Artificial intelligence (AI) Standards and Regulations

Introduction

History of Artificial Intelligence (AI)

Artificial intelligence, according to a 1955 definition by John McCarthy, is "the science and engineering of making intelligent machines," but it has gone beyond that in today's technology.[1] AI ranges from computerized chess games to attentive surveillance cameras. In 1935, Alan Turing described a machine with limitless memory

Figure 1: The three key terms in AI and how they are related

and an interior scanner that read symbols, which are instructions, to guide computer functions. This became an outline for all future computers. Turing continued to teach about computer intelligence in the 1940s, saying "What we want is a machine that can learn from experience".[2] In 1950, the Turing test helped determine what is considered intelligent in the electronic world. In this test, an interrogator asks questions to a computer and a human via digital messaging. The interrogator is trying to discover who the computer is. The computer's goal is to trick the integrator, and the human's goal is to help the integrator. If the integrator is unable to distinguish, the computer is intelligent.[3]

John McCarthy, a Stanford Professor, helped found the Dartmouth Summer Research Project on Artificial Intelligence. This took approximately six weeks and initiated practices such as symbolic methods and systems focused on limited domains.[4] Since this project was so foundational, Dartmouth College founded the field of AI research in 1956.[5] In 1973, James Lighthill released the Lighthill report. Commissioned by the UK Science Research Council, this report heavily denounced AI research, because "in no part of the field have the discoveries made so far produced the major impact that was then promised".[6] This spurred an "AI winter". During this period (1974-1980), funding for automation from the American and British governments ceased. Funding returned between 1980-1987 when businesses invested billions of dollars into AI in order to solve problems that require
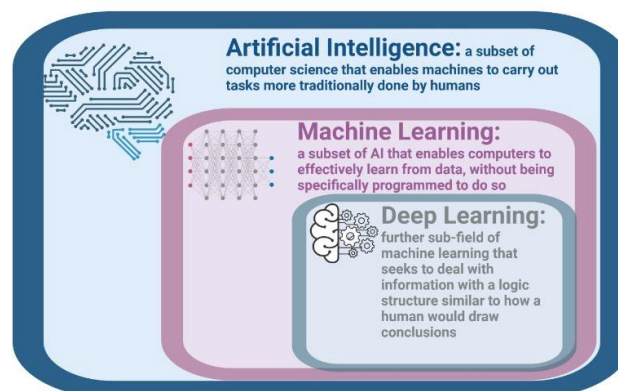
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[1] "Artificial Intelligence: Proceedings of the International Conference and Workshop on Emerging Trends in Technology." *ACM*. https://bit.ly/3UjacnG.

[2] "The Turing Test." *Encyclopædia Britannica*. https://www.britannica.com/technology/artificial-intelligence/The-Turing-test.

[3] Ibid

[4] "The Dartmouth Workshop--as planned and as it happened." *Stanford University.* https://stanford.io/3qPuGXM.

[5] "Artificial Intelligence (AI) Coined at Dartmouth." *Dartmouth* College. https://bit.ly/3UjaBGI.

[6] "History of Ai Winters." *Actuaries Digital*. https://www.actuaries.digital/2018/09/05/history-of-ai-winters/.

human expertise (i.e. identifying chemical compounds).[7] Since these programs were expensive and difficult to maintain, another AI winter manifested from 1987 – 1993.[8] After that, there was an explosive growth. 1997, specifically, was monumental, because a chess-playing AI program beat the grand champion Gary Kasparov in a game of chess. This demonstrated what AI could do.

Types of AI

There are three different classifications of artificial intelligence: Artificial Narrow Intelligence (ANI), Artificial General Intelligence (AGI), and Artificial Super Intelligence (ASI). ANI is the simplest type since it has a forte in a single area. For example, Siri can only do functions within a phone. Next, AGI refers to human-like intelligence within a machine. An example of this would be a customer service chat box directing others as a general human would.[9] Lastly, ASI refers to machines that surpass human capabilities in multiple or all fields.[10] For example, the Mayo Clinic's AI rapidly creates better treatment ideas for cardiovascular issues like weak heart pumps and strokes.[11]

Big Data

Big data includes "sets of information that are too large or too complex to handle, analyse or use with standard methods".[12] This information can be found in social media, search history, and even physical objects. Biological information, such as genetics, can improve human welfare in medicine. For example, doctors will better know which medicine can improve one's health when looking at one's family history. Additionally, cars are being integrated with Artificial Super Intelligence to prevent accidents and improve driving safety conditions. An example of this can be a car automatically stopping once sensing biological information that a human is within three feet of it. Not only will humans be analyzing data, but experts predict by 2026 artificial intelligence will join the board of directors of many companies.[13]

Despite the positives, big data caused some concerns within the general public. Big Data Zone asked thirteen executives about their concerns regarding big data. Some emphasized how personal data can be used against them. Their concern is how the manager of one's data decides to penalize him or her for his or her characteristics ranging from social media posts to house location. Another pointed to companies and the amount of data they collect from an individual. This Executive is wondering if companies are protecting one's data from others or sharing it freely. An example of this is search engines. Search engines like Google became popular and easy to use, because they used your past searches to guide your future searches. These concerns over privacy and data management, when combined with the power of AI, has many people advocating for the introduction of basic standards and regulations for data holders, collectors, and analyzers.[14]

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[7] Ibid
[8] Ibid
[9] "What Is Artificial Intelligence? Types, Trends and Future of It?" *GreatLearning Blog*. https://bit.ly/3S9k0Pe.
[10] "Artificial superintelligence: The next big evolutionary leap." *Geek Time.* https://www.geektime.com/artificial-superintelligence-evolutionary-future-kyndryl/.
[11] "Cardiovascular Medicine." *The Mayo Clinic*. https://mayocl.in/3RTOzc1.
[12] "Big Data." *Oxford Advanced Learner's Dictionary.* https://bit.ly/3DzdL33.
[13] ""What Are AI and Big Data?" *World Economic Forum*. https://www.youtube.com/watch?v=uD8Dbozzod4.
[14] "Concerns about Big Data - Dzone Big Data." *Dzone*. https://dzone.com/articles/13-concerns-about-big-data.

The Benefits & Problems of AI

Human Rights Concerns

Some countries have found AI a useful tool in monitoring and restricting their populations. China gives every individual a social score that they decrease or increase using AI surveillance. If someone jaywalks in China, the AI will automatically display the jaywalker's face for all to see while lowering their social score.[15] Then punishments arise in that range from denying public transportation or denying university applications.[16] The UN has taken a look into the risks of AI in excessive governmental surveillance and their risks to human rights. UN High Commissioner for Human Rights, Michelle Bachelet, created a report on the dangers of AI to human rights in 2019.[17] This report concluded that the growth and advances in AI pose a risk to human rights until greater safeguards are developed to ensure that AI is not being misused.[18]

During the COVID-19 pandemic, AI has been used both ethically and unethically. Ethically, AI has helped researchers analyze COVID-19 and develop a more effective response.[19] On the other hand, some countries have used AI in ways that might stem the spread of COVID-19, but erode human rights and privacy of their citizenry. In South Korea, AI was used to develop a system that would automatically alert authorities if an individual was not comply with instructions to self-isolate.[20] In China, many citizens have been forced to use phone applications that track their symptoms and movements and can prevent them from getting on public transit or trains if the AI believes they could have COVID or been exposed to it.[21] Defenders of this use of AI see this level of monitoring as positive as it could help slow the pandemic, but others contend that such high levels of surveillance make societies less free and undermine individual liberties. Additionally, many countries and corporations have lax data protection policies meaning that a lot of the data gathered and used by AI is easily accessible by criminals. Finally, AI played a role during the pandemic in helping spread disinformation on social media about the pandemic and vaccines. AI can quickly flood social media with repetitive responses that confuse the public about COVID-19 and undermine faith in vaccines. Prior to the pandemic, bots on Twitter linked to the Russian government spread disinformation about vaccines in order to increase mistrust in western nations.[22] This misinformation is credited with reducing vaccination rates in Europe and the United States. AI makes this level of misinformation both effective and ubiquitous.

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[15] "The Age of AI." *Public Broadcasting Service.* https://www.pbs.org/video/in-the-age-of-ai-zwfwzb/.
[16] Ibid; "China's 'Social Credit' System Ranks Citizens and Punishes Them with Throttled Internet Speeds and Flight Bans If the Communist Party Deems Them Untrustworthy." *Business Insider.* https://bit.ly/2kHinOQ.
[17] "The U.N. Warns That AI Can Pose a Threat to Human Rights." *NPR.* https://n.pr/3qNvlsM.
[18] "Urgent action needed over artificial intelligence risks to human rights." *United Nations.* https://bit.ly/3Sfc7YI.
[19] "AI and control of Covid-19 coronavirus." *The Council of Europe.* https://bit.ly/3ydc4VN.
[20] Ibid.
[21] "How to protect the world from ultra-targeted biological weapons." *Bulletin of Atomic Scientists.* *https://thebulletin.org/premium/2020-12/how-to-protect-the-world-from-ultra-targeted-biological-weapons/.*
[22] "Russia trolls 'spreading vaccination misinformation' to create discord." *BBC.* https://bbc.in/2LU90Tk.

Scientific Advances

However, the fight against climate change has found great assets in automated tools. Microsoft's AI for Earth program is a search engine that provides important geological data to scientists who "address environmental challenges''. Using sources that originate from everyone from NASA to Chinese Meteorologists, these climate scientists make "innovative solutions to the way we monitor, model, and ultimately manage Earth's natural systems."[23] Additionally, "This Climate Does Not Exist" platform is a digital design tool that allows young researchers to take reality today and display possibilities of the future. This AI imaging takes images of renowned tourist sites and shows what could happen if the effects of climate change aren't mitigated. This tool can be utilized by a number of stakeholders, including policymakers to encourage legislation aimed at climate action.[24]

  AI also actively helps researchers make important discoveries. In biology, AI has been utilized to better analyze the structures of proteins and genetic sequences.[25] AI can help researchers find cures for rare diseases or even improve treatments for diseases for which we already have cures. In medicine, AI often helps doctors analyze imaging from tests, helping improve the chance of a doctor spotting a cancerous growth or an issue with an internal organ.[26] These positive uses of AI can help save lives across the globe—but their use remains largely confined to economically advanced countries. In this way, the adoption and use of AI is spread inequitably across the globe.

  On the other hand, AI can have unethical applications in scientific research. A paper published in 2022 demonstrated that an AI system developed to more quickly develop effective pharmaceuticals, could also be used to develop biological and chemical weapons. In six hours, the AI developed brand new nerve agents that could kill individuals, even though the dataset on which it had trained had not nerve agents included.[27] In this way, AI is a dual-use technology in that it can be used for positive things, discovering new medicines, but it can also easily be used for other more nefarious purposes. AI can even design biological weapons to target specific characteristics, such as common genetic traits among groups of people or even a specific individual.[28] Thus, AI has the ability to design more dangerous biological and chemical weapons. Despite the positives of AI in scientific research, it also comes with substantial risks.

Military Implications

AI can be found in weaponry and in manufacturing. In terms of automation and weaponry, 2003 saw two notable developments. In 2003, an automated US Patriot missile system struck an allied UK

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[23] "AI for Earth." *Microsoft*. https://www.microsoft.com/en-us/ai/ai-for-earth.
[24] "What Ai Can Do for Climate Change, and What Climate Change Can Do for Ai." *Scientific American*. https://www.scientificamerican.com/article/what-ai-can-do-for-climate-change-and-what-climate-change-can-do-for-ai/.
[25] "Applications of Artificial Intelligence in Biology: An Easy Intro for Researchers." *BiteSizeBio*. https://bitesizebio.com/64186/artificial-intelligence-in-biology/.
[26] "Top 5 Use Cases for Artificial Intelligence in Medical Imaging." *Health IT Analytics*. https://bit.ly/2Q6EZm0.
[27] "Artificial Intelligence and Chemical and Biological Weapons." *LawFare*. https://bit.ly/3C9lO5M.
[28] "How to protect the world from ultra-targeted biological weapons." *Bulletin of Atomic Scientists*. *https://thebulletin.org/premium/2020-12/how-to-protect-the-world-from-ultra-targeted-biological-weapons/*.

fighter jet during the invasion of Iraq. Two deaths were a result of misclassified targeting from the automated missile parts.[29] While automated missiles decrease costs and increase accuracy, it does not eliminate human error and can cause its own mistakes. In this case, the Patriot missile system thought the fighter jet was an incoming Iraqi missile so it recommended that a missile be launched against it. In this way, the AI misidentified the target as a missile, when it was an allied airplane. Though an override process exists for the AI system, the speed at which decisions have to be made and the typically accuracy of the system can make individuals hesitant to override the AI.

But weaponry can still be advanced further by AI, changing the scope and intensity of conflicts. Some examples of this intensification can be found in Killer Robots, missiles, and spyware. According to Human Rights Watch, Killer Robots are "fully autonomous weapons…to select and engage targets without meaningful human control".[30] Utilizing data, this weaponry can effectively or accurately aim and attack any target without the necessity of a human operator. Many have raised concerns about the dangers of data-driven weapons if AI could get in the wrong hands. For example, a Killer Robot could be set to kill a group of people with the same race or the same political beliefs. Killer Robots are being developed in nations such as the United Kingdom, United States, Russian Federation, South Korea, Israel, and China. The Human Rights Watch notes that the deployment and development of AI Killer Robots goes beyond International Humanitarian Law (IHL) standards. These standards include rules regarding proportionality and distinction in combat and warfare.[31]

IHL is "a branch of public international law that consists of rules that, in times of armed conflict, seek–for humanitarian reasons–to protect persons who are not or are no longer directly participating in the hostilities".[32] Distinction is found in Rule 1 of IHL, which states that parties within conflict must always distinguish between combatants and civilians; attacks must only be directed at combatants. According to this rule, automated weapons must be able to distinguish between combatants and civilians, but it remains to be seen whether AI will be able to effectively and consistently make this distinction.[33] Proportionality is seen in rule 14 of the IHL, which states that damage to civilian or civilian property is prohibited if it is directed outside of the intended military action. If an AI attacks a civilian outside the opponent's military, someone must determine who would be held accountable if the machine is fully autonomous.[34] Are the original engineers or programmers held accountable? Or the individual who made the decision to deploy the AI system?

Moreover, missiles are being upgraded with AI to find their own targets without human aid. The UN Secretary General, António Guterres, believes that automated weaponry, like missiles, is unacceptable—a belief he bases on the Convention on Conventional Weapons (CCW).[35] This

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[29] "Understanding the Errors Introduced by Military AI Applications." *Brookings*. https://brook.gs/3Uirotq.
[30] "Killer Robots." Human Rights Watch. https://www.hrw.org/topic/arms/killer-robots.
[31] Ibid
[32] "What Is IHL?" *International Committee of the Red Cross*. https://www.icrc.org/en/document/what-ihl.
[33] "Rule 1. the Principle of Distinction between Civilians and Combatants." *The International Committee of the Red Cross*. https://ihl-databases.icrc.org/customary-ihl/eng/docs/v1_cha_chapter1_rule1.
[34] "Rule 14. Proportionality in Attack." *The International Committee of the Red Cross*. https://ihl-databases.icrc.org/customary-ihl/eng/docs/v1_cha_chapter4_rule14.
[35] "Autonomous Weapons That Kill Must Be Banned, Insists UN Chief." *United Nations*. https://bit.ly/2TxM5RB.

convention creates "prohibitions or restrictions on the use of certain conventional weapons which may be deemed to be excessively injurious."[36] In response to the Lethal Autonomous Weapon System (LAWS), CCW created 11 guiding principles when considering these LAWS, but these are not binding.[37]

Spyware with AI is increasing and is being used as a weapon. Spyware is a program that can be placed on your computer or phone and then steal your data on the device, read your messages and emails, and even log your key strokes as you type. AI can make spyware more effective and difficult to spot, but it can also be used to spot malicious spyware. The EU funded the Sectrap project at VisionTechLab to program this defending type of AI.[38] The UN human rights chief denounces the use of spyware, declaring it undermines rights. One human right that Guterres emphasizes the right to life. Guterres states that "machines with the power and discretion to take lives without human involvement are politically unacceptable, morally repugnant and should be prohibited by international law"[39]

Economic Implications

AI can be used as a replacement for workers, with these replacements often impacting so-called lower skilled workers. During the pandemic, nearly 200 toll booth operators in Northern California lost their jobs as the tollbooth collection system was automated using robots and AI.[40] While AI was transitioned into the role in order to limit the human-to-human contact and slowdown the spread of COVID, the switch to an automated system also helped reduce costs as the company no longer needed to pay human workers. Economists estimate that nearly 2 million workers in manufacturing will be replaced by AI by 2025.[41] In this way, AI can threaten the jobs of employees, leading to unemployment.

However, AI in the workforce also brings great benefits. According to the UN, AI does not inherently cause mass unemployment, but brings many additional threats.[42] AI can increase the number of jobs by increasing productivity and creating new products—which in turn creates job opportunities. Additionally, AI such as 3D printers are created for a single function that will unlikely take over an entire occupation. This increases the chance for employees to work side by side with AI such as an algorithm directing a delivery driver to their next delivery in an efficient manner.[43]

Conversely, AI can cause increased economic inequality. According to the UN, it's because "[New Technologies] do change the demand for certain skills and contribute to a shift towards more

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[36] Ibid

[37] "Background on Laws in the CCW – Unoda." *United Nations*. https://bit.ly/3dlTeV9.

[38] "Artificial Intelligence Being Turned against Spyware." *Horizon Magazine*. https://ec.europa.eu/research-and-innovation/en/horizon-magazine/artificial-intelligence-being-turned-against-spyware.

[39] "Autonomous Weapons That Kill Must Be Banned, Insists UN Chief." *United Nations*. https://bit.ly/2TxM5RB.

[40] "Millions of Americans Have Lost Jobs in the Pandemic—And Robots and AI Are Replacing Them Faster Than Ever." *Time*. https://time.com/5876604/machines-jobs-coronavirus/.

[41] Ibid.

[42] "Will Robots and Ai Cause Mass Unemployment? Not Necessarily, but They Do Bring Other Threats." *United Nations*. https://www.un.org/en/desa/will-robots-and-ai-cause-mass-unemployment-not-necessarily-they-do-bring-other.

[43] Ibid

flexible but precarious 'contingent work' arrangements."[44] As these shifts in in-demand skills occur, entire industries can be disrupted, causing an increase in unemployment and forcing employees to seek to develop new skills. These disruptions can be economically painful for individuals as well as entire regions and countries reliant on sectors that AI disrupts. Furthermore, low-income countries will likely be greatly impacted by these disruptions as they often lack the infrastructure and resources to develop and use AI within their own economies.

Nevertheless, AI has done great work to battle global hunger and aid global health, which helps all economic classes. Regarding global hunger, people are innovating new approaches to farming utilizing AI technology. For example, Plenty and Aerofarms are developing vertical indoor farming, which, with technological algorithms, increases yields in real time. Another example is Root AI, where advanced automation notifies the workers when harvest is at its prime. Indoor farming supported by AI increases production substantially. Experts found that indoor farming produces 20 times more food per acre while using 90% less water.[45] Regarding AI health, the Ministry of Health (MoH) in Malaysia is a prime example. This MoH digitized their EMRs and integrated AI into their data analysis. Here, machine learning identifies health burdens and diseases inflations by noticing variables in the data. Prediction of outbreaks can occur when technology scans through non-health data, like roof angles and wind speed. This shows what an impact that AI has. So much an impact that this ANI can predict the location of the next dengue outbreak three months before it occurs.[46]

International Actions

There are no binding or globalized conventions on AI. While AI has been in development since the end of the Second World War, it has really only risen to prominence since the late-1990s. In this sense, it is an issue that is relatively new to the global agenda. There are increasingly calls for the United Nations or international community to develop overarching treaties, agreements, or conventions on AI issues. Those calling for a treaty believe that it should cover ethics for the development of AI, implement reporting structures for AI development in sectors where the AI could have a dual use (such as pharmaceuticals), set strict guidelines for the appropriate usages of AI, articulate a standard for AI-infused weaponry (either banning it outright or setting specific limits that can be monitored) and outline rigorous data privacy regulations.[47]

Right now, international action on AI is a patchwork approach. The United Nations Educational, Scientific and Cultural Organization (UNESCO) adopted a series of recommendations that should be taken into account when developing and using AI. These recommendations want AI to do no-harm; be fair and not discriminate; sustainable; and respect a right to privacy and protect data

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[44] Ibid
[45] "This Is How AI Could Feed the World's Hungry While Sustaining the Planet." *World Economic Forum.* https://bit.ly/3QMzs2E.
[46] "Artificial Intelligence in Global Health." USAID. https://www.usaid.gov/sites/default/files/documents/1864/AI-in-Global-Health_webFinal_508.pdf.
[47] "Moving Toward an Artificial Intelligence Treaty." *The Michigan Journal of International Law.* http://www.mjilonline.org/moving-toward-an-artificial-intelligence-treaty/.

that AI relies on—among other recommendations.[48] The United Nations does already have a Special Rapporteur on Privacy, whose mandate originated in 2015 and increasingly includes data protection as it relates to data collection for AI and AI surveillance issues.[49] On the issue of killer robots, the sixth review conference of the Convention on Certain Conventional Weapons (CCW) convened in December 2021 and tried to adopt a ban on killer robots—but failed.[50] The conference could not even adopt regulations on autonomous weapons as many countries, such as the United States and Russian Federation, are opposed to such regulations—including bans.[51] In a sense, there has been limited global action on AI issues, with only certain facets of the AI issue addressed.

Questions to Consider

1) What can nations do domestically and internationally regarding AI to prevent harm and protect rights?
2) To what extent can AI be regulated in terms of its use or incorporation in warfare?
3) How can societies better balance the negatives of AI with its positives?
4) To what extent can data be better protected?
5) How can the dual-use nature of AI be better monitored?

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[48] "Recommendation on the Ethics of Artificial Intelligence." *UNESCO.* https://unesdoc.unesco.org/ark:/48223/pf0000381137.
[49] "Special Rapporteur on the right to privacy." *United Nations.* https://www.ohchr.org/en/special-procedures/sr-privacy.
[50] "Conference Makes No Progress on Robotic Weapons." *The Arms Control Association.* https://www.armscontrol.org/act/2022-01/news/conference-makes-progress-robotic-weapons.
[51] Ibid.