undermine global stability or violate human rights (Antebi, 2019). Furthermore, there are concerns about the possibility that artificial intelligence systems will increase the likelihood of the use of nuclear weapons, even if they are not directly connected to nuclear weapons launchers, due to a change in the balance of power that has guaranteed stability in the arena to date (Geist & Lohn, 2018). There are also concerns regarding "hyper war," a conflict situation in which human decision making is almost non-existent, and thus responses are immediate and potentially destructive (Sayler & Hoadley, 2019).

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World order, "arms race," and balance of power: Many countries in the world have realized the potential of artificial intelligence and have begun work to develop the field. Among the superpowers, most prominent is the "arms race" between the United States and China, which are struggling for supremacy in the field. The two countries have national programs that encompass civilian and security aspects. The scope of the budget for artificial intelligence is not public knowledge in China, but it is estimated at $150 billion, by far surpassing the US budget, which stands at several billion dollars (Future of Life Institute, 2019; Hunter et al., 2018). The two are not the only countries investing in the field, understanding its importance; other countries such as Israel, Russia, France, and Germany can be counted among those working toward advances in the field. Given the vast capabilities that this field enables, the race could undermine the world order and change the existing balance of power. It is also likely to increase the gap between developed countries and failed states.

Cyber security: As with other computing systems, dependency on artificial intelligence systems increases the exposure of their users to attacks by rivals. In the cyber context, increased use of artificial intelligence systems increases the amount of "hackable things," including systems that if hacked could have a fatal impact (Future of Life Institute, 2019; Hunter et al., 2018).

Ethics: Within the debate over ethical and moral aspects of the use of artificial intelligence, questions arise about the systems' decision making process and the values considerations that are taken into account. The decision making of artificial intelligence systems can lead to bias and discrimination against groups in society. In addition, the ethical debate includes reference to the use of artificial intelligence for military purposes, the issue of responsible and safe use, and in the future, even the rights of robots.

Regimes in general and democracy in particular: The 2016 US presidential election brought into the spotlight the use of various artificial intelligence-based tools to disseminate false information, influence public opinion, and enable foreign interference in the internal elections of other countries. These tools grow all the time, raising concerns among lawmakers about the stability of democracy (Horowitz et al., 2018). Inter alia, concern arises from the use of "deep fake" algorithms that allow for very high level falsification of images, sound, and video files, which may affect public opinion and create distrust of government.

Artificial Intelligence in Global Research

In the world's leading research institutes, most of which are in the United States, including the

Center for Strategic and International Studies (CSIS), the Wilson Center, and others, the prominent school of thought is that research in the field of artificial intelligence should be expanded. One of the first institutes to invest in extensive research of the subject over the past decade is the Center for a New American Security. The center has a comprehensive research program called Artificial Intelligence and Global Security Initiative, comprising a team of people from industry, former senior government officials, and academic experts. The aim of the program is to explore a range of issues related to the impact of the artificial intelligence revolution on global security, inter-state power relations, the nature of conflicts, and crisis stability. The program also examines the safety of artificial intelligence and possible international collaborations (Center for a New American Security, 2019).

One of the most prominent authors at CNAS is Paul Scharre, who has been involved for some time in researching a variety of advanced technologies. His book *Army of None: Autonomous Weapons and the Future of War*, published in 2018, addresses the potential implications of using artificial intelligence and autonomous tools by the military. The book presents many benefits of this technological process, but also warns against complete transfer of judgment and decision making to machines. Bill Gates named the book one of the five books he loved in 2018, writing, "I agree with Scharre that we have to guard against becoming 'seduced by the allure of machines – their speed, their seeming perfection, their cold precision.' And we should not leave it up to military planners or the people writing software to determine where to draw the proper lines. We need many experts and citizens across the globe to get involved in this important debate" (Gates, 2018).

The Brookings Institution has also become involved in research in the field over the past two years, and as a result of extensive investment in research has been able to close the gap. Most Brookings research seeks to connect artificial intelligence to related fields such as education, economics, and of course, national security. The institute has a number of programs dealing with artificial intelligence in particular and technology in general, including the Artificial Intelligence and Emerging Technologies Initiative; a series of articles on artificial intelligence published by the institute under the name *A Blueprint for the future of AI*; and a book published in August 2018 called *The Future of Work: Robots, AI, and Automation*, which examines the effects of the transition from industrial economies to digital economies (West, 2018). Among those who have published on the subject are the head of the institute, General John Allen, who participated in some of the outstanding studies in the field published by the institute.

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The RAND Corporation research institute deals extensively with the topic of artificial intelligence. The think tank began publishing on the topic as early as the 1960s, but then it focused mainly on the technology itself. In recent years, it has begun to expand to other areas—education, ethics, the employment market, privacy, and national security. Inter alia, RAND has a multidisciplinary project called Security 2040, which aims to understand how security will be affected in the future by technology, ideas, and people, and how security policy should be designed accordingly (RAND Corporation, 2019). The think tank presents a rather pessimistic view of the potential implications of this technology and deals extensively with its negative aspects—from inherent biases in algorithms that may lead to discrimination or be detrimental to equality (Yeung, 2018; Osoba et al., 2019), through the ability of individuals to generate wide-scale

destruction (Clarke, 2018), and the link between artificial intelligence and nuclear weapons in a way that may accelerate nuclear response, due to automation (Geist & Lohn, 2018).

Researchers at RAND were not the only ones concerned about the possible impact of this technology on security. Prior to institutionalized research on artificial intelligence, most research was focused on autonomous weapon systems. This topic has been studied in depth for several years, both in academia and research institutes and by human rights organizations or various initiatives that work to restrict the development and use of systems that are capable of deciding on a lethal strike without human involvement, based on the decision of an algorithm. Since 2014, the issue has also been discussed at the United Nations, but in fact, other than marginal discussion at the United Nations of the broader issues of artificial intelligence, the organization deals almost exclusively with the issue of autonomous weapon systems, under the Convention on Certain Conventional Weapons (CCW). This is very problematic because many studies by reputable institutions point to the challenges of the broader technological sphere and the need to regulate it internationally. In addition to the institutions mentioned here, there are many other institutions that have published in the field over the past two years, some of which are listed in the recommended reading at the end of this review.

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Alongside research institutes and universities, it is evident that the issue has also received the attention of public opinion shapers and decision makers, past and present, and they have begun to engage in the subject in various ways, from forums to position papers. Notable persons involved in the field include former US Secretary of State Henry Kissinger, who holds regular meetings on artificial intelligence, as indicated in a March 2019 fireside chat at the Massachusetts Institute of Technology (MIT), where he claimed that almost all of the assumptions we developed in the past [with regard to arms control] will be overturned or will have to be changed because of artificial intelligence (Massachusetts Institute of Technology, 2019).

In an attempt to create a general division between the different research approaches, it appears that the main studies in the field are divided between those that argue that great dangers are inherent in artificial intelligence and that we must act to prevent those dangers or be prepared to deal with them, and those who believe that there is a need to invest in certain directions in artificial intelligence in order to gain a leading position in international competition and to maintain diplomatic standing. Most of the studies mentioned here represent relatively balanced approaches, with Brookings and CNAS in particular seeking practical approaches to policymaking that will boost the field, improve ecosystem collaboration with security and government needs, and enable America to gain a lead in the field. CNAS has also thoroughly examined Chinese policy in the field, in order to fully understand the actions to be taken in the "arms race" challenge currently faced by the United States.

Artificial Intelligence and Policy Research in Israel

In parallel with international developments in the field, research has also begun to appear in Israel in recent years on the effects of artificial intelligence on different areas of life, as well as policy-driven research. This research is relatively limited given Israeli leadership in the field of artificial intelligence, for example, in the number of companies and start-ups involved in the field: as of 2018, there were an estimated 950-1150 start-ups engaged in artificial intelligence, whether in development

of core capabilities or implementation (Press, 2018; Calcalist, 2019). Notable among the first policy studies is a study by the Knesset Research Center, written in 2018 at the request of then-chairman of the Science and Technology Committee MK Uri Maklev. The short document describes the field and seeks to point out areas where policy is needed (Goldschmidt, 2018). Another study by the Samuel Neaman Institute for National Policy Research, commissioned by the National Council for Research and Development, examines Israeli activity in the fields of artificial intelligence, data science, and smart robotics. The study reviews a wide range of areas of influence as well as the state of research and extensive activity in Israel in these areas (Getz et al., 2018). In addition, Prime Minister Benjamin Netanyahu has appointed a committee headed by Prof. Isaac Ben-Israel and Prof. Eviatar Matanya, with the aim of formulating a comprehensive national program to promote artificial intelligence in Israel and thereby influence issues such as health, finance, transportation, and industry, and contribute to Israel's economic and security prowess (Berkowitz and Shahaf, 2018).

The Institute for National Security Studies (INSS) has been involved in the field of artificial intelligence since 2013, including through research on autonomous weapon systems and the cyber realm. In 2015, INSS published a memorandum focused on a comprehensive study on military robots. A major part of the study deals with artificial intelligence-based autonomy, the effects on the future battlefield, and the military forces that will operate in it, and presents policy recommendations for Israel. Today, in parallel with the study of various advanced technologies, INSS has a research program examining the link between artificial intelligence and national security. As part of the study, there is an advisory committee of experts from various fields consulting on a memorandum that is scheduled to be published in the coming year.

It seems, therefore, that the technological advances in the field of artificial intelligence and other computing technologies are fertile ground for challenges and opportunities that require personal, social, political, and international preparation in a variety of fields. Research institutes and universities find it difficult to keep up with the pace of technology development and to carry out research and policy research —inter alia because of the enormous budgets invested in the field by companies and countries that are accelerating technological change. However, it is evident that many elements, including academia and research institutes, can and want to help both the general public and decision makers understand the technology and its potential impact on various areas of life, and enable decisions and policies that will create a better future and allow us to benefit from artificial intelligence.

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Recommended reading

Congressional Research Service. (2019). Artificial intelligence and national security. Congressional Research Service.

Cummings, M. L. (2017). Artificial intelligence and the future of Warfare. Chatham House. https://www.chathamhouse.org/sites/default/files/publications/research/2017-01-26-artificial-intelligence-future-warfare-cummings-final.pdf

Horowitz, M., Scharre, P., Allen, G. C., Frederick, K. Cho, A., & Saravalle, E. (2018). Artificial intelligence and international security. Center for a New American Security. https://www.cnas.org/publications/reports/artificial-intelligence-and-international-security

Scharre, P. (2018). *Army of none: Autonomous weapons and the future of war*. New York: W. W. Norton.

Recommended viewing

Fridman, L. Youtube channel. Fridman, an MIT researcher, interviews various researchers about artificial intelligence. https://www.youtube.com/user/lexfridman

How the enlightenment ends: A conversation. Interview with Henry Kissinger, MIT. (2019). https://www.youtube.com/watch?v=nTyIeMuUavo

Recommended sites

Artificial intelligence for the American people: A U.S. government website providing information to the public about AI. https://www.whitehouse.gov/ai/

Future of Life Institute: an organization supporting research and initiatives that ensure safe use of artificial intelligence and reduce risks connected to the use of the technology. https://futureoflife.org/

OpenAI: an organization whose mission is to ensure that Artificial General Intelligence benefits all of humanity. https://openai.com/

Futurism: a website publishing global news and updates in the technology field. https://futurism.com/

Bibliography

Antebi, L. (2019). The proliferation of autonomous weapons systems: Effects on international relations. In C. Padan & V. Michlin-Shapir (Eds.), *National Security in a "Liquid" World* (pp. 75-92). Tel Aviv: Institute for National Security Studies, Memorandum 189.

Berkowitz, A., & Shahaf, T. (, 2018, August 11). We will make Israel one of the leading countries in artificial intelligence. *Globes*. https://www.globes.co.il/news/article.aspx?did=1001249550 [in Hebrew]

Calcalist. (2019, March 11). AI companies accounted for 37% of investment in Israeli tech companies in 2018. https://www.calcalistech.com/ctech/articles/0,7340,L-3758021,00.html

Center for a New American Security. (2019). *Artificial intelligence and global security*. https://www.cnas.org/artificial-intelligence-and-global-security

Clarke, C. P. (2018, June 18). *Toy drones and Twitter: The ability of individuals to wreak large-scale havoc*. https://www.rand.org/blog/2018/06/toy-drones-and-twitter-the-ability-of-individuals-to.html

Future of Life Institute. (2019). *AI policy – United States*. https://futureoflife.org/ai-policy-united-states/?cn-reloaded=1

Gates, B. (2018, December 3). *When ballistic missiles can see*. https://www.gatesnotes.com/Books/Army-of-None

Geist, E., & Lohn, A. (2018). *How might artificial intelligence affect the risk of nuclear war?* California: RAND Corporation.

Getz, D., Shaham Katz, A., Klein, R., Czene, R., Rosenberg, S., Shoham, A., Barzani, A., Lek, E., & Zipferple, S. (2018). Research: Artificial intelligence, data science and smart robotics, first report. Haifa: Samuel Neaman Institute for National Policy Research.

Goldschmidt, R. (2018). Information on "artificial intelligence." Jerusalem: Knesset, Research and Information Center. [in Hebrew]

Horowitz, M. C., Allen, G. C., Saravalle, E., Cho, A., Frederick, K., & Scharre, P. (2018). *Artificial intelligence and international security.* Washington: Center for a New American Security.

Hunter, A. P., Sheppard, L. R., Karlen, R., & Balieiro, L. (2018). *Artificial intelligence and national security: The importance of an AI ecosystem.* Washington, D.C: Center for Strategic and International Studies.

Launchbury, J. (2017). *A DARPA perspective on artificial intelligence*. https://machinelearning.technicacuriosa.com/2017/03/19/a-darpa-perspective-on-artificial-intelligence/

Massachusetts Institute of Technology. (2019, March 11). *How the Enlightenment Ends: A Conversation*. https://www.youtube.com/watch?v=nTyIeMuUavo

Osoba, O. A., Boudreaux, B., Saunders, J., Irwin, J. L., Mueller, P. A., & Cherney, S. (2019). *Algorithmic equity: A collection-oriented framework for social applications.* California: RAND Corporation.

Pecotic, A. (2019, March 5). *Whoever predicts the future will win the AI arms race*. https://foreignpolicy.com/2019/03/05/whoever-predicts-the-future-correctly-will-win-the-ai-arms-race-russia-china-united-states-artificial-intelligence-defense/#

Press, G. (2018, September 24). *The thriving AI landscape in Israel and what it means for global AI competition.* https://www.forbes.com/sites/gilpress/2018/09/24/the-thriving-ai-landscape-in-israel-and-what-it-means-for-global-ai-competition/#8585bf630c51

RAND Corporation. (2019). *Security 2040*. https://www.rand.org/international/cgrs/security-2040.html

Sayler, K. M. & Hoadley, D. S. (2019). *Artificial intelligence and national security.* Washington: Congressional Research Service.

West, D. M. (2018, May 15). *The future of work: Robots, AI, and automation*. https://www.brookings.edu/book/the-automated-society/

Yeung, D. (2018). *Intentional bias is another way artificial intelligence could hurt us*. https://www.rand.org/blog/2018/10/intentional-bias-is-another-way-artificial-intelligence.html