Artificial intelligence

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Introduction

Artificial intelligence helps humanity; however, it may also be destroying it. A prediction of 85 million jobs by 2025 will no longer require humans. This has benefits, but downsides. Voice assistants are gathering more data, and Tesla autopilot has more than two dozen crashes 8 of which resulted in 10 deaths. Artificial intelligence has different types and examples, different ways to learn and diverse benefits, however there are also dangerous downsides.

About AI

What is AI?

Artificial intelligence (AI) is the intelligence performed by machines; it refers to the simulation of human intelligence in machines. The term AI may also be applied to any machine that displays traits associated with the human mind.[1]

Types of AI?

There are many types of AI, however the main types are machine learning, neural networks, and deep learning, these are all subsets of AI.

Machine learning (ML)

Machine learning is a method of data analysis.[2] It is a branch of AI and computer science which focuses on the use of data and algorithms to mimic the way humans learn gradually improving through experience and the use of data.[3]

Examples of machine learning include:[4]

- Search engines
- Email filters
- Websites
- Banking software
- Apps
- Voice recognition

[1] (Jake, Artificial intelligence, March 8, 2021)
[2] (SAS, Machine Learning)
[3] (IBM cloud, Machine Learning, 15 July 2020)
[4] (Anirudh, what is Machine Learning: Definition, Types, Applications and Examples, Toolbox.com, December 13, 2019)

Neural Networks (NN/ANN)

Neural networks are series of algorithms that try to recognize underlying relationships in a set of data. Through a process that mimics the way the human brain operates; they are pieces of computer systems designed to simulate the way the human brain operates.[5]

Examples of neural networks:

Microsoft claims to have developed a speech recognition system using neural networks and Google makes use of neural networks in connection to power voice search.

Deep learning (DL)

Deep learning also called deep structured learning is a subset of machine learning.[6] It uses algorithms to produce important solutions based on input data.[7] It works by giving large neural networks algorithms and data continuously improving its ability to think and learn.[8] As deep learning does not require a human programmer to tell it what to do it is usually semi-supervised or unsupervised.

Examples of deep learning include:[9]

- Virtual assistants
- Vision for driverless cars
- Facial recognition
- Chat bots
- Shopping and entertainment apps such as Netflix, YouTube, Amazon, Spotify
- Advertisements
- Money laundering detection
- Fake news detection
- Image coloring
- Composing music
- Healthcare

[5] (James, Chen, Neural Networks, Investopedia, Dec 23, 2020)
[6] (Chris, Deep Learning, Wikipedia, August 3rd, 2021)
[7] (Yulia, A Guide to Deep Learning and Neural Networks, serokell.io, October 8th, 2020)
[8] (HPE, what is Deep learning? Hpe.com)
[9] (Richa, Deep Learning - Overview, Practical Examples, Popular Algorithms, analyticssteps.com, March 10th, 2021)

How does AI learn and improve?

AI learns in a few diverse ways but usually large amounts of data (unlabeled, labeled or both) are combined with fast iterative processing and intelligence algorithms, patterns or features in the data.

Supervised learning

With supervised learning data scientists provide input, output and feedback to build a model.[10] It includes both classification which is used to determine what category something belongs in and occurs after a program sees several examples of things from several different categories, and regression which is the attempt to produce a function that describes a relationship between inputs and outputs.[11] Supervised learning algorithms are trained using labeled data.[12] For example it can be used to classify spam in a separate folder from your inbox.[13]

Unsupervised learning

Unsupervised learning is a type of algorithm[14] that uses machine learning to analyze and cluster unlabeled data sets.[15] It refers to the use of AI algorithms to identify patterns within data sets on its own.[16] The most common unsupervised learning algorithm is cluster analysis.[17] Cluster analysis is a powerful data mining tool, and it is used sometimes by insurance providers to detect fraudulent claims.[18]

Semi-supervised learning

Semi-supervised learning is an approach to machine learning that combines a small amount of labeled data with a large amount of unlabeled data during training. It falls between unsupervised learning and supervised learning.[19] Semi supervised learning allows for algorithms to learn from a small amount of labeled data while still classifying a large amount of unlabeled data. Text document classifiers are one of the main examples of semi-supervised learning. It is time efficient for this job and allows for algorithms to learn from a small amount of labeled text.[20]

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[10] (Mary, unsupervised learning, Searchenetrprise.com, July 2020)
[11](Shubham, Supervised learning, Wikipedia, 19 April 2021)
[12] (Javatpoint, difference between supervised and unsupervised learning, JavaTpoint)
[13] (IBM, what is Supervised learning, IBM, 19th August 2020)
[14] (Neurotok, Unsupervised learning, Wikipedia, 23 July 2021)
[15] (IBM, what is unsupervised learning, IBM, 21 September 2020)
[16] (Mary, Unsupervised learning, towardsdatascience.com, July 2020)
[17] (IBM cloud blog) (Education, 21 September 2020)
[18] (Qualtrics, what is cluster analysis when you should use it, Qualtrics.com)
[19] (Tom, semi supervised learning, Wikipedia, 18th October 2020)
[20] (Algorithmia, Semi-supervised learning, Algorithmia, 11 August 2020)

Reinforcement learning

Reinforcement learning is the training of machine learning models to create a sequence of decisions.[21] It is a subset of machine learning, and it enables an agent (software robot) to learn through the consequences of actions in a specific environment. Reinforcement learning is used in things like teaching robots new tricks, personalized recommendations, traffic light control, web system configuration, chemistry, advertising and deep learning.[22]

The positives and negatives

Deepfakes

Deepfakes are videos, audio recordings or images in which a persons, voice, face or body is replaced with someone else's likeness.[23] Channel 4s deepfake video replaced an actor with the queen as this was for entertainment purposes it was not harmful, however deepfakes can be. Photo manipulation developed in the 19th century soon later applied to motion pictures and as time passed deepfakes improved. Deepfakes are created typically by feeding hundreds and thousands of images into a neural network training it to reconstruct patterns which most of the time are faces, however they can also be audio recordings, bodies or any image. Deepfakes are usually used to replace faces, manipulate facial expressions, synthesize faces or synthesize speech.[24] Creating a convincing deepfake used to require a lot of data and computing power however now with apps you can quickly efficiently and easily stitch anyone's face onto someone else's body. This is a cause for concern, deepfakes are only improving and they can cause severe issues such as ruin an election and cause extreme emotional and mental trauma to the person involved. As deepfakes get stronger many people may start to lose faith in the news that's real, this could greatly impact humanity.

Mental health

Mental health with AI is a leading 3. Loss of day-to-day interactions may have a negative impact on someone's mental health. The benefits of social interaction are limitless however with AI most of that could go, therefore harming one's mental health.

The New York times published an article explaining the positive effect of on mental health due to day-to-day interactions. With AI these interactions can reduce significantly thus impacting people's mental health. With an increasing number of jobs being lost social interaction will reduce.

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[21] (Błażej Osiński, what is reinforcement learning? The complete guide, deepsense.ai, 5 July 2018)
[22] (Jair, Reinforcement Learning and 9 examples of what you can do with it, October 23rd, 2020)
[23] (Material Scientist, Deepfakes, Wikipedia, 18th July 2021)
[24] (Watch Blog, Deconstructing Deepfakes—How do they work and what are the risks? Blog.gao.gov, October 20th, 2020)

According to the World Economic Forum (WEF) 85 million jobs will be replaced by machines with AI by the year 2025 as discussed below.[25] This number shall only increase. Less jobs means less day-to-day interactions with people like cashiers, public transport and uber/taxi drivers, restaurant employees, doctors, surgeons, security guards, receptionists and personal trainers. The result of so many day-to-day interactions gone may negatively affect someone's mental health.

Psychologist Susan Picker states that direct personal contact triggers parts of your nervous system that releases a "cocktail" of neurotransmitters tasked with regulating our response to stress and anxiety. Also due to social interaction dopamine is generated which gives us a little high and kills pain. This response will be limited with reduced daily interactions. A study from 2017 showed that those undergoing chemotherapy for cancer tend to fare better if they have access to socialization and support. By interacting with others, you can train your brain too.[26]

Research has shown that by interacting with others we train our brain, through memory formation which helps protect the brain from neurodegenerative diseases. With AI limiting social interactions this effect on our brains will be limited. However artificial intelligence can also take over dangerous or boring tasks in jobs.[27]

If AI takes over dangerous tasks in jobs, job satisfaction would increase therefore making that person happy and mentally better. Not only that but mental health websites and apps like Woebot and Replika may be effective. A study conducted at Stanford university concluded that using Woebot led to a significant reduction in depression among young adults aged 18 – 28 years old. Compared to an information only control group, however both groups anxiety was greatly reduced,[28] and there were only 70 participants. Meaning the likelihood of it being a coincidence is greatly increased.

Unemployment

AI could cause unemployment. AI performs better in most jobs than humans, they are more productive, and they don't procrastinate, they can work 24/7 and they usually do what they are a told to. According to WEF about 85 million jobs by 2025 will be replaced by robots,[29]

[25] (WEF, The future of jobs report 2020, Weforum.org, 20th October 2020)
[26] (Maria, Socialization: How does it benefit mental and physical health? Medical news today, Feb 23rd, 2018
[27] See citation 26) (Scientist, 18th July 2021) (Placeholder1)
[28] (Kathleen, Delivering Cognitive Behavior Therapy to Young Adults with Symptoms of Depression and Anxiety Using a Fully Automated Conversational Agent (Woebot): A Randomized Controlled Trial, mental.jmir.org, June 2017)
[29] See citation 25

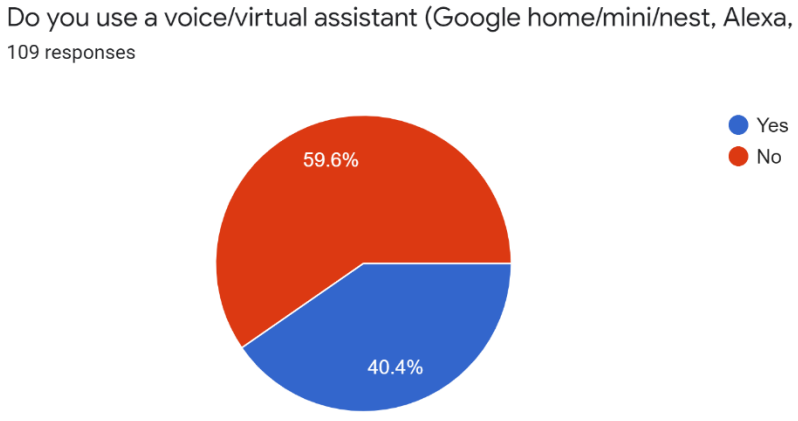
that's 3.4x Australia's population (2019).[30] This number of jobs lost will increase over time, however AI can also create jobs.

AI can create more jobs; jobs may be created with the task of managing or controlling AI. In the same report as above WEF states that 97 million new jobs will be created by 2025 due to AI.[31] That is a total increase of 12 million new jobs.

Key benefits

AI makes mistakes less often than humans. As it is programmed to do things, it does what it is programmed to do unless the AI does not require a human programmer to tell it what to do (semi-supervised or unsupervised).

This means that when AI performs tasks that humans could do, they eliminate human error aside from the human programmer's error. AI can also take over dangerous tasks that humans cannot do due to safety. Dangerous jobs pose no risk to AI as they will perform better, and they can be replaced. Another benefit of AI can be assistance. AI can assist anyone for almost anything, voice assistants like Siri, Alexa and Google Assistant all assist you. They are programmed so you can ask a question and immediately get an answer. This is very helpful for all people, however especially for those who require extra assistance. This type of AI will improve which is incredibly convenient. However as shown below from the results of my survey, many people use a voice assistant, and the data voice assistants collect is astounding.



Survey completed by BPS students, family and work colleagues of my parents at around August 2021.

In order to personalize responses, AI voice assistants use data from users, many are hesitant to share that data with companies. All AI assistants listen to many conversations gathering

[30] (Data commons, Australia, Datacommons.org, 2019)
[31] See citation 25

data, and we don't always know what they do with this data. AI also provides the ability to solve problems relating to healthcare.

Effective healthcare is essential for the survival of the human race. There is remote patient monitoring technology which allows healthcare providers to perform clinical diagnosis and suggest treatments quickly without having the patient actually visiting the hospital in person.[32] AI can also solve complex problems.

Complex problems even math ones can be effortlessly solved by AI. Problems like fraud can also be detected by AI and personalized customer interactions for weather forecasting are also benefits of AI. AI may also perform automated tasks resulting in higher production rates and increased productivity.[33]

A key benefit of AI is that its available at all times 24/7, compared to a normal working week of about 40 hours. AI works with no breaks or distractions and is productive for every second, however humans do not have such ability. Self-driving cars are already starting to develop, and they have benefits too.

Self-driving cars or autonomous cars will reduce accidents. Humans have the trait of getting easily distracted from things some distractions include talking to someone, smoking cigarettes, fatigue and phones however AI has no such flaw. Self-driving cars are efficient and may even improve productivity and mood. Driving can make humans angry and fearful, most would rather do work or read a book, if you have an autonomous car, you can do just that, it is time efficient and safer also it has less of an impact on the environment therefore helping everyone's longevity.

Future, controversy

Superintelligence

Superintelligence, defined by philosopher Nick Bostrom is "any intellect that greatly exceeds the cognitive performance of humans in virtually all domains of interest."[34] This simply means anything that has better intelligence than humans for everything virtually.

[32] 10xds, Top ten benefits of AI, 10xds

[33] See citation 32

[34] Motrox, Superintelligence, Wikipedia, 5th May 2021

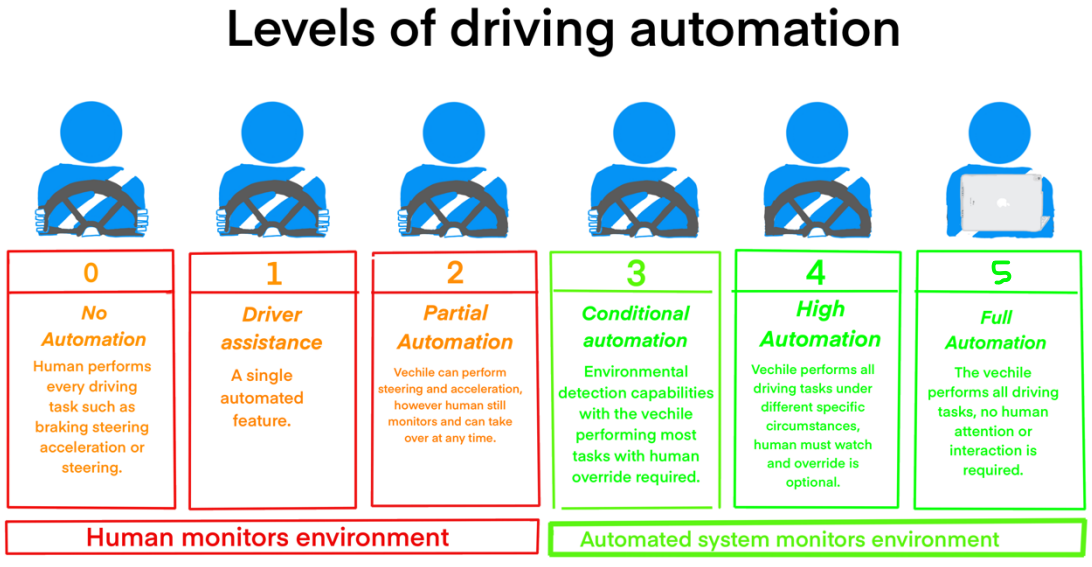
Elon Musk CEO of Tesla claims that AI will be smarter than humans by 2025,[35] however other sources believe 2030. It is impossible to tell or predict how or when superintelligence may take over or the way it might take over.

Although it is impossible to identify the way AI might take over the most possible way is, over time AI may be able to reprogram and improve itself. This could be an unforeseeable attack; the human race may not know when they have created superintelligence. As it will be smarter than us at everything, we will not be able to fight back.

Ethics

Self-driving cars

Self-driving cars are simply vehicles capable of sensing their environment to detect hazards. To be a self-driving car it must operate without human involvement, there are 5 levels of self-driving cars all of which explain the involvement of humans.



[35] Srishti Deoras, AI Will Overtake Humans in Five Years: Elon Musk, analyticsindiamag.com, 29/07/2021

Self-driving cars work with LIDAR (light detection and ranging), sensors, actuators, complex algorithms, machine learning systems and processes

LIDAR uses a narrow invisible infra-red laser which can image features as small as a button on a pedestrian's shirt. It fires a train of short laser pulses to give depth resolution. With many short pulses LIDAR develops a detailed view of a hazard, this process uses integrated photonics to create the pulses quickly and accurately.[36]

Self-driving or autonomous cars have many ethical concerns surrounding them such as who is responsible for the crash of the self-driving car, who makes the decisions surrounding self-driving cars and who decides to swerve or stop.

Self-driving cars according to iihs.org may only reduce 33.33% of crashes,[37] while caradvice.com claims that self-driving cars may reduce 72% of accidents.[38] Some sources believe self-driving cars cause more accidents, despite different opinions most sources support the safety of self-driving cars, however when a self-driving car causes an accident until review no one knows who is responsible.

When a self-driving car causes an accident, you can't tell who's at fault before you look into it. The company may be at fault, or the programmers, the human and maybe even the AI itself. For example, on Sunday 18th April 2021 a Tesla driverless car crashed into a tree, resulting it bursting into flames killing two men, they were believed to be operating without anyone in the driver's seat.[39] This example could very well be Tesla's fault and the human's fault. Many have exploited Tesla's self-driving cars to operate the car without any human involvement and the drivers not being in the driver's seat.[40] If this was the same case with the two men it would mean the two men were at wrong here, as they broke laws, and were very irresponsible. However, in this situation Tesla may also be getting the blame as their safety features should be upgraded.

Lethal autonomous weapons

Autonomous weapons that use AI are simply weapons that work on their own. At this stage there isn't any fully autonomous weapons (that we know about) however they are being developed in nations including China, Israel, South Korea, Russia the United Kingdom and

[36] Sajan Saini, how do self-driving cars see? TED, May 2019
[37] Joe Young, Autonomous cars won't eliminate crashes – report, iihs.org, 4th June 2020
[38] Tina Bellon, Self-driving sector contends its cars can prevent many more crashes than insurance study says, Reuters, June 6th, 2020
[39] ABC, Tesla driverless car crashes into tree and bursts into flames in Texas, killing two, abc.net.au, 19th Apr 2021
[40] Keith Barry, CR Engineers Show a Tesla Will Drive With No One in the Driver's Seat, Consumerreports.org, May 27th, 2021

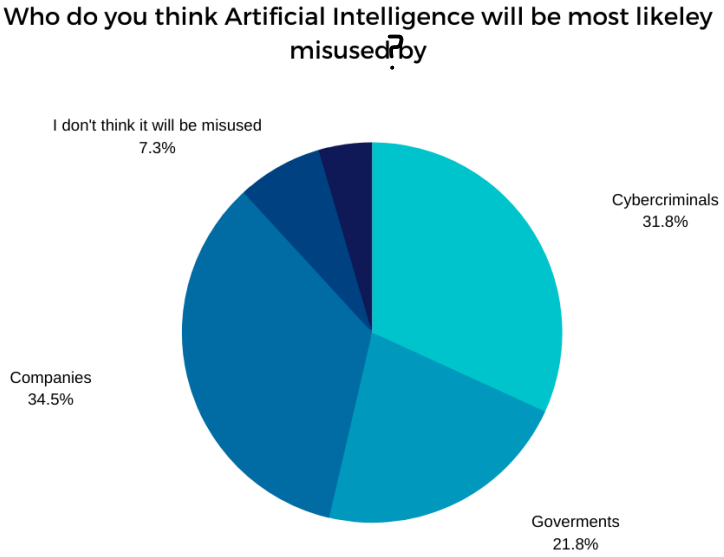
the United States.[41] These robots could save or destroy a life, and many don't trust robots to do such a significant task.

The main ethical consideration with autonomous weapons is the trust. As superintelligence nears closer the reasons why we should not use autonomous weapons are infinite. Nevertheless, autonomous weapons increase decision making, therefore getting an action out quicker, and autonomous weapons have better features then humans; they don't get distracted, they don't get scared, and they may be a more effective method of military.[42]

Although faster decision making is good, decisions autonomous weapons make may not be correct. Incorrect decisions may put someone else's life at risk. The chance of a fatality is low as they will most likely be tested, however low is not never and there's always a risk. If a fatality does occur like self-driving cars many organizations and people may be blamed depending on the circumstances.[43]

Misuse of AI

Despite the benefits of AI, it's easy to exploit. As shown on the graph below many people think AI will be misused. You can exploit AI in many ways; however, the most common ways are deepfakes, AI supported password guessing, Human impersonation on social networking platforms and AI supported hacking.[44]



Survey completed by BPS students,
family and work colleagues of my parents at around August 2021.

[41] HWR, Killer robots, Hwr.org, (N.D)
[42] Future of Life, Lethal Autonomous Weapons Systems, futureoflife.org, (n.d)
[43] StopKillerRobots, The threat of fully autonomous weapons, stopkillerrobots.org, (n.d)
[44] Trend Micro, Exploiting AI, trendmicro.com, November 19th, 2020

Deepfakes can be used to exploit and impersonate anyone.[45] This can cause trauma to the victim or mental health issues. It can also spread misinformation that could affect the victim's reputation. In which infinite things could happen including money loss and an election to be ruined. Also spreading misinformation and affecting someone's reputation is another way mental health issues could be caused.

With the use of machine learning AI algorithms can guess anyone's password.[46] This could be a breach of someone's privacy. Not only that but it could unravel private information causing embarrassment among the victim leading to mental health issues, and in some cases, passwords can end up on the deep/dark web or even social media for sale.[47]

Cybercriminals are abusing AI to mimic and impersonate humans.[48] Similar to deepfakes this can cause trauma to the victim and misleading information may spread which can cause many issues.

Cybercriminals are weaponizing AI frameworks for hacking vulnerable hosts.[49] Hacking can cause damage to digital equipment, loss of data, hackers can also steal credit card information and request new Personal Identification Numbers (PIN).[50]

Safe?

Deepfakes, automated weapons, risk of superintelligence and other misuse examples are not very safe. Deepfakes can cause trauma and mental health issues, they can be misused, and they can cause for misinformation to spread which can cause many issues both short and long term.

Misusing AI can cause many problems, a hacker can use AI to get someone's credit card information or pin number. Hackers can also sell passwords on the dark web or social media. This could cause social embarrassment and a risk of personal data/information becoming public.[51] Cybercriminals can take data, gather intelligence and threaten digital security, they can also access automated weapons if advanced enough, which can cause panic and it puts lives at stake.[52]

Superintelligence may be able to invent or discover anything they will be smarter than humans therefore making it impossible for humanity to gain back control. Nevertheless, self-driving cars despite a few accidents are safe.

[45] See citation 44
[46] See citation 44
[47] Webroot, The Dangers of Hacking and What a Hacker Can Do to Your Computer, webroot.com, (n.d)
[48] See Citation 44
[49] See citation 44
[50] See citation 47
[51] See Citation 47
[52] Ploughshares, 5 Misconceptions about Autonomous Weapons Systems, Ploughshares.ca, (n.d)

Conclusion

Artificial intelligence may be used for good or bad. As superintelligence is a possibility many fear that AI may become smarter than humans. The types of AI are diverse, deepfakes are dangerous. Artificial intelligence impacts one's mental health greatly and unemployment is a great concern relating to AI. Self-driving cars under circumstances may not be ethical, and AI for the most part may not be safe due to the concerns around danger and impact. However, AI may be here to stay if we slow down with the development of AI, use AI responsibly and don't take risks, we can use AI to our convenience.

Glossary

Algorithm - Sequences of instructions telling a computer what to do
Cognitive - mental action or process
Simulate - to mimic

List of abbreviations

AI - Artificial intelligence
ML - Machine learning
ANN - Neural network/Artificial neural network
DL - Deep learning
SL - Supervised learning
UL - Unsupervised learning
SSL - Semi-supervised learning
RL - Reinforcement learning

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