AI for Good: Use of AI as a Tool to Achieve UN's SDGs

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Abstract

From healthcare, to manufacturing, even to how we get the food we eat, artificial intelligence (AI) is changing our world—and fast. AI has been around since 1950's but the explosion of data from connected devices and recent improvements in processing power, led to AI-driven innovations in every sector. More than half of the 340,000 AI related patents have been proposed in the past five years.

AI (and related exponential technology) is the most important change force on earth. Most exciting is the potential to use AI to create extraordinary benefit—curing disease, advancing clean energy, promoting sustainable transportation and enabling smart cities. And it's not just the work of computer scientists—schools and communities worldwide are beginning to engage young people in tackling local challenges using smart tools. The movement is called AI for Good.

In this paper an attempt has been made to find out how has artificial intelligence (AI) provided an opportunity to understand and solve the United Nations Sustainable Development Goals (SDGs) for 2030.

Keywords: AI (Artificial Intelligence), SDG (Sustainable Development Goals), Machine learning, Algorithms.

Artificial intelligence is technology and a branch of computer science that studies and develops intelligent machines and software. Major AI researchers and textbooks define the field as "the study and design of intelligent agents", where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success.

In the simplest terms, artificial intelligence (AI) refers to systems or machines that mimic human intelligence to perform tasks and can iteratively improve themselves based on the information they collect. AI manifests in a number of forms. A few examples are:

- Chatbots use AI to understand customer problems faster and provide more efficient answers.
- Intelligent assistants use AI to parse critical information from large free-text datasets to improve scheduling.
- Recommendation engines can provide automated recommendations for TV shows based on users' viewing habits.

History of Artificial Intelligence

The history of Artificial Intelligence is quite interesting and dated back in 20th century when science fiction familiarized the world with the concept of artificially intelligent robots.

The 1950s period world saw a generation of scientists, mathematicians, and philosophers with the concept of AI culturally understood in their minds. One such person was Alan Turing, a young British polymath who discovered the mathematical possibility of artificial intelligence. He suggested that humans can utilize available information as well as reason in order to solve problems and make decisions.

But some great challenges stopped Turing from getting to work right then and there. The first reason was computers needed to fundamentally change. Because, before 1949 computers lacked a key prerequisite for intelligence – they couldn't store commands, only execute them. It means that computers could be told what to perform but couldn't remember what they performed. And the second reason was computing was extremely expensive.

During 1950-1974, when AI was in its infancy, a lot of pioneering research was being performed, also huge hype was being created that pushed AI into seclude state, and the research funding gone dry.

The next few years would later be called an "AI winter",

The biggest problem had been the lack of computational power to perform anything substantial, meaning computers simply couldn't store enough information or process it fast enough. At the time, many researchers noted that computers were still too much weak to show intelligence. But in the 1980s, AI was reignited by two sources – an expansion of the algorithmic toolkit, and a boost of funds.

The success was essentially due to increasing computational power, greater emphasis on solving specific problems, new ties between AI and other fields (such as statistics, economics and mathematics), and a commitment by researchers to mathematical methods and scientific standards.

Notable milestones

Deep Blue became the first computer chess-playing system to beat a reigning world chess champion, Garry Kasparov, on 11 May 1997.

In 2011, a Jeopardy! quiz show exhibition match, IBM's question answering system, Watson, defeated the two greatest Jeopardy! champions, Brad Rutter and Ken Jennings, by a significant margin.

In March 2016, AlphaGo won 4 out of 5 games of Go in a match with Go champion Lee Sedol, becoming the first computer Go-playing system to beat a professional Go player without handicaps.

This marked the completion of a significant milestone in the development of Artificial Intelligence as Go is a relatively complex game, more so than Chess.

2015 was a landmark year for artificial intelligence, many attribute this to an increase in affordable neural networks, due to a rise in cloud computing infrastructure and to an increase in research tools and datasets.

Other cited examples include Microsoft's development of a Skype system that can automatically translate from one language to another and Facebook's system that can describe images to blind people.

SDGs

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030.

Through the pledge to Leave No One Behind, countries have committed to fast-track progress for those furthest behind first. SDGs are designed to address the world's most pressing problems, like poverty, hunger, AIDS and discrimination against women and girls.

Everyone is needed to reach these ambitious targets. The creativity, knowhow, technology and financial resources from all of society is necessary to achieve the SDGs in every context.

AI for Good

AI for Good is an initiative supporting institutions employing AI to tackle some of the world's greatest economic and social challenges. It was launched as a United Nations platform, and centred around annual Global Summits, that fosters the dialogue on the beneficial use of Artificial Intelligence, by developing concrete projects.

Applications of artificial intelligence in SDGs

Most of the recent advances in Artificial Intelligence are based on the application of different and more sophisticated Machine Learning techniques. Using such algorithms, computers are equipped with the ability to learn without being explicitly programmed. The fast paced growth of both of data and CPU together with the development of better algorithms is now bringing forward ever more astonishing applications of Artificial Intelligence. So how and where can we use this for sustainable development? The hopes and ideas are many, ranging from applications in healthcare and energy over agriculture and education to environmental protection. Let's look at some initiatives that are putting these ideas into practice.

Agriculture

Due to the increase in population and the growth of demand for food in the future there will need to be at least a 70% increase in yield from agriculture to sustain this new demand. The adaption of these new techniques and the use of Artificial intelligence will help reach that goal.

- AI now predicts the time it takes for a crop like a tomato to be ripe and ready for picking thus increasing efficiency of farming.
- Crop and soil monitoring uses new algorithms and data collected on the field to manage and track the health of crops making it easier and more sustainable for the farmers.
- AI's ability to analyse high-resolution images from satellites, drones can increase agricultural productivity, through digitization and analysis of images from automated drones and satellites.
- AI is favouring less use of, and greater access to, resources such as water. The system creates self-generated recommendations that will be made available to local farmers, making it easier for them to take decisions related to water usage and so guaranteeing a more efficient and optimal use of water resources.

Education

- AI tutors could allow for students to get extra, one-on-one help.
- Study devices could be able to create lessons, problems, and games to tailor to the specific student's needs, and give immediate feedback.
- AI can be used to assess the learning capability of students and help them develop confidence to master subjects.
- AI can help people with a disability or special needs in numerous ways. AI is getting better at doing text-to-voice translation as well as voice-to-text translation, and could thus help visually impaired people, or people with hearing impairments, to use information and communication technologies (ICTs).
- They could also reduce anxiety and stress for some students, that may be caused by tutor labs or human tutors.

Governance

Artificial intelligence (AI) has a range of uses in government. While applications of AI in government work have not kept pace with the rapid expansion of AI in the private sector, the potential use cases in the public sector mirror common applications in the private sector.

- Receiving benefits at job loss, retirement, bereavement and child birth almost immediately, in an automated way (thus without requiring any actions from citizens at all).

- Detecting and preventing the spread of diseases
- Assisting public servants in making welfare payments and immigration decisions
- Adjudicating bail hearings
- Monitoring social media for public feedback on policies
- Identifying fraudulent benefits claims
- Structured deep learning to analyze traditional tabular data sets. It can help solve problems ranging from tax fraud (using tax-return data) to finding otherwise hard to discover patterns of insights in electronic health records.

Health

- Improving the collection, processing and dissemination of health data and information can enhance patient diagnosis and treatment, especially for people living in rural and remote areas.
- AI's ability to analyse high-resolution images from medical scans can improve responses to humanitarian emergencies and help doctors identify skin cancer or other illnesses.
- Better data on climate and environmental conditions can also help governments better predict the occurrence of malaria, control the spread of the disease, and deploy medical resources more efficiently using AI.
- Transport based morphometry (TBM) is a foundational AI technology that enhances the ability of doctors to see diseases that are otherwise imperceptible to the human eye. What is exciting about TBM is that it has the potential to find diseases early, even before obvious signs can be seen on medical images. With the technique researchers have created a disease-detection AI system using the visual diagnosis of natural images, such as images of skin lesions to determine if they are cancerous that outperformed professional dermatologists.
- AI enabled wearable devices can detect people with potential early signs of diabetes with 85 percent accuracy by analysing heart rate sensor data.

Marine Ecosystem

- Pattern recognition can track marine life migration, concentrations of life under the sea and fishing activities to enhance sustainable marine ecosystems and combat illegal fishing.
- A wealth of data and information products are now required and available for oceanography. A number of ocean-born disasters can and should be predicted and their devastating consequences avoided (e.g. typhoons or hurricanes, flooding, and tsunamis).
- Data on water temperature in the upper ocean layer helps with the prediction of tropical cyclones.
- A highly complex information system that includes seismic stations, Internet, satellite and mobile communications, special buoys and modelling is used to support coordinated tsunami warnings for the world. There is potential to further reduce the time needed to detect a tsunami on the ocean surface and generate a more accurate warning, where ocean bottom telecommunication cables crisscrossing the ocean floor can be used for additional ocean observations and data communication.

Crisis response

- Information verification and validation focuses on filtering or counteracting misleading and distorted content, including false and polarizing information disseminated through the relatively new channels of the internet and social media. Such content can have severely negative consequences, including the manipulation of election results or even mob killings, triggered by the dissemination of false news via messaging applications.
- Using AI on satellite data to map and predict the progression of wildfires and thereby optimize the response of firefighters.
- Drones with AI capabilities can also be used to find missing persons in wilderness areas.

Concerns

With so much potential for sustainable AI applications at hand, it is crucial to provide the right incentives for innovators to move into this direction. However, there are a number of problems associated with AI that if not addressed may inhibit the achievement of several SDGs.

First, the great wealth that AI-powered technology has the potential to create may go mainly to those already well-off and educated, while job displacement leaves others worse off. Globally, the growing economic importance of AI may result in increased inequalities due to the unevenly distributed educational and computing resources throughout the world. Furthermore, the existing biases in the data used to train AI algorithms may result in the exacerbation of those biases, eventually leading to increased discrimination.

Second is the case of political polarization due to the massive use of social media. AI and Its tools and techniques can be misused by authorities and others—or be subject to unintentional misuse, sometimes harming the very people they are intended to help. Examples are elections interference, fake news leading to mob lynching.

Third is the lack of robust research methods to assess the long-term impact of AI.
A very important area certainly is the topic of Explainable AI, which wants to crack open the black box of machine learning algorithms and provide ways to understand the reasoning behind machine decisions. Only this in turn will provide a route towards

accountability of AI systems. Just look at the recent case of the tragic and fatal Uber accident, that ended in the death of a pedestrian and the suspension of all of Ubers testing of self-driving car activities. The aftermath of the tragedy shows how important it will be in the future to be able to assess the reasons behind certain decisions of AI systems.

Fourth is privacy issues related to the data-intensiveness of AI applications.
The concerns lie in the field of digital ethics, which tries to develop guidelines to make sure that autonomous agents comply with our moral and ethical standards. Data privacy will be become even more important as we need to protect individuals from the growing desire from corporations and intelligence agencies for data as the most valuable resource for the development of more powerful algorithms. Wide-spread AI education and accessibility is crucial in order to prevent that AI will increase the global divide and lead to an unfair advantage in the hands of very few countries and organizations.

Conclusion

Using the words of of US historian Mervin Kranzberg: "Technology is neither good, nor bad; nor is it neutral". This holds true also for Artificial Intelligence. Artificial intelligence (AI) has the potential to help tackle some of the world's most challenging social problems.
Existing capabilities could contribute to tackling cases across all 17 of the UN's sustainable-development goals, potentially helping hundreds of millions of people in both advanced and emerging countries. For now, issues such as data accessibility and shortages of AI talent constrain its application for social good.

AI is not a silver bullet for all of humanity's problems. But it has the potential to be a formidable tool in the toolkit.

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