Applications of Algorithmic Government Around the World

Abstract This chapter presents different progressive steps taken worldwide concerning the automation of decision making in the public sector. During the COVID-19 pandemic, more than 100 nations used contact tracing apps that used the Artificial Intelligence technique to manage the spread of infection. In general, a lot of experimentation is going on around the world. The postal services in America, digital farming technology in Japan, Lawbots in China, AI-based electoral candidates in New Zealand, military surveillance in Australia, AI-based healthcare in Africa, and Roads & transportation improvement in Europe are some of the prominent areas around the world which are thriving on the usage of Artificial Intelligence technology in the public sector for automated decision making. Many countries are investing huge amounts in technology adoption in the near future.

Keywords Contact tracing apps · Lawbots · AI elections · AI investment policy

Decision making actively governs the policies of the Government in the interest of the citizens. With the upcoming and emerging technology, the human workforce can be replaced by future technological advancements, which ease the automaton process in the interests of the public. During
the COVID-19 pandemic, almost 100 nations used contact tracing apps\(^1\) that used Artificial Intelligence techniques to manage the spread of infection. But in general, a lot of experimentation is going on around the world.\(^2\) The following are the case studies of few countries depicting their algorithmic decision-making process in the public sector.

### 5.1 America

The postal services in America handle quite a large number of volumes. Postal service is the country’s basic functionality and is used by the majority of sectors, including education, personal, business, legal, etc. The postal service in the past has not provided efficient and reliable services in all the areas of the sectors, which could have been beneficial to both rural and urban areas alike. Although it has been used in majorly, all sectors yet the postal services have not been able to deliver. They have not been able to cope up with the revenues, and operating costs are just increasing. The postal services have been in loss for more than a decade, and there is a net loss of 3.9 billion dollars. The postal services have a budget around the fuel cost, and the postal services vehicles have been involved in so many road accidents. Due to the uncertain nature of the financial status, postal services in America are at a halt. The postal service sector is also designated as a high-risk sector due to the postal delivery persons and vehicles’ deaths and accidents. To overcome this issue, the government has started to build autonomous cars for postal services and mails and parcels using AI technology.

Autonomous vehicles designed are based on technology that uses high tech cameras, and the use of radar and lidar makes it easy to navigate. Artificial Intelligence uses the data that is collected from cameras, radars, and the driving vehicle system makes further analysis. It combines the sensors’ information with the detailed digital maps that provide the layout, traffic signs, speed limits, and other necessary information related to the roads. The complex vehicle system can also communicate with surrounded vehicles to coordinate with others and avoid collisions and road accidents. The vehicles’ level till now is seen as they use the autopilot for navigation, i.e.,

\(^1\) Contact Tracing Apps around the World—https://www.technologyreview.com/2020/05/07/1000961/launching-mitr-covid-tracing-tracker/.

\(^2\) AI Policy around the world—https://www.holoniq.com/wp-content/uploads/2020/02/HoloniQ-2020-AI-Strategy-Landscape.pdf.
they require a physical driver to intervene in some hazardous situation if it arises. With the increase of AI technology, it is seen as shortly autonomous vehicles will be made to deliver postal service emails, parcels, etc. There is no setup of framework architecture for all the legal implications, so that remains unclear. The AI system also learns driving patterns from the humans and mistakes performed by them. Based on the vehicle’s level, they can then provide the physical driver if the requirement demands. Manufacturers are already in the race to build autonomous cars, and based on the investment, it seems that the postal service sector is committed to integrating autonomous vehicles into the delivery model.

The AI technology in the postal services industry will be beneficial as well as cost-effective. Since the autonomous vehicles are based on electricity, the fuel cost is saved. AI technology to implement autonomous vehicles will help the workers as they will not suffer from fatal accidents and deaths since the vehicle’s system will communicate with other cars, so chances of collision and accidents are minimal. The autonomous vehicles will make administrative work easier and faster. Though the technology seems to be near, many problems may arise as the project implementations come closer. The workers who are already in the job might lose their jobs, the delivery of packages and parcels is a topic yet to be discussed. If done well, the postal services in America will become efficient and faster. If the technology is not implemented in the correct order, this also threatens to displace human labor. It also raises the questions of data privacy and many such problems. Yet, it seems it will solve many issues shortly.

Apart from the postal services department, many use cases across multiple levels are being planned up in the United States. As per a report on US federal agency (Engstrom, Ho, Sharkey, & Cuéllar, 2020), there are 12 use cases either identified or implemented for the Office of Justice Programs, 10 for Securities and Exchange Commission, 9 for National Aeronautics and Space Administration, 8 each for Food and Drug Administration and Geological Survey, 7 for Social Security Administrations, 6 for Patents and Trademark Office, 5 for Bureau of Labor Statistics, and 4 for Customs and Border Protection.

3 Government by Algorithm—https://law.stanford.edu/publications/government-by-algorithm-a-review-and-an-agenda/.
5.2 Asia

There are various growing concerns around the world. One of them is agricultural sustainability, which also includes a shortage of water in Japan’s countryside (Doan & Kosaka, 2020). Sustainable development is the world’s demand at the current moment. Using and developing agriculture is such a way that we meet the present generations’ needs without compromising the needs of the future generation. In the agricultural sector, future generations must take care of the land to provide them food and productivity in the farming sector. Using agricultural land for the sake of our current needs will be very difficult for the prospect. As we know, the fertilizers used up deteriorate the soil’s quality and make it less productive as the years progress. The world is also facing a water shortage, and providing water to agricultural land is an emergent issue. The inexperienced farmers do not know how to maintain the land’s productivity and keep the current generation’s needs. The choice of their fertilizers makes the soil suitable for one or two seasons, and later the quality of the land is degraded. There is less production with the ground’s degradation, and meeting the current needs will be a difficult task.

Following this issue, digital farming technology has been developed in Japan. This technology, with the use of IoT devices and AI-enabled devices, collects the data from the farming practices and the surrounding environment. This data is analyzed, and it tells the inexperienced farmers to use the techniques followed by experienced farmers for sustainable development. The knowledge provided by these experienced farmers is used for sustainable development in the agricultural sector. This digital technology can help in better decision making by analyzing the current situation and environmental surroundings and will suggest better farming techniques that can hold up the soil for better productivity in the future as well. These technologies can help those farmers where the supply of water is limited. This technology is capable of bringing a massive change in the sustainable development of the agricultural sector. Inexperienced growers generally use more fertilizers and water, so using experienced cultivators can help control the quality of crops and maintain a sustainable development environment. AI analyzes the soil and plant data and uses the knowledge to find the minimum amount of water required to serve the purpose. Using digital farming, the IoT sensors collect information and send data for AI devices that analyze and suggest better farming methods for sustainable development.
Digital farming in Japan is already being used and is highly praised. As we know the problem of water shortage, this technique of farming can primarily reduce this problem. This technique is inexpensive and highly efficient. Implementing this technique has brought a change in agriculture, where the use of water had no limits. Still, the usage of new technology manages how much water is sufficient for the land to grow a particular crop type. This technique will raise the value of farming and save both land and water for future generations. This technology has made sustainable development possible in the field of the agricultural sector. It will give the experience to those farmers as well who are new in the farming sector. It will help the newcomers adapt to the farming techniques while using less water and fewer fertilizers that will increase the soil’s age. This technique will maintain the productivity of the land. This technique is also helpful in solving the problem of water shortage in the world. This technology uses extensive experiences from experienced farmers and uses the knowledge to develop sustainable agricultural sector techniques. This technique has already shown Japan’s results and is moving toward other nations like Taiwan, Vietnam, and China.

Apart from farming, Japan also allowed an AI bot\(^4\) to participate in elections for mayor’s post, and it was even claimed to be World’s first AI Mayoral candidate. It was built on the dataset of the region and answered most of the queries. A similar thing happened in New Zealand\(^5\) as well. In the Chinese territory, AI is extensively used for managing the repetitive work of people in the Judiciary,\(^6\) and soon we may see Lawbots giving judgments. Also, China is using AI aggressively in the Social Credit Systems of its citizens for better trust and worthiness assessment.

### 5.3 Australia

In this twenty-first century, Governments worldwide are funding the technological sector for increased productivity and efficiency. Governance in Australia is expanding its IT sectors and technologies for decision making

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\(^4\) AI Mayoral Candidate—https://law.stanford.edu/publications/government-by-algorithm-a-review-and-an-agenda/.

\(^5\) AI Candidate in NZ Elections—https://analyticsindiamag.com/worlds-first-ai-powered-virtual-politician-sam-joins-the-electoral-race-in-new-zealand/.

\(^6\) AI in Chinese Judiciary—https://english.bjinternetcourt.gov.cn/2019-07/01/c_190.htm.
Artificial Intelligence is introduced in the management to replicate humans’ work, and the task can be done repeatedly, faster, and efficiently. The use of Artificial Intelligence in the Defence sector is a new beginning to this era. The problem earlier was unable to detect weapons, vehicles, and other military-related stuff. The section had to rely on the data observed and collected by humans, resulting in errors and mistakes. Managing a large amount of data and complex maintenance are the issues in the military workforce.

The military has faced this issue for ages, but now the introduction of AI has brought a new change to this industry, making it much easier to perform these tasks. Government agencies are using AI to recognize gun truck’s military tanks, and many more. Using cognitive automation has brought this change. To reduce the human workforce, AI assistants can be used to increase the military’s readiness and the effectiveness of the operations in more constrained environments where humans can barely reach. AI assistants have accelerated the speed of work and reduce human errors. This also creates a broader perspective in the training of other military persons in wider aspects of the field. The training of AI and machine learning systems is done for military vehicles. Moreover, new trucks and tanks are being designed using AI technology to help in better and faster decision making in the real-time war situation. Monitoring and processing of data collected by the machines for military surveillance. The Australian defense has also brought in augmented reality to maintain these systems to close the skill gaps between humans and automated systems. The government is also initializing facial recognition methods, solving logistics problems, and much more in the military tasks. Support games for military training and creating life-like war situations can be used to visualize such cases. Better solutions can be designed using the use of AI technology. The NSW business OCIUS technology claims using AI technology, using cameras to detect electronic hearing, and much more. These things work 24*7 and provide continuous coverage at a low cost without affecting a single human life. Automation of combat weapons will be a lifeline for the human workforce. In contrast, speed weapon development and identifying targets by the AI technology will play a crucial role in security surveillance activities.

The impact of the solution will define the future trends of military services around the world. The AI technology-based decision making has been so useful in the early stages of its implementation. When this AI technology is fully implemented can make life so easy for the defense of
the country. The detection of weapons, military trucks, under the sea monitoring all this has been possible due to the introduction of AI technology. The Australian government has already approved 29.9 million dollars to increase the capability of Artificial Intelligence and machine learning in the country. The AI technology-based decision making in the military has proven to be faster, less of errors, and least damage to human life. AI technology is creating real like war situations, and the troops’ training had been better after that. Implementation of AI technology can help use the human workforce in those areas where AI technology is least developed. More efficient and capable systems in the defense forces strengthen and provide a computation of data faster and predict the results much quicker.

5.4 Africa

In Africa, AI helps the continent with some of the root problems, including poverty, education, sustainable development, delivering healthcare, and eradicating diseases (Besaw & Filitz, 2019). Many Governments have given access to innovative and productivity-boosting technologies that can help the continent grow. Healthcare systems in Africa face many challenges on a day-to-day basis. The governments face many structural problems. There is a shortage of quality and equipped professionals and services. The healthcare system of the countries in Africa does not match the standards set up by the WHO. There is a lack of services provided to the patients. Lack of awareness in the health sector is one reason patients do not get the necessary treatment and care. There are lesser health services policies framed. Even though the staff and medicines are available, affordability comes into play. Poverty does not allow the needed services to be in the reach of the patients. AI can plug and reduce these gaps in the health sector. Many startups in the continent are building AI-enabled technologies to focus on healthcare scenarios in the continent.

AI-enabled devices for healthcare can train the individuals in better treatment and supplement themselves as staff for the healthcare department. With high technology penetration, the professionals can focus on more patients and give more time to the patients. AI technology can help formulate better health policies, and these machines can better understand the patterns in the spread of the disease. These devices can build better solutions to tackle these situations. These devices can make the
healthcare system more active. The conditions which are not taken seriously advance analysis techniques of AI can quickly figure out the problem and, in advance, better tailor the treatment. AI technology can prevent a disease from becoming a health crisis. The government is now looking at these technologies to simplify the problem of healthcare on the continent. With AI, technology health services will be much cheaper, readily available, and results in better treatment of the patient. AI technology is for analysis and diagnosis. Using AI services in the sector has already resulted in a faster and better understanding of the tests. It helps the working professionals in finding out complex problems and their solutions. AI tools as the online conversation and machine monitoring have extended the services to millions and remote areas. AI technologies can be useful in accurately predicting and prescribing treatment for people in remote areas. AI technology can make life-saving decisions much quicker than humans because it analyzes powers and capabilities with higher accuracy.

The government has started to incorporate AI technology in the health sector. With an increase in population and the number of diseases increasing, it is necessary to find a solution faster with higher accuracy. AI technology has a massive impact on providing services to millions, even in remote areas. The AI technology has helped in better prediction of results and treatment. It proactively selects a therapy based on analysis and prevents the disease from spreading. The AI technology has helped find patterns in a particular condition and get better results faster with high accuracy. AI technology in the African continent is a blessing in the health sector. The AI technology better understands the disease and can bring up the cause and ways to further spread the disease. AI offers vast opportunities for how we know the condition and how we can improve health. Using this technology, the healthcare system will provide better delivery of services to the continent’s citizens.

5.5 Europe

There has always been a rapid increase in deaths due to road accidents. Millions of lives are lost due to road accidents around the world. Even with the variety of safety measures such as seat belts, helmets, and many more, there has been an increase in road accidents. Pedestrians and cyclists are on unprotected vehicles; hence, the injuries caused to them are fatal. Every mistake on the road can have deadly consequences and vulnerable. Life is lost; thus, something needs to be done to avoid these
accidents. Currently, the government is applying this AI technology in autonomous driving and cameras to prevent accidents. Accidents can be avoided either the virtual assistants and self-driving cars manage themselves and avoid accidents. AI technology here plays a significant role. The German government has urged car manufacturers to use AI technology and knowledge gathered from these devices to prevent road accidents and fatal deaths every day. AI technology is new to Germany; hence the developments are still in the research phase, and later implementation of these technologies is meant to be done. Road accidents are a matter of grave concern, and if AI technology can help the world solve this issue, this will be an excellent achievement for humans. The AI technology in Germany has a goal of zero road accidents, and to achieve this, Artificial intelligence technology is a must.

Artificial Intelligence will enable vehicles to make decisions that could save lives. The sensors and cameras will detect the person on the road either on a cycle or walking by. The AI technology will perform the task based on the detection of critical points of human eyes, nose ears, and detect the full body of the person. These points will help to discover the posture and movement of the body. Using the detection analysis will be made about how far the individual is and how they can be saved from an accident. The system can detect if the person instantaneously comes in front of the vehicle; the driver can get late in recognizing the danger and applying breaks. Simultaneously, the AI-enabled technology will handle this situation and inform the driver about it. AI technology can detect pedestrians, cyclists and even avoid other cars coming in front of it. For this, the vehicles must coordinate with other vehicles and find ways to avoid collisions with each other. The German government has funded the car manufacturing industry to use AI-enabled technology and integrate this into the vehicles. However, to achieve this, we must grow toward the world of autonomous driving. The government of Germany has already stated its goals in this particular field. Once implemented, millions of road accidents can be prevented using AI technology. AI technology can be a boon to human life and make such decisions that could be lifesaving. All this processing and analysis that is done should be computed exceptionally fast because there will be no time to think and analyze in a real-time scenario. AI technology is in the country’s early stages, so it will take time to implement this when we see this happening in real-time.

AI technology-based decision making will have a considerable impact on the vehicle manufacturing industry and humans as well. AI technology,
if utilized and implemented correctly, can turn out to be a life-saving machine. Trials are in process in the country. The AI technology in vehicles and to avoid road accidents is possible shortly. When the car can detect people, other vehicles, and other things, the device will avoid collisions. The car will collect the data from sensors and cameras; using this data, the processing needs to be done, and detecting the person and avoiding collision will be done through the AI-enabled system. AI technology can make decision making in real-time situations easy and free of errors.

The European region seems to be the most advanced in terms of the adoption of the Algorithmic Government. A survey by IE Center for the Governance of Change\(^7\) suggested that a quarter of Europeans favor technology-based decisions at the Government level. 43% of the respondents from the Netherlands, 31% each from Germany and the United Kingdom, 29% from Ireland, 28% from Italy, 26% from Spain, 25% from France, and 19% from Portugal, responded affirmatively in favor of usage of Algorithmic Decision Making at Government level. In fact, Estonia is one of the most advanced regions in Europe with a robust E-Governance infrastructure through schemes like E-Estonia. And now, it is moving toward implementing AI in judicial systems\(^8\) just like the Chinese System.

### 5.6 Policy Level Progress Around the World

By 2030, China purposes to become the world’s leading AI innovator. For this purpose, the country has published a national AI-based strategy and has announced plans to invest a massive amount toward developing AI-based skills. Beijing announced a US$2.1 billion AI-centric technology park, and Tianjin plans to set up a US$16 billion AI fund. Money is flowing from the private sector, too. In 2017, Chinese AI startups received 48 percent of global AI venture funding, outpacing the United States for the first time. China is recorded to be the second-highest number of AI companies globally, behind the United States—and is home to the most highly regarded AI corporation in the world (Deloitte, 2020).

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\(^7\) European Tech Insights—https://docs.ie.edu/cgc/European-Tech-Insights-2019.pdf.

\(^8\) AI in Judicial System of Estonia—https://www.wired.com/story/can-ai-be-fair-judge-court-estonia-thinks-so/.
India, the fastest-growing economy with the second largest population globally has substantial stakes in the AI revolution. Recognizing AI’s ability to turn economies and India’s need to strategize its future, Hon’ble Finance Minister, mandated in his 2018–2019 budget address, set up the AI National Program. In line with the above, NITI Aayog has adopted a three-pronged approach—conducting exploratory proof-of-concept AI projects in different regions, creating a national strategy for developing a vibrant AI ecosystem in India, and working with various experts and stakeholders. Since the beginning of this year, NITI Aayog has collaborated with several leading AI technology-based companies (NITI, 2020).

Europe is well equipped to take advantage of AI’s potential, not only as a user but also as a developer and a creator. It has outstanding research centers, creative start-ups and is a global leader. It has placed robotics in the competitive manufacturing and services industries, ranging from automobile to health, energy, financial services, and agriculture. Europe has developed a robust computing infrastructure (e.g., high-performance computers) that is important to the functioning of AI. In April 2018, the EU Commission adopted the Correspondence on Artificial Intelligence, a 20-page paper setting explaining the EU approach to AI. The goal of the EU Commission is to increase the EU’s technical and industrial ability and the involvement of the public and private sectors in the AI, to prepare Europeans for the socio-economic changes brought about by AI, and to ensure that an adequate ethical and legal structure is in place (Salami, 2020).

In May 2017, Finland’s Minister of Economic Affairs Mika Lintilä appointed a steering group to investigate how Finland can become one of the world’s leading countries in the field of AI technology. While the group will not issue its final report until April 2019, two preliminary reports have already been published. The Finnish government has started to integrate the group’s findings into government policy. The first report, Finland’s age of AI, explains Finland’s strengths and weaknesses in AI and provides recommendations to turn Finland into a global leader of AI. The second document, the Work in the Age of AI, corresponds to a 28 pager policy document on AI, which discussed the ethics and culture while working with Artificial Intelligence.
5.7 Prominent Global Projects

There are many global projects which are using the concepts of Government by Algorithms. They are either running successfully or are in progress for their execution. Many departments are successfully working toward adopting AI in their work processes and moving toward Algorithmic methods. Table 5.1 shows the list of such projects and departments.

Table 5.1 List of prominent global projects under Algorithmic Government

| S.No. | Name of the project or department | Scenario |
|-------|----------------------------------|----------|
| 1.    | US Citizenship and Immigration Services (USCIS) | In 2015, the (USCIS) started using chatbots; Emma managed the visitors who inquired on the website and handled more than 14 million immigration calls. This software automatically routes the user to the required human agent for real-time interaction. The chatbot uses natural language processing to feed thousands of instant messages, including various usual migration issues and service requests, such as a request for a visa application status. It is all managed by Algorithms |
| 2.    | Canada’s AI Investment in Research and Talent | Canada was the first nation to invest a considerable amount to increase the number of AI graduates and establish a national research community based on AI. It currently has the following three institutes; the Alberta Machine Intelligence Institute (AMII) in Edmonton, the Vector Institute in Toronto, and MILA in Montreal, working toward building a community that possesses the required AI-based skills and competencies |
| 3.    | Infocomm Development Authority of Singapore | The Government of Singapore recently collaborated with Microsoft to create an interactive interface for fulfilling its plan of building a Smart Nation. The project primarily aims to expose online public service websites to all the cities and all age groups |

(continued)
| S.No. | Name of the project or department | Scenario |
|-------|----------------------------------|----------|
| 4.    | Denmark’s Digital Growth         | Denmark launched a digital growth strategy in 2018 to make progress on AI-related technologies and transform digital businesses of the city for Danish people |
| 5.    | Atlanta Fire Rescue Department   | Georgia Institute of Technology, Emory University, and the University of California, Irvine worked with the Atlanta Fire Rescue Department (AFRD) to strengthen predictive analytics software to forecast fire risk scores for 5000 buildings and mitigate the impact of the same |
| 6.    | China’s Next Generation Artificial Intelligence Development Plan | China launched a next-generation AI development plan to support and foster AI development strategies, to further build an AI-based industry worth 1 trillion RMB by 2030 |
| 7.    | City of Pittsburgh Traffic Improvement | The City of Pittsburgh partnered with Rapid Flow Technologies for building SURTRAC (Scalable Urban Traffic Control), automated traffic optimization, and controller software that can be used to oversee traffic, decrease travel time and haul-time |
| 8.    | India                            | Under NITI Aayog, the government has adopted an AI strategy to enable Indians to develop competencies and skills for securing quality jobs, putting resources and scaling AI-usage across sectors to amplify the level of development happening across the world |
| 9.    | Singapore Armed Defense          | To deal with labor deficiencies, SAF is using AI-based technologies for combating the need for soldiers and replacing them with sensors and cameras, and other autonomous weapons wherever possible |
| 10.   | New York City Department of Social Services (DSS) | DSS is using AI for digitizing and automating the process of the online experience for the visitors |
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