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Research Paper

Evaluation of Influence of Artificial Intelligence (Ai) On Technologies in 21ST Century

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Abstract: *The development of computer systems capable of doing activities that ordinarily require human intelligence, such as visual perception, speech recognition, decision making, and language translation, is referred to as artificial intelligence (AI). AI systems are becoming increasingly beneficial in all aspects of life as they become more complex. AI is intelligence demonstrated by machines as opposed to intelligence demonstrated by humans or other animals in sensing, synthesizing, and inferring information. In a nutshell, AI is the intelligence displayed by appliances. AI research had established ways for dealing with uncertain or partial information by the late 1980s and 1990s, utilizing notions from probability and economics. Humans, on the other hand, rarely employ the step-by-step deduction that early AI research could mimic. They address the majority of their difficulties by making quick, intuitive decisions. AI has been employed in applications to solve a wide range of problems in companies, organizations, services, other sectors, and the academic world. AI, like electricity, machines, equipment, gadgets, or computers, is a general-purpose technology with numerous uses. It has even been utilized in language translation, picture recognition, credit scoring, e-commerce, business, military, air, marine, transportation, and a variety of other industries. AI is used by intelligent personal assistants to grasp various natural language requests in ways other than basic commands. Today, common instances of AI include Apple's Siri, Amazon's Alexa, and ChatGPT from OpenAI, a more modern AI. It is an analytical research effort that evaluates the impact of AI on machines, equipment, technologies, and gadgets in every area of the person, community, society, national, and global arena, as well as the future development and problems of AI in the twenty-first century.*

Key Words: *AI, IoT, ML, Cybersecurity, 4IR, AR, VR, NLP, VLE, KM*

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I. Introduction

Intelligence is defined as a system's ability to calculate, think, detect relationships and analogies, learn from experience, store and retrieve information from memory, solve problems, comprehend complicated ideas, use natural language fluently, classify, generalize, and adapt to new contexts. Intelligence is immeasurable.[1] Reasoning, Learning, Problem Solving, Perception, and Linguistic Intelligence are the five components.[2] Artificial intelligence (AI) is a vast branch of computer science concerned with the development of intelligent machines capable of doing tasks that would typically need human intelligence.[3] While AI is a multidisciplinary field with numerous methodologies, breakthroughs in machine learning and deep learning in particular are driving a paradigm shift in practically every sector of the IT industry.[4] AI, on the other hand, is a collection of technologies that enable computers to do a wide range of advanced operations, such as seeing, understanding, and translating spoken and written language, analyzing data, making suggestions, and so on. Actually, AI is the backbone of modern computing innovation, unleashing value for consumers and enterprises.[5] AI is a vast discipline that includes computer science, data analytics and statistics, hardware and

[1]Luger, George; Stubblefield, William (2004). Artificial Intelligence: Structures and Strategies for Complex Problem Solving (5th ed.). Benjamin/Cummings. ISBN 978-0-8053-4780-7
[2]Poole, David; Mackworth, Alan; Goebel, Randy (1998). Computational Intelligence: A Logical Approach. New York: Oxford University Press. ISBN 978-0-19-510270-3
[3]Dreyfus, Hubert; Dreyfus, Stuart (1986). Mind over Machine: The Power of Human Intuition and Expertise in the Era of the Computer. Oxford, UK: Blackwell. ISBN 978-0-02-908060-3
[4]https://builtin.com/artificial-intelligence,accessed on 17June 2023
[5] https://cloud.google.com/learn/what-is-artificial-intelligence, accessed on 17 June 2023

software engineering, languages, neurology, and even philosophy and psychology.[6] Machine Learning, as previously said, is the science of teaching machines to read, process, and analyze data in order to solve real-world issues.[7]Deep Learning, on the other hand, is the process of using Neural Networks on high-dimensional data to obtain insights and build solutions.[8]Deep Learning is a subset of Machine Learning that can be used to address more complex problems. genuine Language Processing (NLP), on the other hand, refers to the study of extracting information from genuine human language in order to communicate with machines and grow enterprises.[9]Robotics, once again, is a branch of Artificial Intelligence that focuses on various branches and applications of robots. AI robots are artificial agents that act in the real world to achieve results through accountable activities.[10]

An expert system is a computer system that uses artificial intelligence to learn and replicate the decision-making abilities of a human expert. To handle complicated issues, expert systems employ if-then logical notations. It is not based on traditional procedural programming. Expert systems are mostly utilized in data management, medical facilities, loan analysis, virus detection, and other areas. Innovative AI technology, real-time language understanding, and an online ChatGPT certification course. AI research has produced methods for representing certain domains like as objects, characteristics, categories, and object relationships;[11] situations, events, states and time;[12] causes and effects;[13]knowledge about knowledge (that is, knowledge about what other people know);[14]Default thinking (things that humans believe are true until proven otherwise and will continue to be true even if other facts alter)[15] etc. Formal knowledge representations are used in content-based indexing and retrieval,[16] scene interpretation,[17] clinical decision support,[18] knowledge discovery (suggesting the elimination of interesting and actionable insights from huge databases),[19] and other areas.AI enables machines to mimic or even surpass the capabilities of the human intellect. And, from self-driving cars to the emergence of generative AI tools like ChatGPT and Google's Bard, AI is quickly becoming a part of everyday life, particularly in the case of running and managing businesses and organizations. AI is a collection of technologies that are mostly based on machine learning and deep learning and are used for data analytics, predictions and forecasts, object classification, natural language processing, recommendations, intelligent data retrieval, and other applications.

Deep learning algorithms rely on artificial neural networks (ANNs) or simulated neural networks (SNNs), which are a subset of machine learning. Their name and form are inspired by the human brain, and they replicate the way biological neurons communicate with one another.An ANN is composed of node levels, including an input layer, one or more hidden layers, and an output layer. Each node, or artificial neuron, is connected to the next and has its own weight and threshold. Neural networks use training data to learn and improve their accuracy over time. However, once these learning algorithms have been refined for accuracy, they

[6] Brynjolfsson, Erik; Mitchell, Tom (22 December 2017), What can machine learning do? Workforce implications, Science, 358 (6370)

[7] https://www.edureka.co/blog/top-machine-learning-tools/, accessed on 17 June 2023

[8]https://www.aiche.org/resources/publications/cep/2018/june/introduction-deep-learning-part-1?, accessed on 17 June 2023

[9] https://www.sciencedirect.com/science/article/abs/pii/S138650561730446X, accessed on 17 June 2023

[10] https://www.tandfonline.com/doi/10.1080/20479700.2018.1498220, accessed on 17 June 2023

[11]Luger, George; Stubblefield, William (2004). Artificial Intelligence: Structures and Strategies for Complex Problem Solving (5th ed.), Benjamin/Cummings. ISBN 978-0-8053-4780-7

[12]Poole, David; Mackworth, Alan; Goebel, Randy (1998). Computational Intelligence: A Logical Approach. New York: Oxford University Press. ISBN 978-0-19-510270-3

[13]Poole, David; Mackworth, Alan; Goebel, Randy (1998). Computational Intelligence: A Logical Approach. New York: Oxford University Press. ISBN 978-0-19-510270-3

[14]Russell, Stuart J.; Norvig, Peter (2003), Artificial Intelligence: A Modern Approach (2nd ed.), Upper Saddle River, New Jersey: Prentice Hall, ISBN 0-13-790395-2

[15]Luger, George; Stubblefield, William (2004), Artificial Intelligence: Structures and Strategies for Complex Problem Solving (5th ed.). Benjamin/Cummings. ISBN 978-0-8053-4780-7

[16] Smoliar, Stephen W.; Zhang, HongJiang (1994), Content based video indexing and retrieval, IEEE MultiMedia. 1 (2): 62–72. doi:10.1109/93.311653

[17]Neumann, Bernd; Möller, Ralf (January 2008). "On scene interpretation with description logics". Image and Vision Computing. 26 (1): 82–101. doi:10.1016/j.imavis.2007.08.013

[18]Kuperman, G. J.; Reichley, R. M.; Bailey, T. C. (1 July 2006). "Using Commercial Knowledge Bases for Clinical Decision Support: Opportunities, Hurdles, and Recommendations". Journal of the American Medical Informatics Association. 13 (4): 369–371. doi:10.1197/jamia.M2055

[19]McGarry, Ken (1 December 2005). A survey of interestingness measures for knowledge discovery. The Knowledge Engineering Review. 20 (1): 39–61. doi:10.1017/S0269888905000408

are powerful tools in computer science and artificial intelligence, allowing us to rapidly classify and cluster data. When compared to manual identification by human experts, speech or picture recognition tasks can be completed in minutes rather than hours. Google's search algorithm is one of the most well-known neural networks.[20] Some of the primary benefits of automation, cognitive technology, and data analysis employing AI algorithms are increased productivity, time and cost efficiency, human error reduction, faster business choices, consumer preference prediction, and sales maximization. AI investment has been increasing in recent years and is expected to continue in the next years.[21]Today, we must determine what skills will be required for future occupations based on the advancement of AI in various fields of business.[22]This will assist the human community in preparing for and accepting the changes brought about by the rapid incorporation of AI into human life and industry.

The impact of AI on technology is due in part to how it affects computing. Computers can harness huge volumes of data and utilize their learned intelligence to make optimal decisions and discoveries in fractions of the time that people would take.[23] Recent occurrences, ranging from election interference to data breaches, including cyber-attacks, have demonstrated that technology is altering our perceptions of privacy, national security, and, possibly, democracy itself. Today, new complicated challenges in a few key areas will determine the future of the digital era as a result of the advent of AI, including the justice system, the impact on democracy, global security and international conflict, the impact of automations and the job marketplace, identity, and privacy. However, in the twenty-first century, AI is critical for operating, controlling, and running daily work/events on a huge scale in industry, business, and the service sector. Furthermore, in the present era, AI has an impact on every part of life.[24]It is an analytical work that evaluates the impact of machines, equipments, technologies, devices, concepts, and operations by AI in every area of the individual, community, society, national, and global arenas, as well as the future development and difficulties posed by AI in the twenty-first century.

Figure 1: AI has brought the world in our finger tips[25] and future of AI[26]

History and Chronological Development of AI

Throughout history, innovation has been the primary driver of rising living standards. However, the process of innovation is extremely disruptive because it renders existing technology outdated. The Internet of Things (IoT), data science and big data, cloud computing, artificial intelligence (AI), and blockchain are developing technologies that may produce both winners and losers around the world.[27] Some of these technologies have been around for at least two and a half decades[28]; In the past, they were unable to establish themselves as ordinary technology. In contrast, in today's world, there isn't a single subject where one or a

[20]https://www.ibm.com/topics/neural-networks#,accessed on 17June 2023
[21]Firschein, Oscar, et al, Forecasting and assessing the impact of artificial intelligence on society, IJCAI, 1973
[22]CB Insights. Mosaic Algorithm. https://www.cbinsights.com/company-mosaic, accessed on 23 June 2023
[23] https://builtin.com/artificial-intelligence/artificial-intelligence-future, accessed on 17 June 2023
[24]http://it-in-industry.org/index.php/itii/article/view/702,accessed on 17June 2023
[25] https://www.aljazeera.com/opinions/2021/12/2/artificial-intelligence-must-not-exacerbate-inequality-further, accessed on 17June 2023
[26] https://postandparcel.info/99943/news/innovation/humans-have-significant-role-to-play-in-the-future-of-ai-says-inform/, accessed on 17June 2023
[27]Borkar, Vinayak R., Michael J. Carey, and Chen Li. "Big data platforms: What's next?" XRDS: Crossroads, The ACM Magazine for Students 19.1, 2012
[28]Lohr, Steve, The origins of 'Big Data': An etymological detective story, New York Times 1, 2013

combination of more than one of these technologies hasn't been investigated. Many factors contribute to this, including advances in computer technology (such as high-performance computing, grid computing, and cloud computing), more transparency through code sharing platforms such as Github, Gist, GitXiv, and a significant number of open source software.[29]

Artificial intelligence first appeared as a storytelling device in antiquity and has since become prevalent in literature, like in Mary Shelley's Frankenstein.[30] The study of mathematical logic led directly to Alan Turing's idea of computation, which proposed that a machine could imitate any conceivable act of logical deduction by shuffling symbols as simple as "0" and "1". The Church-Turing thesis refers to the realization that digital computers can imitate any process of formal reasoning.[31]This, together with breakthroughs in neuroscience, information theory, and cybernetics, prompted academics to examine the potential of creating an electronic brain.[32] McCullouch and Pitts' 1943 formal design for Turing-complete artificial neurons was the first study that was widely acknowledged as AI.[33] Two perspectives of how to create machine intelligence arose by the 1950s. One ambition, known as Symbolic AI, was to utilize computers to generate a symbolic representation of the world as well as systems capable of reasoning about it.

In 1956, a workshop at Dartmouth College gave birth to the field of artificial intelligence research. Attendees went on to become the founders and leaders of AI research. They and their pupils created activities that were lauded by the press;[34] Computers were learning checkers strategies, mathematics word problems, logical theorems, and speaking English.[35]By the mid-1960s, the Department of Defense began heavily funding research in the United States.[36] and Around the world, laboratories had been created.[37]In the 1960s and 1970s, researchers believed that symbolic approaches would eventually succeed in constructing a machine with artificial general intelligence, and this was the goal of their discipline.[38]"Within twenty years, machines will be capable of accomplishing whatever work a man can do,' said Herbert Simon.[39] According to Marvin Minsky, 'within a generation... the problem of developing 'artificial intelligence' will be significantly overcome.'

They had underestimated the difficulty of several of the remaining jobs. Progress stagnated, and in 1974, in response to Sir James Lighthill's criticism and continuous pressure from the US Congress to support more productive initiatives, both the US and British governments halted exploratory AI research.[40] The subsequent years would be dubbed a "AI winter," a period in which acquiring funding for AI initiatives was challenging. The commercial success of expert systems, a type of AI software that emulated the knowledge and analytical skills of human experts, revitalized AI research in the early 1980s.[41]By 1985, the AI market had grown to more than a billion dollars. At the same time, Japan's fifth generation computer project spurred the governments of the United States and the United Kingdom to resume funding for academic research.[42] However,

[29] Marston, Sean, et al. "Cloud computing—The business perspective." Decision support systems 51.1, 2011
[30]Winston, P H (1984). Artificial intelligence. Second edition. United States
[31]Berlinski, David (2000). The Advent of the Algorithm.Harcourt Books. ISBN 978-0-15-601391-8
[32]McCorduck, Pamela (2004), Machines Who Think (2nd ed.), Natick, MA: A. K. Peters, Ltd., ISBN 1-56881-205-1
[33]Russell, Stuart J.; Norvig, Peter (2009). Artificial Intelligence: A Modern Approach (3rd ed.). Upper Saddle River, New Jersey: Prentice Hall. ISBN 978-0-13-604259-4
[34]Russell, Stuart J.; Norvig, Peter (2003), Artificial Intelligence: A Modern Approach (2nd ed.), Upper Saddle River, New Jersey: Prentice Hall, ISBN 0-13-790395-2
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[36]NRC (United States National Research Council) (1999)."Developments in Artificial Intelligence". Funding a Revolution: Government Support for Computing Research. National Academy Press
[37]Howe, J. (November 1994). "Artificial Intelligence at Edinburgh University: a Perspective". Archived from the original on 15 May 2007, accessed on 11 May 2023
[38]Newquist, HP (1994). The Brain Makers: Genius, Ego, And Greed In The Quest For Machines That Think. New York: Macmillan/SAMS. ISBN 978-0-672-30412-5
[39] Simon, H. A. (1965). The Shape of Automation for Men and Management. New York: Harper & Row. Archived from the original on 26 July 2020, accessed on 15 June 2023
[40] Lighthill, James (1973). "Artificial Intelligence: A General Survey". Artificial Intelligence: a paper symposium. Science Research Council
[41]Russell, Stuart J.; Norvig, Peter (2003), Artificial Intelligence: A Modern Approach (2nd ed.), Upper Saddle River, New Jersey: Prentice Hall, ISBN 0-13-790395-2
[42]Lighthill, James (1973), Op Cit

with the failure of the Lisp Machine market in 1987, AI fell into disdain once more, and a second, longer-lasting winter began.

Geoffrey Hinton, David Rumelhart, and others rekindled interest in neural networks and "connectionism" in the mid-1980s.[43] Soft computing technologies such as neural networks, fuzzy systems, Grey system theory, evolutionary computation, and numerous tools borrowed from statistics or mathematical optimization were developed in the 1980s.AI gradually rehabilitated its reputation in the late 1990s and early 2000s by solving specific difficulties. Because of the tight emphasis, researchers were able to create verifiable results, use more quantitative approaches, and work with academics from other domains (such as statistics, economics, and mathematics). AI researchers' solutions were extensively employed by 2000, despite the fact that they were rarely referred to as AI in the 1990s.[44]

Advances in machine learning and perception were facilitated by faster computers, algorithmic enhancements, and availability to vast amounts of data; data-hungry deep learning algorithms began to dominate accuracy standards about 2012.[45]According to Bloomberg's Jack Clark, 2015 was a watershed moment for artificial intelligence, with the number of software projects at Google that incorporate AI increasing from "sporadic usage" in 2012 to over 2,700 projects in 2015. He ascribed this to an increase in inexpensive neural networks as a result of increased cloud computing infrastructure and research tools and datasets.[46]One in every five businesses said they have "incorporated AI in some offerings or processes" in a 2017 poll. AI research (as assessed by total publications) increased by 50% between 2015 and 2019.[47]

Many academic researchers became concerned that artificial intelligence was no longer pursuing its initial goal of producing adaptable, fully intelligent robots. Much of today's research focuses on statistical AI, which is overwhelmingly utilized to solve specific issues, including extremely successful techniques like deep learning. This worry gave rise to the subfield of artificial general intelligence (or "AGI"), which by the 2010s had numerous well-funded organizations.[48]Jaron Lanier, a computer scientist, provided an alternative picture of AI in The New Yorker in April 2023[49] as less intelligent than the name, and popular culture, may suggest. Lanier concludes his essay as follows: 'Think of people. People are the answer to the problems of bits.'[50] Digital engineering transformation is a fundamental process for the fourth industrial revolution (4IR) engineering paradigm shifts, and AI is a critical enabling technology in digital engineering transformation.[51]The Fourth Industrial Revolution (the 4IR) is a technological transformation that is altering cultures and economies all around the world. It depicts the development and advancement of numerous modern technologies that are sparking breakthrough breakthroughs and inventions across industries.[52]

[43] Russell, Stuart J.; Norvig, Peter (2021). Artificial Intelligence: A Modern Approach (4th ed.). Hoboken: Pearson. ISBN 9780134610993. LCCN 20190474

[44]McCorduck, Pamela (2004), Machines Who Think (2nd ed.), Natick, MA: A. K. Peters, Ltd., ISBN 1-56881-205-1

[45]"Ask the AI experts: What's driving today's progress in AI?". McKinsey & Company. Archived from the original on 13 April 2018, accessed on 11June 2023

[46] Clark, Jack (2015b). "Why 2015 Was a Breakthrough Year in Artificial Intelligence". Bloomberg.com. Archived from the original on 23 November 2016, accessed on 11June 2023

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[48]Pennachin, C.; Goertzel, B. (2007)."Contemporary Approaches to Artificial General Intelligence". Artificial General Intelligence.Cognitive Technologies. Berlin, Heidelberg: Springer. doi:10.1007/978-3-540-68677-4_1. ISBN 978-3-540-23733-4

[49] Lanier, Jaron (20 April 2023). "Annals of Artificial Intelligence - There Is No A.I. - There are ways of controlling the new technology—but first we have to stop mythologizing it". The New Yorker. Archived from the original on 23 April 2023, accessed on 11June 2023

[50] Bogdan, Dennis (2 February 2023). "Comment - In the Age of A.I., Major in Being Human - David Brooks". The New York Times. Archived from the original on 3 February 2023, accessed on 11June 2023

[51] https://content.iospress.com/articles/journal-of-integrated-design-and-process-science/jid229010,accessed on 11June 2023

[52]https://www.ilo.org/africa/information-resources/publications/WCMS_821305/lang--en/index.htm,accessed on 11June 2023

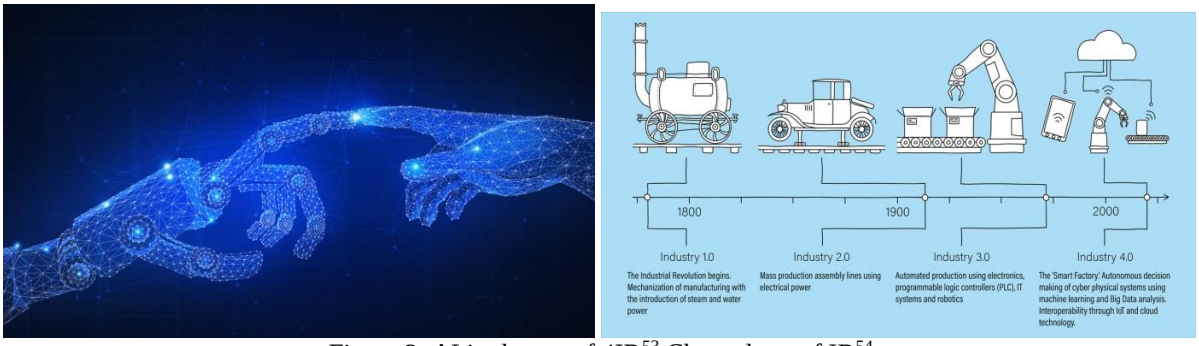

Figure 2: AI in the era of 4IR[53] Chronology of IR[54]

Human Error and Use of AI

The advantages of analytics are well established. Analytics has assisted enterprises in transforming shopping experiences, mapping train and truck routes, discovering extraterrestrial life, and even predicting diseases. However, in recent years, corporations all over the world have grappled with how much human error has entered their analytics efforts, often with disastrous outcomes. Human error in data processing has far-reaching consequences for businesses, from crashing spacecraft to sinking ships, transferring billions of dollars to unintended receivers, and causing deaths due to medicine overdose.[55] Human mistake in data analysis can occur for a variety of reasons, including a lack of expertise, exhaustion or loss of focus, a lack of information, or the all-too-common biases in data interpretation. The most prevalent human errors, on the other hand, are related to humans reading, processing, analyzing, and interpreting data. AI can effectively overcome human mistake by doing the heavy job of processing, analyzing, drilling down, and dissecting enormous amounts of data. It can also do high-level arithmetic, logical, and statistical functions on a scale that human-led, self-service analytics cannot. AI-driven analytics has numerous advantages, ranging from giving actionable insights in minutes to removing errors or biases in self-service analytics.We may expect to see increased adoption of AI in analytics around the world as more business executives look to AI for insights that fuel their businesses. There are five most typical human errors that can be eliminated with AI;[56]

Confirmation bias. When you're continually thinking about a yellow car, it's easy to spot one. Confirmation bias influences how we seek, understand, and recall information. Gut feeling frequently overrides statistics in the corporate environment, and data is altered, omitted, misrepresented, or misread to support one's own opinions. And when facts contradicts ideas, the material is criticized and dismissed. Artificial intelligence avoids this method of cherry-picking data by examining past data for trends, patterns, and outliers, yielding reliable, bias-free conclusions.[57]Lockheed Martin, one of the world's leading aerospace corporations, manages its projects proactively using prior project data, often known as dark data.[58]The organization was able to identify leading and lagging indications of program progress, predict program degradation, and boost project foresight by 3% by correlating and analyzing hundreds of parameters.

Inability to break silos. According to the Business Dictionary, the Silo Mentality is a mindset in which particular departments or sectors do not want to share information with others within the same firm. This approach will impair overall operational efficiency, morale, and may contribute to the collapse of a productive organizational culture.[59]Far too many businesses struggle with data-related difficulties such as organizing many data sources, a lack of collaboration among data sources, low data accuracy, and poor data accessibility. Using relational data modeling techniques, AI may readily break through silos by connecting with and correlating big data sets from several applications, databases, or data sources. For example, following the publication of a report in The Hindu, a national newspaper, highlighting the time, frequency, and common routes in which elephant deaths occur frequently, multiple Indian state governments decided to collaborate with the National

[53] https://www.information-age.com/artificial-intelligence-fourth-industrial-revolution-11579/,accessed on 11June 2023

[54]https://nntc.digital/blog/4ir-how-to-exploit-the-fourth-industrial-revolution/, accessed on 11June 2023

[55] Albert, E.T. (2019), "AI in talent acquisition: a review of AI-applications used in recruitment and selection", Strategic HR Review, Vol. 18 No. 5

[56]https://gulfbusiness.com/human-error-in-data-analytics-and-how-to-fix-it/, accessed on 11June 2023

[57]L. Cosmides, The logic of social exchange: Has natural selection shaped how humans reason? Studies with the Wason selection task, Cognition, 1989

[58]https://www.lockheedmartin.com/, accessed on 11June 2023

[59] https://www.forbes.com/sites/brentgleeson/2013/10/02/the-silo-mentality-how-to-break-down-the-barriers/?sh=3bdde3928c7e, accessed on 11June 2023

Green Tribunal on Project Elephant, to assess and prevent elephant deaths on railway lines connecting multiple states. The newspaper was able to compile this article by gathering information from railways and forest reserve departments.In fact, the advantages of AI-driven analytics are numerous, ranging from giving actionable insights in minutes to removing errors or biases in self-service analytics. The advantages of analytics are well established. Analytics has assisted enterprises in transforming shopping experiences, mapping train and truck routes, discovering extraterrestrial life, and even predicting diseases. However, silos occur in numerous departments or business units throughout the firm, and AI might be used to break down silos in any of these business operations.[60]

Downplaying losses. It's our nature to fear loss. Toyota minimized the significance of malfunctioning brakes in its vehicles, causing some Toyota models to be removed from Consumer Reports' list of recommended automobiles. BP downplayed the effects of the Gulf of Mexico oil leak by running slick advertising apologizing for a'minor spill,' until it was severely chastised by then-President Barack Obama, who claimed the firm should have used its PR budget to clean up the spill instead.[61]Downplaying loss fosters tunnel vision and impairs leaders' ability to make good judgments. And this might be costly to the organization in the long run. Because of the analytical DNA of artificial intelligence, it reads and interprets data as it is and does not favor positive patterns over negative trends, therefore eliminating the human predisposition to favor positive results. As a result, AI-powered analytics is a perfect ally for executives seeking to make decisions based on comprehensive facts rather of a partial image. AI's thirst for enormous volumes of training data will increase the relevance of data, altering how we must think about data protection.[62]

Inflated predictions. Another disadvantage of human-led analytics is the tendency to give exaggerated future projections. Humans tend to inflate estimates based on their own assumptions and experiences when anticipating budget requirements for the organization, predicting property damage following a natural disaster, or forecasting a fiscal deficit or inflation rates. On the contrary, AI-powered analytics is more accurate because it predicts based on driving or arresting forces as well as external or ambient inputs. The US Navy uses AI and machine learning to predict part failures and plan preventative maintenance for its aircraft and ships.[63]This allows sailors to devote more time to missions and less time to repairing aircraft that fail.[64]

Inability to go beyond surface-level analytics. Drilling down to identify the core cause of a problem can put a company light years ahead of competitors who do not use such methods. Root cause analysis can identify the agents producing an issue, suggest solutions, and provide ideas for preventing such problems in the future. However, with too many data sources, structures, and silos, humans are unable to collect, analyze, and drill down to undertake root cause analysis.[65]AI-driven analytics can easily overcome these limitations by looking into numerous levels of data at the same time. Furthermore, AI can combine numerous possible scenarios to determine the most likely source of a problem.[66]

AI and ANNs Types and Classification

Depending on the stages of development or the activities being taken, AI can be arranged in a variety of ways. Scientists and contemporary geniuses like Elon Musk and Stephen Hawkings have frequently forewarned us about the development of AI. AI is a fairly broad field that encompasses numerous fields, including Computer Vision, Deep Learning, Machine Learning, and Data Science, among others.[67]There are usually four stages of AI development are commonly recognized.

- **Reactive machines AI:** Reactive AI refers to machines that solely operate based on current data, taking just the current situation into account. Reactive AI robots are unable to draw conclusions from data in order to plan their future activities. They only respond to different types of stimuli according to preprogrammed guidelines. A reactive machine was IBM's Deep Blue, which defeated chess champion Garry Kasparov in 1997. Reactive AI is a sort of artificial intelligence that only responds to different types of inputs depending

[60] https://blog.aspiresys.com/digital/big-data-analytics/breaking-down-operational-silos-and-improving-productivity-using-ai/, accessed on 11June 2023

[61] https://www.domo.com/learn/article/how-modern-bi-ai-systems-reduce-human-errors-in-data, accessed on 11June 2023

[62]https://www.cigionline.org/articles/cyber-security-battlefield/?, accessed on 11June 2023

[63]https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3251061/, accessed on 11June 2023

[64]https://marine-digital.com/article_predictive_maintenance_for_marine_vessels, accessed on 11June 2023

[65]https://www.manageengine.com/analytics-plus/it-analytics-blogs/human-errors-in-analytics.html, accessed on 11June 2023

[66]https://blog.gitnux.com/human-error-statistics/, accessed on 11June 2023

[67]https://www.alturis.ai/post/4-types-of-artificial-intelligence-type-iv-self-awareness,accessed on 17June 2023

on preprogrammed rules.[68]But because reactive robots don't interact with the outside world, they always react the same manner to the same situations.

- **Limited memory AI:** Most contemporary AI is thought to have a limited memory. By being trained with fresh data over time, generally using an artificial neural network or other training model, it can use memory to get better. Limited memory AI is a subset of ML called deep learning.[69]As the name implies, Limited Memory AI is able to make better judgements by reviewing historical data stored in its memory. Such an AI has a transitory memory that it can use to retain past events and, in turn, judge what to do in the future. In order to make quick choices, self-driving cars use limited memory artificial intelligence (AI). Self-driving cars, as an illustration, employ sensors to detect pedestrians crossing the road, hilly roads, traffic signals, etc. to help them make better driving choices. This aids in averting any upcoming mishaps.
- **Theory of mind AI:** concept of mind Although AI is not yet a reality, research into its potential is ongoing. It depicts AI with decision-making abilities comparable to those of a human, including the ability to recognize and remember emotions and respond in social settings the same way a person would.[70] Principles of Mind A highly developed form of AI is AI. It is believed that this class of machines has a significant impact on psychology. This kind of AI will put a lot of emphasis on emotional intelligence to better understand human beliefs and thoughts. Although the Theory of Mind AI is still in its early stages of development, careful research is being done in this field.
- **Self aware AI:** superior to the theory of mind self-aware AI AI refers to a fantastical robot with the same mental and emotional faculties as humans, which is conscious of its own existence. Self-aware AI is a hypothetical concept that does not yet exist. Let's only hope that we avoid artificial intelligence (AI), which would enable machines to become conscious and aware of themselves. Given the state of the world right now, this kind of AI seems a little unrealistic. Nevertheless, super-intelligence might be attainable in the future.[71]

Today, AI is referred to as artificial "narrow" intelligence since, thanks to its programming and training, it can only carry out a limited range of tasks. However, a natural language processing task cannot be carried out by an AI object classification algorithm. Google Search, predictive analytics, and virtual assistants are examples of narrow AI. A machine with artificial general intelligence (AGI) would be able to "sense, think, and act" just like a human. AGI doesn't exist right now. The next stage would be artificial superintelligence (ASI), where a machine could perform tasks better than a human could. Contrary to popular belief, neural networks have been around for far longer. The concept of "a machine that thinks" dates back to the Ancient Greeks, but we'll concentrate on the crucial moments that shaped the development of thinking about neural networks, which has fluctuated in popularity over time. An artificial neural network, a model loosely modeled on the human brain, is a frequent sort of training model in AI. The first neural network was the perceptron, developed by Frank Rosenblatt in 1958. Perceptrons are actually computational nodes for data classification and analysis. A neural network's first layer receives the data, and each perceptron makes a choice before relaying that information to a number of nodes in the layer above.Deep neural networks or "deep learning" refer to training models with more than three layers. Some contemporary neural networks have a thousand or more layers. The final perceptrons' output allows the neural network to complete the task assigned to it, such as classifying an object or identifying patterns in data. Some of the most common types of artificial neural networks (ANNs) we may come acrossand their applications are:

- **Feedforward neural networks (FF)**Data flows through layers of artificial neurons in multi-layer perceptrons (MLPs), one of the earliest types of neural networks, until the desired output is obtained. Nowadays, the majority of feedforward neural networks are referred to as "deep feedforward" and have multiple layers (including more than one "hidden" layer). 'Backpropagation' is an error-correction method that, to put it simply, starts with the result of the neural network and works back through to the beginning, detecting faults to enhance the accuracy of the neural network. Feedforward neural networks are frequently used in conjunction with backpropagation. Deep feedforward neural networks are frequently basic yet effective.[72]They consist of an output layer, one or more hidden layers, and an input layer. Because most real-world issues are nonlinear, sigmoid neurons, not perceptrons, are used in these neural networks, which

[68]https://www.hypersenseai.com/aiglossary/reactive-machines/,accessed on 17June 2023
[69]https://sintelly.com/articles/what-is-limited-memory-ai,accessed on 17June 2023
[70]https://www.w3schools.com/ai/ai_mind.asp,accessed on 17June 2023
[71] https://www.expresscomputer.in/artificial-intelligence-ai/what-if-ai-becomes-self-aware/81828/, accessed on 17 June 2023
[72] https://deepai.org/machine-learning-glossary-and-terms/feed-forward-neural-network, accessed on 17 June 2023

are also sometimes referred to as MLPs. These models serve as the basis for neural networks used in computer vision, natural language processing, and other fields. Data is typically input into them to train them. Physiological feedforward systems, gene regulation and feedforward, automation and machine control/management are a few examples of applications for FF networks. [73]

- **Recurrent neural networks (RNNs)** They differ from feedforward neural networks in that they often use time series or sequence data. The feedback loops that distinguish RNNs. These learning algorithms are generally used to forecast future events based on time-series data, such as stock market projections or sales forecasting.[74]Recurrent neural networks, unlike feedforward neural networks, which utilize weights in each node of the network, have'memory' of what happened in the previous layer as reliant on the output of the present layer. RNNs, for example, can 'keep in mind' additional words used in a sentence when doing natural language processing. RNNs are frequently used for speech recognition, translation, and image captioning. [75] Different application of RNNsare: Machine translation [76], Robot control [77], Time series prediction[78], Speech recognition[79], Speech synthesis[80], Brain–computer interfaces[81], Music composition[82], Human action recognition[83], Prediction in medical care pathways[84], etc.
- **Long/short term memory (LSTM)** is a more advanced RNN that can'remember' what happened in prior layers by using memory. The distinction between RNNs and LTSM is that LTSM uses'memorycells' to remember what happened several layers ago. LSTM is frequently used in speech recognition and prediction.[85] The LSTM is a type of artificial neural network that is utilized in the disciplines of AI and deep learning. [86] Unlike traditional feedforward neural networks, LSTM has feedback connections. A recurrent neural network (RNN) of this type can analyze not just individual data points (such as pictures), but also complete data sequences (such as audio or video). LSTM is applicable to tasks such as unsegmented, connected handwriting recognition, [87] speech recognition, [88] machine translation, [89] speech activity detection,[90] robot control,[91] video games,[92] healthcare[93]etc.

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- **Convolutional neural networks (CNNs)** comprise some of the most common neural networks in modern artificial intelligence. CNNs) are similar to feedforward networks, however they are typically used for image recognition, pattern recognition, and/or computer vision. These networks use linear algebra principles, notably matrix multiplication, to find patterns in images.[94] CNNs are most commonly employed in image recognition and employ several various layers, such as a convolutional layer, followed by a pooling layer, which filter different elements of an image before reassembling it in the fully connected layer.[95]Earlier convolutional layers may check for simple picture features like colors and edges before moving on to more sophisticated aspects in subsequent levels.[96]CNNs are frequently employed in image recognition systems. CNNs produced a significant reduction in error rate when applied to facial recognition.[97] Following manual training, CNNs were utilized to objectively judge video quality; the resulting system had a very low root mean square error.[98]
- **Generative adversarial networks (GAN)** Two neural networks compete against each other in a game that ultimately increases output accuracy.[99]The generator network generates samples that the discriminator network attempts to prove true or false. GANs have been utilized to produce realistic images as well as art.[100]GANs can be used to make art; The Verge reported in March 2019 that GAN images have become the distinguishing look of current AI art.[101] GANs can also be used to inpaint photographs or generate shots of fictitious fashion models without the requirement for a model, photographer, or makeup artist, as well as the cost of a studio and transportation.[102]GANs have also been used to generate virtual shadows.[103]

Versatile Applications of AI

According to AI history, throughout the first decades of the twenty-first century, highly mathematical and statistical machine learning dominated the area, and this technique has proven highly successful in solving many tough problems in industry and academics.[104]Reasoning, knowledge representation, planning, learning, natural language processing, perception, and object movement and manipulation are all traditional AI study

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[93]Schmidhuber, Jürgen (2021). "The 2010s: Our Decade of Deep Learning / Outlook on the 2020s". AI Blog. IDSIA, Switzerland, accessed on 17 June 2023

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[104]Russell Stuart J., et al, (2009). Artificial Intelligence: A Modern Approach (3rd ed.). Upper Saddle River, New Jersey: Prentice Hall. ISBN 978-0-13-604259-4

goals.[105] One of the field's long-term goals is general intelligence (the capacity to solve any problem).[106]To address these challenges, AI researchers have adapted and incorporated a wide range of problem-solving strategies, including search and mathematical optimization, formal logic, artificial neural networks, and methodologies based on statistics, probability, and economics. AI also employs computer science, psychology, medicine, healthcare, linguistics, philosophy, and a variety of other disciplines.[107] AI applications include advanced web search engines (like Google Search), recommendation systems (like YouTube, Amazon, and Netflix), understanding human speech (like Siri and Alexa), self-driving cars (like Waymo), generative or creative tools (like ChatGPT and AI art), automated decision-making, and competing at the highest level in strategic game systems (like chess and Go).[108]Future AI effects, such as optical character recognition, are typically excluded from things thought to be AI, although having become a standard technology.[109]

Thousands of effective AI applications are also employed to tackle challenges for specific businesses or institutions. A few examples are energy storage,[110] deepfakes,[111] medical diagnosis, military logistics, foreign policy,[112] or supply chain management.AI will have a greater impact on technology in the future, influencing all sectors, machines, equipment, and devices. It is an analytical paper that depicts the impact of AI on technologies, machinery, and devices in our daily lives, business, industry, and other sectors, as well as problems and recommendations for best harvest in the twenty-first century. With a 99% accuracy rate, AI has been applied in facial recognition systems. Apple's FaceID and Android's Face Unlock are two examples. Both are employed in the protection of mobile devices. Google has utilized image labeling to detect products in photographs and to allow customers to search using a photo. Image tagging has also been shown to generate speech in order to describe visuals to blind persons.[113]
AI is being utilized to target web adverts to those who are most likely to click or engage with them. It is also used to boost the amount of time spent on a website by picking visually appealing information for the viewer. It can forecast or generalize client behavior based on their digital traces.[114] AI is used by online gaming organizations to improve client targeting.[115]Personality analysis AI models supplement more traditional social demographics or behavioral targeting with psychological targeting.[116] AI has been utilized to personalize offers and customize shopping alternatives.[117]AI is used by intelligent personal assistants to grasp numerous natural language requests in ways other than rudimentary commands. Apple's Siri, Amazon's Alexa, and a more modern AI, ChatGPT by OpenAI, are popular examples.[118]Machine learning can be used to combat spam, frauds, and

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phishing. It can examine the contents of spam and phishing attempts for dangerous elements.[119] Numerous models based on machine learning algorithms perform exceptionally well in differentiating between spam and real emails, with accuracies of more than 90%.19 Artificial intelligence has been used to automatically translate spoken language and textual content.[120] Furthermore, research and development are being conducted to decipher and conduct animal communication.[121]While no system can achieve the ideal of totally automatic high-quality machine translation of unfettered text, numerous fully automated methods can give acceptable results.[122] When the domain is constrained and regulated, the quality of machine translation improves significantly.[123]

AIs have produced superhuman results in various games in the twenty-first century, including chess (DeepBlue), Jeopardy (Watson),[124] Go (AlphaGo),[125] poker (Pluribus and Cepheus),[126] E-sports (StarCraft),[127] as well as general game playing (AlphaZero and MuZero).[128] In most chess systems, AI has superseded hand-coded algorithms.[129] Poker, unlike go or chess, is a game of imperfect information. As a result, a poker program must reason under uncertainty. Without knowing the rules, the general game players operate with feedback from the game system. AI for Good is an ITU program that supports institutions that use AI to address some of the world's most pressing economic and social concerns. The University of Southern California, for example, established the Center for AI in Society with the purpose of applying AI to address issues such as homelessness. Researchers at Stanford University utilize artificial intelligence to scan satellite photos in order to identify high-poverty areas.[130] In agriculture, AI has assisted farmers in identifying regions that require irrigation, fertilization, pesticide treatments, or yield increase.[131] AI is used by agronomists to do research and development. AI has been used to forecast crop ripening times, such as tomatoes,[132] monitor soil moisture, operate agricultural robots, conduct predictive analytics,[133] classify livestock pig and cow call emotions, automate greenhouses,[134] detect diseases and pests,[135] save water[136], etc. AI will eventually be utilized to entirely automate most cyber security procedures.[137]Applications of AI in cyber security are:

- Network protection:By expanding the search beyond previously detected threats, machine learning improves intrusion detection systems.
- Endpoint protection: Attacks such as ransomware can be defeated by becoming familiar with typical virus behaviour.

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[136]Olick Diana, (2022-04-18). "How robots and indoor farming can help save water and grow crops year round". CNBC

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- Application security: can aid in the prevention of server-side request forgery, SQL injection, cross-site scripting, and distributed denial-of-service attacks.
- Suspect user behavior: ML can detect fraud or hacked applications in real time.[138]

AI has the ability to create a dysfunctional environment with retaliatory outcomes,[139] likeTechnology that impairs students' ability to focus.[140] In another situation, AI can predict student achievement in a virtual learning environment (VLE) like Moodle.[141] AI can assist students customise their training during the educational process. Furthermore, for educators, AItechnology can increase the quality of the educational process and teaching skills.[142] AI is used by large financial firms to help with their investment procedures. Aladdin, BlackRock's AI engine, is utilized to aid in investment decisions both within the company and by clients. Banks such as UBS and Deutsche Bank mine data using SQREEM (Sequential Quantum Reduction and Extraction Model) to create consumer profiles and link them with wealth management products.[143]It can examine material such as news, broker reports, and social media feeds using natural language processing. Banks employ AI to coordinate operations, bookkeeping, stock investing, and property management. Even when there is no activity, AI can detect changes.[144] By examining behavioral patterns for irregular changes or anomalies, artificial intelligence (AI) is used to combat fraud and financial crimes.[145]The deployment of artificial intelligence (AI) in applications such as online trading and decision making has changed fundamental economic concepts.[146] AI-powered buying and selling platforms, for example, anticipate individualized demand and supply curves and hence offer individualized pricing. AI robots reduce market knowledge asymmetry, making markets more efficient.[147]Many banks, funds, and proprietary trading organizations now have AI-managed portfolios. Large institutional investors often utilize automated trading systems, although smaller enterprises trading with their own AI systems are also included.[148]There are numerous applications in which AI assists ordinary people in their daily lives. The table below shows a common application of AI with an example.[149]

Sl No	Common application of AI System with Example
1	**Expert Systems** Examples: Flight-tracking systems, Clinical systems.
2	**Natural Language Processing** Examples: Google Now feature, speech recognition, Automatic voice output.
3	**Neural Networks** Examples: Pattern recognition systems such as face recognition, character recognition, handwriting recognition.
4	**Robotics** Examples: Industrial robots for moving, spraying, painting, precision checking, drilling, cleaning, coating, carving, etc.
5	**Fuzzy Logic Systems** Examples: Consumer electronics, automobiles, etc.

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[149]https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligent_systems.htm, accessed on 13 June 2023

AI is divided into three categories: formal tasks, ordinary activities, and expert tasks. Since birth, humans have been learning banal (ordinary) jobs. They learn by perception, speaking, language use, and locomotives. They learn formal activities first, followed by expert tasks. The everyday chores are the easiest for humans to learn. Before attempting to integrate monotonous jobs in machines, the same was assumed. Previously, all AI work was concentrated in the humdrum task area. Actually, for ordinary activities, the computer requires greater information, more knowledge representation, and advanced algorithms. This is why AI work is thriving in the expert tasks space right now, Because the expert task domain necessitates expert knowledge rather than common sense, it is easier to express and manage. Task domains of AI has been shown in table below.[150]

Task Domains of AI		
Mundane (Ordinary) Tasks	**Formal Tasks**	**Expert Tasks**
Perception • Computer Vision • Speech, Voice	• Mathematics • Geometry • Logic • Integration and Differentiation	• Engineering • Fault Finding • Manufacturing • Monitoring
Natural Language Processing • Understanding • Language Generation • Language Translation	Games • Go • Chess (Deep Blue) • Ckeckers	Scientific Analysis
Common Sense	Verification	Financial Analysis
Reasoning	Theorem Proving	Medical Diagnosis
Planning		Creativity
Robotics • Locomotive • Vehicle		

Ray Kurzweil, an American inventor and futurist, believes that when his concept of the'singularity' becomes a reality, it will be possible to resurrect the dead by digital replication.[151] This is one method to digital immortality, which could be regarded as raising the dead as 'digital ghosts.'[152] or ‘digital avatars’.[153]In the context of knowledge management (KM), a 'virtual persona' could help with knowledge capture, retention, dissemination, access, and usage, as well as learning.[154] Post-mortem privacy is one among them, as is the possible exploitation of tailored digital twins [155] and linked systems by 'big data' businesses and advertisers.[156] Even if they are both extremely artificial and intelligent, biological computers are often distinguishable from synthetic, often silicon-based computers, and they could be integrated or employed in the construction of either. Furthermore, even if artificial intelligence's algorithms are transparent, understandable, bias-free, ostensibly effective, and goal-aligned, and its trained data is sufficiently large and cleansed, many tasks may be performed insufficiently, for example, when the underlying or available metrics, values, or data are inappropriate. Computer-aided is a word used to describe human activities that use computing as a tool in more comprehensive activities, as well as systems such as AI for limited tasks or without largely relying on its outcomes.

Fiction Story and AI

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[155]GambaFiorenza, (11 October 2022). "AI, mourning and digital immortality. Some ethical questions on digital remain and post-mortem privacy". Étudessur la mort. n° 157 (1): 13–25, accessed on26 June 2023

[156]Truby Jon, Brown, Rafael (4 May 2021). "Human digital thought clones: the Holy Grail of artificial intelligence for big data". Information & Communications Technology Law. 30 (2): 140–168, accessed on 26 June 2023

In the future, the fictional character in today's narrative or film will become reality. We have seen in Mary Shelley's novel 'Frankenstein' how a human creation becomes a threat to its creators. This includes works like Arthur C. Clarke's and Stanley Kubrick's 2001: 'A Space Odyssey' (both released in 1968), which include HAL 9000, the malevolent computer in command of the 'Discovery One' starship. Robot/Machine men appear as destructive and uncontrollable creations in 'The Terminator' (in 1984) and 'The Matrix' (in 1999). On the other hand, rare loyal robots such as Gort in the 1951 film 'The Day the Earth Stood Still' and Bishop in the 1986 film 'Aliens' are less well-known in popular culture.[157]However, the 'Three Laws of Robotics' were established by the renowned fiction story writer Isaac Asimov in numerous books and stories, most notably the 'Multivac' series about a super-intelligent computer of the same name.[158] While practically all artificial intelligence researchers are familiar with Asimov's rules through popular culture, they largely deem the laws ineffective for several reasons, one of which being their ambiguity.[159]The manga 'Ghost in the Shell' and the science-fiction series 'Dune' both address transhumanism (the blending of humans and technology).[160]

A machine with general intelligence has the breadth and versatility of human intelligence in solving a wide range of issues. AI can solve many problems by intelligently searching through a large number ofpotential solutions.[161]Robotics algorithms perform local searches in configuration space to move limbs and grip objects. Two popular swarm algorithms used in search are particle swarm optimization (inspired by bird flocking) and ant colony optimization (inspired by ant trails).[162] Logic is used to describe knowledge and solve problems, but it can also be applied to other challenges. Several types of logic are employed in AI research. Truth functions such as 'or and not' are used in propositional logic.[163]First-order logic incorporates quantifiers and predicates, allowing it to describe facts about objects, their qualities, and their relationships to one another.[164] Fuzzy logic assigns a 'degree of truth' (between 0 and 1) to each statement. Description logics; situation calculus, event calculus, and fluent calculus (for capturing events and time); causal calculus; belief calculus (belief revision); and modal logics are all logic extensions designed to handle certain categories of knowledge.[165]Logics have also been developed to describe contradictory or inconsistent assertions that may arise in multi-agent systems.

Thinking of Great Men about AI

Superintelligent AI may be able to outperform humans in terms of intelligence. As physicist Stephen Hawking puts it, this might "spell the end of the human race."[166] According to philosopher Nick Bostrom, sufficiently competent AI will exhibit convergent behavior such as accumulating resources or preventing itself from being shut down if it selects actions based on accomplishing some objective. If this AI's aims do not fully reflect those of humanity, it may need to damage humanity in order to obtain more resources or avoid being shut down, ultimately to better fulfill its goal. He concludes that AI poses a risk to humanity, regardless of how modest or 'friendly' its claimed intentions are.[167] According to political scientist Charles T. Rubin, 'any sufficiently advanced compassion may be indistinguishable from malevolence.' Humans should not expect machines or robots to treat humans well because there is no reason to anticipate they will share our moral system.[168]

[157] Buttazzo G, (July 2001). "Artificial consciousness: Utopia or real possibility?". Computer. 34 (7): 24–30. doi:10.1109/2.933500

[158] Anderson Susan Leigh, (2008). "Asimov's "three laws of robotics" and machine metaethics". AI & Society. 22 (4): 477–493. doi:10.1007/s00146-007-0094-5

[159] McCauley Lee, (2007), "AI armageddon and the three laws of robotics". Ethics and Information Technology. 9 (2). doi:10.1007/s10676-007-9138-2

[160]https://en.wikipedia.org/wiki/Artificial_intelligence#cite_note-42, accessed on 26 June 2023

[161] Luger George, and Stubblefield William, (2004), Artificial Intelligence: Structures and Strategies for Complex Problem Solving (5th ed.). Benjamin/Cummings, ISBN 978-0-8053-4780-7

[162]Merkle Daniel, and Middendorf Martin, (2013), "Swarm Intelligence". In Burke, Edmund K.; Kendall, Graham (eds.). Search Methodologies: Introductory Tutorials in Optimization and Decision Support Techniques. Springer Science & Business Media. ISBN 978-1-4614-6940-7

[163]McCauley Lee, (2007), Op Cit

[164]Nilsson Nils, (1998). Artificial Intelligence: A New Synthesis. Morgan Kaufmann. ISBN 978-1-55860-467-4

[165]Poole David, et al, (1998), Computational Intelligence: A Logical Approach. New York: Oxford University Press. ISBN 978-0-19-510270-3

[166] Cellan Jones Rory, (2 December 2014), "Stephen Hawking warns artificial intelligence could end mankind". BBC News

[167]Bostrom Nick, (2014), Superintelligence: Paths, Dangers, Strategies. Oxford University Press

[168]Rubin Charles, (Spring 2003), "Artificial Intelligence and Human Nature". The New Atlantis. 1: 88–100

Experts and business insiders have conflicting feelings about the risk posed by future superhumanly capable AI, with substantial groups both scared and indifferent.[169] Stephen Hawking, Microsoft founder Bill Gates, history professor Yuval Noah Harari,[170] and SpaceX founder Elon Musk have all expressed grave concerns about the future of AI.[171]According to Mark Zuckerberg (CEO of Facebook), artificial intelligence is useful in its current form and will continue to help humans. Peter Thiel and other prominent tech titans[172] (Amazon Web Services) and Musk have committed more than $1 billion to nonprofit organizations such as OpenAI and the Future of Life Institute that promote responsible AI development.[173]Friendly AI are machines that have been programmed from the start to reduce risks and make decisions that benefit humans. The term's coiner, Eliezer Yudkowsky, believes that developing benign AI should be a higher research priority: it may take a big investment and must be achieved before AI becomes an existential threat.[174]Intelligent machines have the capacity to utilize their intelligence to make ethical judgements. Machine ethics provides ethical concepts and processes for resolving ethical quandaries to machines.[175] Machine ethics, sometimes known as machine morality, computational ethics, or computational morality, was developed in 2005 at a AAAI symposium. [176]

Several works employ artificial intelligence to force us to confront the fundamental question of what makes us human, depicting artificial beings with the ability to feel and hence suffer. Philip K. Dick addresses the concept that artificial intelligence-created technology alters our perception of human subjectivity.[177]Machine Learning (ML), Natural Language Processing (NLP), Machine Perception, Affective Computing, Artificial General Intelligence, Search Algorithm, Logic Programming Symbolic AI employed formal syntax to translate language structure into logic. Due to the intractability of logic,[178] and the breadth of commonsense knowledge[179] this failed to create useful applications. Co-occurrence frequencies (how frequently one word appears near another), 'keyword spotting' (searching for a certain phrase to extract information), transformer-based deep learning (which discovers patterns in text), and other modern statistical techniques are used.[180] They have achieved adequate accuracy at the page or paragraph level and will be able to generate cohesive output by 2019. Machine perception is the ability to derive features of the world from sensor input (such as cameras, microphones, wireless signals, and active lidar, sonar, radar, and touch sensors). Speech recognition, facial recognition, and object recognition are some of the applications.[181] Affective computing, as we know, is an interdisciplinary umbrella term for systems that perceive, interpret, process, or imitate human feelings, emotions, and mood.[182]

A machine with general intelligence has the breadth and versatility of human intelligence in solving a wide range of issues. AI can solve many problems by intelligently searching through a large number of potential

[169]Müller Vincent C, et al (2014), "Future Progress in Artificial Intelligence: A Poll Among Experts" (PDF). AI Matters. 1 (1): 9–11. doi:10.1145/2639475.2639478

[170]Gibbs Samuel, (27 October 2014), "Elon Musk: artificial intelligence is our biggest existential threat". The Guardian

[171]Bhardwaj Prachi, (24 May 2018). "Mark Zuckerberg responds to Elon Musk's paranoia about AI: 'AI is going to... help keep our communities safe. Business Insider

[172]Lee Timothy B., (22 August 2014). "Will artificial intelligence destroy humanity? Here are 5 reasons not to worry

[173] Post Washington, (2015). "Tech titans like Elon Musk are spending $1 billion to save you from terminators". Chicago Tribune

[174] Yudkowsky E, (2008), "Artificial Intelligence as a Positive and Negative Factor in Global Risk" (PDF), Global Catastrophic Risks, Oxford University Press, 2008

[175]Anderson Michael, et al, (2011). Machine Ethics. Cambridge University Press

[176]"Machine Ethics", www.aaai.org, Archived from the original on 29 November 2014, accessed on 16 June 2023

[177]Galvan Jill, (1 January 1997), Entering the Posthuman Collective in Philip K. Dick's "Do Androids Dream of Electric Sheep? Science Fiction Studies. 24 (3): 413–429. JSTOR 4240644

[178]Russell Stuart J., (2003), Artificial Intelligence: A Modern Approach (2nd ed.), Upper Saddle River, New Jersey: Prentice Hall, ISBN 0-13-790395-2

[179]Lenat Douglas, et al, (1989), Building Large Knowledge-Based Systems.Addison-Wesley, ISBN 978-0-201-51752-1

[180] Cambria Erik, and White Bebo, (May 2014), Jumping NLP Curves: A Review of Natural Language Processing Research, IEEE Computational Intelligence Magazine. 9 (2): 48–57. doi:10.1109/MCI.2014.2307227

[181] Russell Stuart J., and Norvig Peter, (2003), Artificial Intelligence: A Modern Approach (2nd ed.), Upper Saddle River, New Jersey: Prentice Hall, ISBN 0-13-790395-2

[182] Thro Ellen, (1993), Robotics: The Marriage of Computers and Machines. New York: Facts on File. ISBN 978-0-8160-2628-9

solutions.[183]Robotics algorithms perform local searches in configuration space to move limbs and grip objects. Two popular swarm algorithms used in search are particle swarm optimization (inspired by bird flocking) and ant colony optimization (inspired by ant trails).[184]Logic is used to describe knowledge and solve difficulties, but it can also be used to tackle other problems. In AI research, various types of logic are used. Truth functions such as 'or and not' are used in propositional logic.[185] First-order logic incorporates quantifiers and predicates, allowing it to describe facts about objects, their qualities, and their relationships to one another.[186] Fuzzy logic assigns a 'degree of truth' (between 0 and 1) to each statement. Description logics; situation calculus, event calculus, and fluent calculus (for capturing events and time); causal calculus; belief calculus (belief revision); and modal logics are all logic extensions designed to handle certain categories of knowledge.[187]Logics have also been developed to describe contradictory or inconsistent assertions that may arise in multi-agent systems.

5G and AI

AI definitions, capabilities, and disciplines The Fourth Industrial Revolution (4IR) is a scenario in which we will see a dramatic and global shift in the way we live as a result of the development, deployment, and application of 5G technologies in accordance with their increasing capabilities.[188]Big Data (BD), Artificial Intelligence (AI), and linked networks, i.e. 5G, are the three essential parts of the 4IR. Following its crucial position as the enabler of our global economy being enhanced with a tech-based central nervous system, 5G technology will enable the 4IR to be a holistic and immersive experience internationally. Through AI developments, 5G technology will nourish the growth of automated capabilities for both physical and intangible systems. One of the most ubiquitous and far-reaching implications of the 4IR will be AI-enabled automation as a service.[189] During the 4IR, the increased use of AI-enabled automation will increase the demand for consideration of AI model and data protection to ensure that the integrity and confidentiality of such constituents are maintained to the greatest extent possible in the interests of both public and private assurance. Furthermore, the 4IR emphasizes the importance of 5G technology security as a key enabler of AI-enabled automation. This study delves into the board and dynamic security aspects of 5G AI-enabled automation (EC 2018).[190] The application of AI to 5G and the resulting security considerations are best understood by investigating the following aspects of a 5G AI-enabled automated ecosystem: AI definitions, AI capabilities and disciplines, existing and prospective AI standardization frameworks, AI developments, and thus robust approaches to AI security. To achieve a truly safe 5G AI-enabled automated global ecosystem, a comprehensive and all-encompassing commitment to study, testing, understanding, and eventual standardization is required.[191]This joint commitment will lay the groundwork for the expanding capabilities of 5G technologies and AI-enabled automation to be considered and allowed to improve overall quality of life.

Machine Learning Techniques Given a complex goal, AI systems act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the basis of knowledge, or processing the information derived from this data, and deciding the best action(s) to take to achieve the given goal. AI systems can learn a mathematical model or use symbolic rules, and they can also adapt their behavior by learning how their previous actions influence the environment (EC 2019).[192]. Artificial Intelligence as a Scientific Discipline AI as a scientific discipline encompasses a variety of approaches and techniques, including machine learning (ML) (Deep learning and

[183] Luger George, and Stubblefield William, (2004), Artificial Intelligence: Structures and Strategies for Complex Problem Solving (5th ed.). Benjamin/Cummings, ISBN 978-0-8053-4780-7

[184]Merkle Daniel, et al, (2013), "Swarm Intelligence". In Burke, Edmund K.; Kendall, Graham (eds.). Search Methodologies: Introductory Tutorials in Optimization and Decision Support Techniques. Springer Science & Business Media. ISBN 978-1-4614-6940-7

[185]Thro Ellen, (1993), Op Cit

[186]Nilsson Nils, (1998), Artificial Intelligence: A New Synthesis. Morgan Kaufmann. ISBN 978-1-55860-467-4

[187]Poole David, et al, (1998), Computational Intelligence: A Logical Approach. New York: Oxford University Press. ISBN 978-0-19-510270-3

[188] Focus group on machine learning for future networks including 5G – website, https://www.itu.int/en/ITU-T/focusgroups/ml5g/Pages/default.aspx, accessed on 15 June 2023

[189]Chemouil P., et al, (2019), Artificial intelligence and machine learning for networking and communications. Special Issues of IEEE Journal on Selected Areas in Communications 37 (6):

[190]Ethics guidelines for trustworthy AI, European Commission, December 2018

[191] https://www.researchgate.net/publication/341435854_5G_AI-Enabled_Automation, accessed on 14 June 2023

[192] A definition of AI: main capabilities and disciplines, High-Level Expert Group on Artificial Intelligence, European Commission, April 2019

reinforcement learning are two examples.), machine reasoning (Planning, scheduling, knowledge representation and reasoning, search, and optimization are all examples of tasks that fall under this category.), and robotics (Control, perception, sensors, and actuators, as well as the integration of all other approaches, are all part of cyber-physical systems.).[193]Figure 1 depicts a simplified overview of AI sub-disciplines and their relationships. Many other techniques are included in both ML and reasoning, and robotics includes techniques that are not covered by AI. The study of computer science encompasses all aspects of AI. This article focuses on machine learning. A thorough introduction to the issue, as well as a complete overview of ML methodologies and techniques, can be found, for example, in EC (2019) and IEC (2019).[194]

Artificial intelligence (AI) has been studied for over 60 years. AI will be revitalized in the next decade as computer power, new algorithms, and enormous data collection improve, and it will become one of the most significant enabling technologies for 5G automation. How to use AI algorithms' powerful analysis, judgment, and prediction capabilities to enable 5G equipment, networks, and service systems, and combine them with the planning, construction, maintenance, operation, and optimization of carriers' networks, has become an important topic in the ICT industry.Many organizations have been introducing AI technology to telecom networks and contributing to the development of standards essential for improving the quality and security of AI products and services, ensuring user safety, and creating a fair and open industry ecosystem based on deep understanding, accumulated experience in the telecom field, and long-term investment in AI strategies. With the emergence of AI-based application scenarios, 5G networks can be automatically deployed (automatic service deployment and automated running). AI algorithms can also be utilized for self-healing (automated fault recovery), self-optimization (network self-optimization), and the development of autonomous 5G systems (self-evolving networks), which continuously enhance network efficiency and lower OPEX.[195]

Benefits of AI to Our Society

AI has been around for quite some time. The advantages of AI are steadily improving our daily lives. The technique is being used for robots that greet customers in shopping malls or to provide ideas in online search engines. In AI systems, AI imitate human reasoning. It is the computer program's ability to think and learn. Everything can be considered AI if it involves a program that performs a task that we normally associate with human intellect. AI advancements have resulted in numerous benefits across multiple industries. Processes are more effective and efficient, technology is more widely available, and forecasts are more accurate.Experts predict that the growth of artificial intelligence will benefit the majority of people over the next decade, but many are concerned about how breakthroughs in AI may impact what it means to be human, productive, and free. The automation revolution will have a major impact on the basics of business and society, as well as a huge potential to boost innovation and productivity. [196]In the near future, blockchain technology has the ability to touch most industries throughout the world, ushering in a new era of consumer trust and optimization. AI can improve data backup and disaster recovery planning and policy from an IT standpoint to ensure smooth company continuity. The elements for successful technology and IT leadership continue to evolve, but the requirement for strong business strategy, vision, and IT management, as well as a knowledgeable approach to risk, compliance, outsourcing, and AI, remains as important as ever. [197]

Digital existence is both supplementing and disturbing eons-old human activity. Code-driven systems in ambient information and connectivity have touched more than half of the world's population, bringing previously unimagined benefits as well as tremendous threats. Will people be better off than they are now when new algorithm-driven AI spreads? AI will have an impact on the entire agricultural and manufacturing value chain, from farm to fork, today and in the future. AI will have an impact on next-generation automotive technology, reshaping the way cars, trucks, and powertrains are created and manufactured.[198]AI will have an impact on the technological advancements of the worldwide aviation and aerospace sectors. It will also have an impact on space travel and communications, airport operations and administration, air traffic control systems, and future flight and aviation transport patterns. AI will drive technological innovation, revolutionizing all aspects of the construction and civil engineering sectors, resulting in cost, safety, efficiency, and quality

[193] https://www.ericsson.com/en/white-papers/machine-intelligence, accessed on 14 June 2023

[194]Artificial intelligence across industries, International Electrotechnical Commission, White Paper, April 2019.

[195] https://www.researchgate.net/publication/341435854_5G_AI-Enabled_Automation, accessed on 14 June 2023

[196] https://www.clickworker.com/customer-blog/benefits-of-ai/, accessed on 24 June 2023

[197]Unified architecture for machine learning in 5G and future networks, Technical Specification TU-T FG-ML5G-ARC5G, January 2019

[198] https://addepto.com/blog/10-ways-that-ai-influences-the-automotive-industry/, accessed on 24 June 2023

improvements.[199]AI will have an impact on smart phones, tablets, and wearable tech gadgets, as well as how people live, work, and consume services, prompting businesses to establish their own methods for dealing with such use at the back end and capitalizing on it at the front end.

Networked AI, according to experts, will boost human effectiveness while diminishing human autonomy, agency, and skills. Computers may match or even exceed human intelligence and capabilities in activities such as complex decision-making, reasoning and learning, advanced analytics and pattern recognition, visual acuity, speech recognition, and language translation.[200] Smart technologies in communities, autos, buildings and utilities, farms, and company operations will save time, money, and lives while giving people a more customized future.[201]The use of artificial intelligence in healthcare seems promising, with applications such as diagnosing and treating patients and supporting senior persons in living fuller and better lives. They were also excited about AI's role in large-scale public-health programs based on massive amounts of data that may be collected in the coming years on anything from personal genomes to nutrition. AI would facilitate long-awaited changes in official and informal education systems. Our entire society and its different sections benefit from AI. A list of those benefits is presented below.

Help entire Business Sector. AI has several applications in business, such as simplifying employment procedures and gathering company data. Researchers are unsure what artificial intelligence implies for the future of business, particularly for blue-collar professions. AI is projected to move digital technology away from the two-dimensional screen and into the three-dimensional physical environment that surrounds a person. Artificial intelligence has several business uses. In truth, most of us have daily encounters with AI in some kind. Artificial intelligence is already transforming nearly every business function in every industry, from the mundane to the spectacular. AI technologies are becoming increasingly vital for preserving a competitive edge as they advance. Artificial intelligence is frequently viewed as a supplement to, rather than a replacement for, human intelligence and resourcefulness.[202]Although artificial intelligence (AI) is currently incapable of performing commonsense tasks in the real world, it is capable of digesting and analyzing huge volumes of data significantly faster than the human brain. The artificial intelligence software can then give synthesized action plans to the human user. As a result, we may use AI to simulate the likely repercussions of each action and streamline decision-making. AI is essentially the second coming of software. It is a type of software that can make judgments on its own and respond in situations that the creators did not anticipate. In comparison to traditional software, AI has a greater range of decision-making capacity.These characteristics make AI extremely beneficial in a variety of businesses, whether it's just assisting visitors and employees in smoothly navigating a corporate site,[203]or executing a hard task such as monitoring a wind turbine to determine when it may require maintenance.

Improved Customer Experience. AI-powered solutions enable organizations to respond to consumer complaints and inquiries more swiftly and efficiently. The importance of relationship commitment in AI-enabled customer experience cannot be overstated.[204]Chatbots mixed with conversational AI and Natural Language Processing provide customized messages for customers, assisting them in locating the best solution for their needs. AI tools aid in decreasing the pressure on customer service personnel. Finally, it aids in increasing productivity.

Smarter Decision Making. Smarter decision-making is aided by technology. AI coordinates data distribution, ensures data consistency, analyzes trends, assesses uncertainties, and delivers projections to help your firm make the right decision. As long as AI cannot duplicate human emotions, it will remain neutral and can assist in making the appropriate decision to promote corporate efficiency. AI and IoT can have a favorable impact on smart decision-making.[205]AI is now becoming a necessity for daily living and organizational procedures as

[199] https://www.sciencedirect.com/science/article/pii/S2352710221011578, accessed on 24 June 2023
[200] Baum Seth, A Survey of Artificial General Intelligence Projects for Ethics, Risk, and Policy, Global Catastrophic Risk Institute Working Paper 20, archived (PDF) from original on 14 November 2021, accessed on 24 June 2023
[201]M.Patel,et al, Mobile-Edge Computing – Introductory Technical White Paper. September 2014
[202] https://www.businessnewsdaily.com/9402-artificial-intelligence-business-trends.html, accessed on 24 June 2023
[203] https://iopscience.iop.org/article/10.1088/1742-6596/1827/1/012126/pdf, accessed on 24 June 2023
[204] https://www.sciencedirect.com/science/article/pii/S0747563220302983, accessed on 24 June 2023
[205]Russell, S.; Norvig, P. Artificial Intelligence: A Modern Approach; Prentice Hall: Hoboken, NJ, USA, 2002

technology advances in enabling AI advancement.[206]AI contributes to smart city decision-making because smart decision-making collects data in a systematic and organized manner and employs rational decision-making processes rather than relying on chance, instinct, or generalization from overall experience.[207]

Research and Data Analysis. AI combined with machine learning is used to analyze data more efficiently. It aids in the development of prediction algorithms and models for data processing, as well as predicting the future consequences of various scenarios and trends. Furthermore, AI's strong computing capabilities accelerate data analysis and processing for research and development, which would otherwise take much longer.[208]This is one of the most significant advantages of AI in specialist R&D activity.

Solves Complex Problems. The advancement of AI technology, from basic machine learning to powerful deep learning models, has made it easier to handle complex issues. AI is assisting organizations across industries in finding the correct solutions to adequately solve problems ranging from personalized consumer contact and fraud detection to medical diagnosis.[209]Reduced expenses and increased productivity result from enhanced problem-solving efficiency. AI has been used to augment the four components of a complex problem, namely cognitive, meta-cognitive, social, and emotive, to varying degrees with extremely good and effective results.[210]AI systems can analyze enormous datasets in real time, including unstructured data, and find patterns or structures that can be utilized to help human decision-making and team-based problem-solving. [211]

Manages Repetitive Tasks. Repeated chores might take a long time to complete. Furthermore, when conducted by humans, it can become repetitive and impair productivity over time. AI-powered Robotic Process Automation (RPA) has the potential to automate interactions across several organizations. It assists in informing human behaviors within digital systems in HR, marketing, IY, or sales departments to execute any company function without the requirement for manual labor. RPA is a sort of business process automation technology based on metaphorical software robots (bots) or artificial intelligence (AI)/digital workforce. [212] When implementing workflow automation solutions, a software developer constructs a list of actions to automate a process and interface to the back end system via internal application programming interfaces (APIs) or a dedicated scripting language.[213]RPA systems, on the other hand, generate the action list by observing the user complete the task in the application's graphical user interface (GUI) and then automating those actions directly in the GUI. [214]This can reduce the barrier to using automation in products that would not otherwise provide APIs for this purpose. According to Harvard Business Review, most operational teams that have used RPA have assured their staff that automation will not result in layoffs.[215][216] Workers have instead been redeployed to more intriguing jobs. According to one academic study, knowledge workers were not scared by automation; rather, they welcomed it and saw the robots as team members.[217] According to academic studies, RPA, among other technology advancements, will fuel a new wave of productivity and efficiency gains in the global labor market.[218] Although not directly due to RPA, Oxford University believes that by 2035, up to 35% of all

[206] Raisch, S.; Krakowski, S. Artificial intelligence and management: The automation–augmentation paradox. Acad. Manag. Rev. 2021, 46, 192–210

[207] Berntzen, L.; Johannessen, M.R.; El-Gazzar, R. Smart Cities, Big Data and Smart Decision-making-Understanding "Big Data" in Smart City Applications. In Proceedings of the ICDS 2018, The Twelfth International Conference on Digital Society and eGovernments, Rome, Italy, 25–29 March 2018

[208] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3785652, accessed on 24 June 2023

[209]Dörner and Funke, 2017, D. Dörner, J. Funke, Complex problem solving: What it is and what it is not, Frontiers in Psychology, 8 (2017)

[210]Cannon-Bowers and Salas, 2001, J.A. Cannon-Bowers, E. Salas, Reflections on shared cognition, Journal of Organizational Behavior, 22 (2) (2001)

[211]Kunze et al., 2018,, T. Kunze, M. Stadler, S. Greiff, A look at complex problem solving in the 21st century, Education: Future Frontiers, 11 (2018)

[212] DeBrusk Chris, "Five Robotic Process Automation Risks to Avoid". MIT Sloan Management Review. MIT Sloan Management Review, accessed on 24 June 2023

[213]https://www.mulesoft.com/resources/api/what-is-an-api, accessed on 24 June 2023

[214] https://www.computerhope.com/jargon/g/gui.htm, accessed on 24 June 2023

[215]https://hbr.org/, accessed on 24 June 2023

[216]Lacity Mary C., et al, (19 June 2015), What knowledge workers stand to gain from automation, Harvard Business Review

217 Robotic Process Automation at Xchanging (PDF), London School of Economics

218Nine likely scenarios arising from the growing use of software robots (PDF), London School of Economics

occupations might be automated.[219]In a TEDx talk hosted by University College London (UCL), entrepreneur David Moss explains how digital labor in the form of RPA is likely to revolutionize the cost model of the services industry by driving down the price of products and services while simultaneously improving the quality of outcomes and increasing the opportunity for personalization of services.[220]A 2021 study on the effects of robotization in Europe discovered that the gender wage gap expanded at a rate of.18% for every 1% growth in robotization in a specific industry.[221]

Reduces Errors. Another significant advantage of AI is that it can aid in the reduction of manual errors. Robotic Process Automation tools can benefit from data processing and entry duties since they make systems more efficient and less prone to generate problems due to data processing errors. It is beneficial for businesses that cannot afford even minor mistakes. It is undeniable that one motivation for the existence of artificial intelligence is to prevent direct human intervention, hence eliminating human error. And it's understandable! Human mistake was recently designated the leading cause of manufacturing and production losses in a study conducted by VansonBourne, an independent and specialised market research firm for the worldwide technology sector.[222]Is artificial intelligence the solution to human error, or is human error the problem with artificial intelligence?[223]Human errors are common in everyday life; it is estimated that humans make a mistake every other minute. Some predict that a person will make approximately 800,000 decisions in their lifetime, of which 150,000 will be regretted.[224]Even though AI and technology address the majority of process variability and enhance some weaknesses, one gap remains: the human, the very one who started it all! Is AI the answer to human error, or is human error the new AI problem? You make the decision. So, robots are taking over the world. They shop for us, nurse us, search for us, and work for us. Actually, robots are taking over human tasks. Should we look into using robots to help employees with their work, better their roles, and give the firm with scalable growth in the future? Of course, most sectors would agree that human error accounts for roughly 80% of catastrophes.[225]

Strengthens the Economy. Whether or not AI is viewed as a threat to the world, it may contribute more than US$ 15 trillion to the global economy by 2030. According to a PwC report, AI advancements will boost global GDP by up to 14% between now and 2030. AI will generate the most significant economic growth in North America and China. The two countries will account for around 70% of global economic effect. Most IT behemoths are already experimenting with AI as a labor-saving solution. Companies who are sluggish to implement AI-based solutions, on the other hand, will gain a competitive advantage.

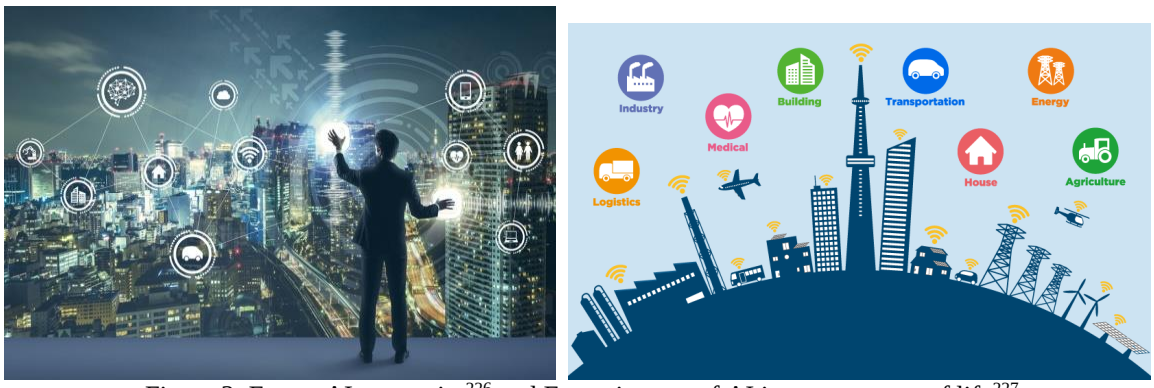

Figure 3: Future AI smart city[226] and Extensive use of AI in every aspect of life[227]

[219] THE FUTURE OF EMPLOYMENT: HOW SUSCEPTIBLE ARE JOBS TO COMPUTERISATION?, archived from the original on 2016-02-05, accessed on 24 June 2023

[220] White Collar Robots: The Virtual Workforce, TEDx Talks

[221] Aksoy CevatGiray, et al, (2021-05-01), "Robots and the gender pay gap in Europe". European Economic Review. 134: 103693. doi:10.1016/j.euroecorev.2021.103693

[222] https://humanerrorsolutions.com/problems-and-solutions-ai-and-human-error/,accessed on 24 June 2023

[223] https://www.engineering.com/AdvancedManufacturing/ArticleID/15974/Human-Error-is-Worse-in-Manufacturing-Compared-to-Other-Sectors.aspx, accessed on 24 June 2023

[224] https://www.mirror.co.uk/news/uk-news/average-person-makes-773618-decisions-90742, accessed on 24 June 2023

[225] https://dashdev.com/resources/can-artificial-intelligence-reduce-errors-in-business/,accessed on 24 June 2023

[226] https://www.techopedia.com/top-14-ai-use-cases-artificial-intelligence-in-smart-cities/2/34049, accessed on 24 June 2023

Enhances Lifestyle. Artificial intelligence has recently progressed from a premise in a science-fiction film to a significant component of our daily life. Since the introduction of AI in the 1950s, its potential has grown exponentially. We now use AI-based assistants like Cortana, Siri, and Alexa to interact with our smartphones and other gadgets. It is also used to forecast fatal diseases like leukemia and ALS. Some platforms track our browsing patterns in order to recommend things that they believe we will enjoy. Even while AI remains a persistent threat, it continues to assist humanity in some way.[228]New technology are being used to support elderly persons at home, generating a large amount of health and well-being data. The use of artificial intelligence algorithms to this healthcare and wellbeing data can improve patient care while also assisting professionals by decreasing cognitive burden. These algorithms can detect abnormal physiological, physical, and cognitive abnormalities in older people, which can aid in the identification of emergency circumstances or the early diagnosis of a growing health disease.[229]

Help Disaster Management. Generally, accurate weather forecasting makes things like vacation planning much easier. Even minor improvements in weather prediction can have a huge influence on our daily life. In fact, it can aid in disaster management. AI is critical in all phases of disaster management, resulting in a faster, more succinct, and well-equipped response. The incorporation of a geographic information system (GIS) and remote sensing (RS) into disaster management allows for improved planning, analysis, situational awareness, and recovery activities.[230]Farmers can make critical harvesting and planting decisions based on reliable weather forecasts. It also makes shipping safer and more convenient. What's more, it may be used to forecast natural disasters that affect many people's lives. After years of research, IBM partnered with the Weather Company to secure massive amounts of data. The collaboration enabled IBM to gain access to Weather Company's predictive algorithms, which supplied massive amounts of weather data that can be fed into IBM's AI platform to improve predictions.

Better Law Enforcement and Ensure Justice. Artificial intelligence (AI) and automated decision-making (ADM) technologies are rapidly being used by law enforcement and criminal justice authorities. These systems are frequently used to profile people, 'predict' their behaviours, and assess their future risk of particular behaviors, like as committing a crime. This can have disastrous effects for those who are categorized as criminals or considered a risk while not having committed a crime.[231]Predictive policing is no longer exclusive to science fiction. Law enforcement agencies all across the world use these systems. And forecasts, profiles, and risk assessments based on data analysis, algorithms, and AI frequently result in actual criminal justice outcomes. Constant surveillance, repeated stop and searches, interrogation, fines, and arrests are examples. These technologies can also have a significant impact on sentencing, prosecution, and probation choices.

Ensure Energy Efficiency. AI is a game changer for today's society, not merely a slogan or something linked with the distant future. AI will continue to alter the IT business with an increasing number of tools, services, and tailor-made solutions, from changing the face of IT assistance with chatbots to conserving a country's rich heritage with cognitive services. In collaboration with BloombergNEF and the German Energy Agency (dena), this report provides an overview of AI deployment in the energy sector, identifies priority applications of AI in the energy transition, and provides a roadmap and practical recommendations for the energy and AI industries to maximize the benefits of AI. [232]According to the paper, AI has the potential to add significant value to the global energy transition. According to BNEF's net-zero scenario modeling, every 1% increase in demand efficiency generates $1.3 trillion in value between 2020 and 2050 due to lower investment requirements. AI might accomplish this, among other things, by improving energy efficiency.[233]

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[227]https://riberasolutions.com/smart-city-iot-and-ai/, accessed on 24 June 2023

[228] Bakar UABUA, et al., "Activity and Anomaly Detection in Smart Home: A Survey.", Mukhopadhyay SC. (Ed.), Next Generation Sensors and Systems, Springer International Publishing, Cham (2016)

[229] Grossi G, et al., "Positive technology for elderly well-being: A review.", Pattern Recognition Letters, 137 (2020)

[230] https://www.mdpi.com/2071-1050/13/22/12560, accessed on 24 June 2023

[231] https://www.fairtrials.org/campaigns/ai-algorithms-data/?gad=1&gclid=EAIaIQobChMI9-H1t-7g_wIV94tLBR0qZADWEAAYAiAAEgKo5_D_BwE, accessed on 26 June 2023

[232] https://www.maximpact.com/artificial-intelligence-in-energy-efficiency/, accessed on 27 June 2023

[233] https://about.bnef.com/blog/getting-on-track-for-net-zero-by-2050-will-require-rapid-scaling-of-investment-in-the-energy-transition-over-the-next-ten-years/,accessed on 26 June 2023

Ensure Cybersecurity. AI, according to Husain, is a critical ally in finding vulnerabilities in computer network defenses. Believe it or not, AI systems can detect a cyberattack as well as other cyberthreats by monitoring data intake trends.[234]When a threat is detected, it can examine your data for the source and help you avoid future risks. That second set of eyes, as thorough and consistent as AI, will be priceless in protecting your infrastructure. The urge to secure available data and information has resulted in the growth of cybersecurity, and AI has been discovered to have a significant impact on cybersecurity.[235]AI is also playing a growing role in this area.

Helping Customer Relationship Management. Artificial intelligence (AI) is also transforming customer relationship management (CRM) systems. Salesforce and Zoho, for example, rely heavily on human engagement to be current and correct. When we apply AI to these platforms, a standard CRM system changes into a self-updating, auto-correcting system that manages our relationships for us.[236]AI is now capable of writing poems and sophisticated codes, predicting choices, interacting with humans in real time, mining trillions of data points, and offering solutions in milliseconds or less. Today, artificial intelligence (AI) is driving practically every business unit, and Customer Relationship Management (CRM) is one sector that is benefiting the most from improved customer experience (CX).[237]The banking industry is a great example of how AI may help with client connections. Dr. Hossein Rahnama, founder and CEO of AI concierge company Flybits and visiting lecturer at MIT, worked with TD Bank to integrate AI into everyday banking activities. He observed that artificial intelligence is particularly useful in this regard.

HelpingInternet and data research. AI makes use of massive amounts of data to find trends in people's search behaviour and give them with more relevant information about their situation. Users will enjoy a more personalized experience as they use their devices more and as AI technology advances. This implies everything for our small company because we will be able to target a more specialized audience. AI has several applications in business, such as simplifying employment procedures and gathering company data. AI is projected to move digital technology away from the two-dimensional screen and into the three-dimensional physical environment that surrounds a person.[238]

Helping Digital Personal Assistants. AI isn't just for providing a more personalized experience for our customers. It has the potential to change the way our firm functions from the inside out. Artificial intelligence (AI) is a field of study in which computers, robots, and other technologies are designed to demonstrate human-like intelligence, as defined by cognitive skills such as learning and adaptation, as well as decision-making abilities. [239]AI bots can be employed as personal assistants to help us manage our emails, calendars, and even provide suggestions for optimizing operations. [240]These AI assistants can also be programmed to answer inquiries from clients who call or chat online. These are all little chores that make a big difference by giving us more time to focus on implementing business-growth initiatives.

Boasting Healthcare. AI is also becoming more prevalent in healthcare. It is already used in a variety of specialties within this industry. This is especially true in the case of diagnostics. AI can assess some types of data, such as x-ray images. In this manner, the doctor learns critical information for future treatment. One goal linked to additional technological advancements is that, at some point in the future, AI may be able to notice features that are either not apparent or difficult to discern for medical staff. Furthermore, AI has the ability to improve the cost aspect of healthcare.[241]It can be used for both personnel management and patient management. Furthermore, with the application of AI, certain therapy techniques' viability and success prospects can be predicted in specific circumstances. With this possibility and the early detection of health hazards, as well as a corresponding early reaction to these illnesses in patients, the healthcare business might save billions of dollars.

[234] AI security.White Paper. https://www-file.huawei.com/-/media/ corporate/pdf/cyber-security/ai-security-white-paper-en.pdf, accessed on 14 June 2023

[235] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4323317, accessed on 28 June 2023

[236]Artificial intelligence across industries, International Electrotechnical Commission (IEC), White Paper, April 2019.

[237] https://ieeexplore.ieee.org/abstract/document/8442900, accessed on 28 June 2023

[238] https://www.businessnewsdaily.com/9402-artificial-intelligence-business-trends.html, accessed on 28 June 2023

[239] https://ieeexplore.ieee.org/abstract/document/9697300, accessed on 28 June 2023

[240] https://www.sciencedirect.com/science/article/abs/pii/S0007681319301624, accessed on 28 June 2023

[241] https://www.mdpi.com/2079-6374/12/8/562, accessed on 28 June 2023

Manufacturing Industry. AI has an impact on many aspects of our lives. Among these are several fields of industry, where it is employed on a daily basis with growing frequency.[242]AI technology is important in modern production, especially in the context of the Industry 4.0 paradigm. AI is progressively providing substantial opportunities for society and corporate organizations as digital computing devices proliferate and large data emerges.[243] AI is also gaining traction in manufacturing. Many large corporations have been utilizing it for some years. AI is being used in the logistics business, among other places. Voice and voice recognition technologies are also becoming more common in manufacturing. Furthermore, AI is already frequently important with many sorts of industrial lasers nowadays. The economic consequences of AI have been extensively studied in the past, with digital technologies such as AI and big data disrupting business models, increasing efficiency, reducing waste, and enabling organizations to become more adaptable in order to improve stakeholder experience. It is projected to play an even larger role in the future. It is a critical component for the rising digitalization of manufacturing in the framework of Industry 4.0.[244]Processes are progressively being automated and are no longer being carried out by humans, thanks to the Internet of Things. Such advancements are difficult to imagine in the absence of AI.[245]

IT Relation. Although AI has permeated many industries, its impact on information technology (IT) is unraveling traditional computing methodologies and building a new way to address today's complicated IT situations.[246]To avoid falling behind in an increasingly digitized environment, IT organizations will need to use cutting-edge AI technologies. Machine learning, a form of AI, is one of today's most popular technologies. Its maturity rises in tandem with its use. Water firms, for example, can use technology to assist protect and secure client data by using a smart metering scheme that provides for a better understanding of consumer water usage. Overall, businesses who dive deeper into ML tools will value the important insights gathered to make better business decisions. Together with our partners, we can assist businesses in quickly querying, processing, and storing data at speeds that humans simply cannot match.With today's simple AI technology, even developers with limited experience may propel a company idea. Whether it's conserving a country's rich heritage through faster historical image processing or enhancing consumer happiness through the use of robots, cognitive computing is pushing the tech sector in new ways.[247]AI is a game changer for today's society, not merely a slogan or something linked with the distant future. AI will continue to alter the IT business with an increasing number of tools, services, and tailor-made solutions, from changing the face of IT assistance with chatbots to conserving a country's rich heritage with cognitive services.

Breakthrough in Automotive. Nowadays, self-driving automobiles are a mystery, made feasible by the application of AI. It demonstrates how an idea may become a reality. Nothing is anymore science fiction. According to a recent report, around 33 million self-driving cars will be on the road by 2040.[248]We must credit AI for this advancement. Many organizations worldwide offer cutting-edge autonomous automobiles. These self-driving automobiles are guided by data science techniques and artificial intelligence. These firms' vehicles collect over petabytes of data every day in order to continually determine the best driving strategies, efficient routes, and safety precautions.

Business Intelligence. AI is also important in the realm of business intelligence. The concept of prediction in this field was introduced by technology. Business intelligence is making better judgments thanks to AI-powered tools and apps. Furthermore, AI uses its data efficiently and effectively to achieve better results.[249]Although certain forms of AI are not statistical in nature, statistically-based AI technologies such as

[242]https://www.clickworker.com/customer-blog/ai-in-various-industries/, accessed on 27 June 2023

[243] C. Chauhan, V. Parida, A. Dhir, Linking circular economy and digitalisation technologies: a systematic literature review of past achievements and future promises, Technol. Forecast. Soc. Chang., 177, 2022

[244]G. Culot, G. Orzes, M. Sartor, G. Nassimbeni, The future of manufacturing: a Delphi-based scenario analysis on industry 4.0, Technol. Forecast. Soc. Chang., 157 , 2020

[245]WEF.2017b. Realizing Human Potentials in the Fourth Industrial Revolution. White Paper, World Economic Forum

[246] https://www.also.com/ec/cms5/en_6000/6000/blog/future-technologies/how-ai-is-supporting-the-it-sector.jsp, accessed on 24 June 2023

[247] https://www.also.com/ec/cms5/en_6000/6000/blog/future-technologies/how-ai-is-supporting-the-it-sector.jsp, accessed on 24 June 2023

[248] https://infomineo.com/industrial-goods/navigating-the-future-of-autonomous-vehicles/#, accessed on 27 June 2023

[249] http://www.karyailmiah.trisakti.ac.id/uploads/kilmiah/dosen/Jurnal_-_RINA_IJBAS-IJENS.pdf, accessed on 24 June 2023

machine learning and deep learning are fast increasing in strength and acceptance.[250] It is conceivable to employ AI to address technical gaps for people who are not as tech-savvy.

Challenges, Risk, Criticism of AI

A super-intelligence, hyper-intelligence, or superhuman-intelligence is a hypothetical agent with intelligence considerably above that of the most gifted and brightest human mind. The form or degree of intelligence possessed by such an agent may alternatively be referred to as super-intelligence.[251]If artificial general intelligence research yielded sufficiently intelligent software, it may be able to reprogram and enhance itself. The enhanced software would be even better at self-improvement, resulting in recursive self-improvement.[252] Its intelligence would grow exponentially in an intelligence explosion, potentially surpassing humans. This scenario was dubbed the 'singularity' by science fiction author Vernor Vinge.[253] The technological singularity is an occurrence beyond which events are unpredictable or even unfathomable since knowing the limits of intelligence or the capacities of super-intelligent machines is difficult or impossible.[254] In addition, ML AI may create tens of thousands of hazardous compounds in a couple of hours. And this is a major threat to the entire civilization.[255]

AI is used to group individuals and then make predictions based on the assumption that the individual would resemble other members of the group. This assumption may be incorrect in some instances.[256]Robot designer Hans Moravec, cyberneticist Kevin Warwick, and inventor Ray Kurzweil all believe that in the future, humans and machines will mix to become cyborgs that are more capable and powerful than either. This idea, called trans-humanism,[257]According to Edward Fredkin, 'AI is the next stage in development.'[258]According to a study of economists, there is disagreement regarding whether the increasing usage of robots and AI will result in a significant increase in long-term unemployment.[259] However, they generally agree that redistributing productivity gains could result in a net benefit.[260]According to Michael Osborne and Carl Benedikt Frey, 47% of US employment are at 'high danger' of automation,[261] while according to an OECD survey, only 9% of employment in the United States are classified as "high risk."[262] Unlike past waves of automation, artificial intelligence may eliminate many middle-class employment.[263]However, job demand for service and care-related occupations is expected to rise. In any event, AI, IoT, ML, and automation will undoubtedly reduce the labor force/market.[264]

AI provides a number of tools that are especially useful for authoritarian governments or reaching people: smart spyware, face recognition, and voice recognition enable widespread surveillance; such surveillance enables machine learning to classify potential state enemies and prevent them from hiding; recommendation systems can precisely target propaganda and misinformation for maximum effect; and

[250] https://www.tandfonline.com/doi/full/10.1080/2573234X.2018.1543535, accessed on 24 June 2023

[251]Roberts, Jacob (2016). "Thinking Machines: The Search for Artificial Intelligence". Distillations.Vol. 2, no. 2.

[252]Omohundro, Steve (2008). The Nature of Self-Improving Artificial Intelligence. presented and distributed at the 2007 Singularity Summit, San Francisco, CA

[253] Vinge, Vernor (1993). "The Coming Technological Singularity: How to Survive in the Post-Human Era". Vision 21: Interdisciplinary Science and Engineering in the Era of Cyberspace: 11. Bibcode:1993vise.nasa...11V

[254]Kurzweil, Ray (2005). The Singularity is Near. Penguin Books. ISBN 978-0-670-03384-3

[255]Urbina, Fabio; Lentzos, Filippa; Invernizzi, Cédric; Ekins, Sean (7 March 2022). "Dual use of artificial-intelligence-powered drug discovery". Nature Machine Intelligence. 4 (3): 189–191. doi:10.1038/s42256-022-00465-9

[256]Lipartito, Kenneth (6 January 2011), The Narrative and the Algorithm: Genres of Credit Reporting from the Nineteenth Century to Today (PDF) , doi:10.2139/ssrn.1736283

[257]Moravec, Hans (1988). Mind Children. Harvard University Press. ISBN 978-0-674-57616-2

[258]Dyson, George (1998). Darwin among the Machines. Allan Lane Science. ISBN 978-0-7382-0030-9

[259]Acemoglu D., and Robinson J., (2012), Why nations fail: the origins of power, prosperity, and poverty. Random House Digital, Inc

[260]IGM Chicago, (30 June 2017), "Robots and Artificial Intelligence". www.igmchicago.org, accessed on 15 June 2023

[261] https://www.researchgate.net/profile/Neha-Soni-13/publication/325644986_Impact_of_Artificial_Intelligence_on_Business/, accessed on 24 June 2023

[262]Lohr Steve, (2017), "Robots Will Take Jobs, but Not as Fast as Some Fear, New Report Says". The New York Times

[263]Morgenstern Michael, (9 May 2015), "Automation and anxiety", The Economist

[264]Autor D., and Dorn, D., (2013). The growth of low skill service jobs and the polarization of the us labor market. American Economic Review, vol. forthcoming

advanced AI can make centralized decision making competitive with decentralized decision making.[265]Terrorists, criminals, and rogue states may deploy other forms of weaponized AI, such as advanced digital warfare and lethal autonomous weaponry.[266]Over fifty countries were said to be researching battlefield robots by 2015.[267]When many-to-many mapping is performed without taking steps to guarantee fairness for populations at risk of prejudice, health equity issues may be aggravated. At the moment, there are no equity-focused tools or regulations in place to assure equity application representation and utilization.[268]

Until AI and robotics systems are shown to be devoid of bias errors, they are dangerous, and the usage of self-learning neural networks trained on massive, unregulated sources of incorrect internet data should be limited.[269] There has been some debate regarding whether and to what degree works made with the assistance of AI are protected by copyright rules.[270] The regulatory and policy framework for AI is a developing topic in governments around the world.[271] More than 30 countries adopted AI-specific initiatives between 2016 and 2020. The majority of EU member states, as well as Canada, China, India, Japan, Mauritius, the Russian Federation, Saudi Arabia, the United Arab Emirates, the United States, and Vietnam, had announced national AI strategies. Others, such as Bangladesh, Malaysia, and Tunisia, were developing their own AI strategy.[272] The Global Partnership on AI was launched in June 2020, with the goal of ensuring public confidence and trust in the technology through developing AI in accordance with human rights and democratic ideals. OpenAI leaders issued ideas for superintelligence governance in 2023, which they anticipate will happen in less than ten years.[273]

Again, the mind and the ethical implications of constructing artificial entities with human-like intellect have been examined in myth, literature (science fiction), and philosophy from antiquity.[274]Since then, computer scientists and philosophers have claimed that AI may pose an existential threat to humanity if its rational capacities are not directed toward human-beneficial ends.[275]Economists have regularly highlighted the hazards of AI-related redundancies and speculated on unemployment if suitable social policies for full employment are not implemented.[276] The phrase "artificial intelligence" has also been chastised for exaggerating the genuine technological capabilities of AI.[277]

In 2022, a study of AI researchers discovered that some researchers believe there is a 10% or more possibility that our incapacity to regulate AI could result in an existential disaster (more than half of the survey respondents, with a 17% response rate).[278] The difficulties of AI control and alignment are two areas of concern: managing a superintelligent machine or instilling it with human-compatible ideals may be a more difficult problem than previously assumed.[279]Many academics believe that superintelligence will resist attempts to turn it off or modify its aims; as a result, such an incident will hinder it from achieving its current goals and will be

[265]Harari Yuval Noah, (October 2018), "Why Technology Favors Tyranny". The Atlantic

[266] National Research Council, (1999), "Developments in Artificial Intelligence". Funding a Revolution: Government Support for Computing Research.National Academy Press. ISBN 978-0-309-06278-7

[267]Robitzski Dan, (5 September 2018), "Five experts share what scares them the most about AI"

[268]Berdahl Carl Thomas, (7 February 2023). "Strategies to Improve the Impact of Artificial Intelligence on Health Equity: Scoping Review". JMIR AI. 2: e42936. doi:10.2196/42936

[269]Dockrill Peter, Robots With Flawed AI Make Sexist And Racist Decisions, Experiment Shows Archived 27 June 2022 at the Wayback Machine, Science Alert, accessed on 24 June 2023

[270]Hugenholtz P. Bernt, et al, (October 2021), "Copyright and Artificial Creation: Does EU Copyright Law Protect AI-Assisted Output?". IIC - International Review of Intellectual Property and Competition Law. 52 (9): 1190–1216. doi:10.1007/s40319-021-01115-0

[271]Law Library of Congress (U.S.), Global Legal Research Directorate, issuing body. (2019). Regulation of artificial intelligence in selected jurisdictions

[272]UNESCO Science Report: the Race Against Time for Smarter Development. Paris: UNESCO. 11 June 2021. ISBN 978-92-3-100450-6

[273] Governance of superintelligence. openai.com, accessed on 16 May 2023

[274]Basen Ira, (21 February 2020). "Is AI overhyped? Researchers weigh in on technology's promise and problems". Canadian Broadcasting Corporation. Archived from the original on 11 March 2023,

[275]Giles Martin, (13 September 2018). "Artificial intelligence is often overhyped—and here's why that's dangerous". MIT Technology. Archived from the original on 11 March 2023,

[276]McGaughey E, (2022), Will Robots Automate Your Job Away? Full Employment, Basic Income, and Economic Democracy, p. 51(3) Industrial Law Journal 511–559, SSRN 3044448

[277]E McGaughey, 'Will Robots Automate Your Job Away? Full Employment, Basic Income, and Economic Democracy' (2022) 51(3) Industrial Law Journal 511–559, accessed on 11 May 2023

[278] 2022 Expert Survey on Progress in AI, AI Impacts. 4 August 2022. Retrieved 10 April 2023,

[279] The AI Dilemma, www.humanetech.com. Retrieved 10 April 2023.

extremely difficult to align superintelligence [280] with the full breadth of important human values and constraints.[281] Skeptics, including computer scientist Yann Le Cun, contend that super-intelligent computers will have no motivation for self-preservation.[282]

A third source of concern is that a sudden "intelligence explosion" could catch the human species off guard. For example, if the first generation of a computer program that can roughly match the effectiveness of an AI researcher can rewrite its algorithms and double its speed or capabilities in six months, the second generation program is expected to complete a similar chunk of work in three calendar months.[283]In this scenario, the duration for each generation continues to shrink, and the system goes through an unprecedentedly large number of generations of improvement in a short time span, leapfrogging from subhuman capacity in many fields to superhuman performance in almost all sectors of interest. Empirical data demonstrates that AI systems, such as AlphaZero in the field of Go, can occasionally rapidly progress from limited human-level skill to narrow superhuman ability.[284]

AI Impact and Hazard at Workplace

AI's impact on worker/labor covers both applications to improve worker/labor safety and health and potential risks that must be controlled. One potential application is to use AI to eliminate dangers by removing humans from potentially dangerous situations that involve the risk of stress, overwork, and injury. Prognostic analytics can also be used to detect circumstances that could lead to dangers, including as weariness, repetitive strain injuries, or toxic substance exposure, allowing for earlier action. At the same time, workplace safety and health workflows must be streamlined by automating repetitive tasks, improving safety training programs through VR, or recognizing and reporting near misses.[285] However, AI can sometimes introduce new risks on its own. These may develop as a result of ML approaches causing unpredictable behavior and mystery in their decision-making, or as a result of cyber-security or information privacy concerns. Because AI has the ability to make changes in work organization, many of its risks are psychosocial. Changes in worker skills, more monitoring leading to micromanagement, algorithms mistakenly or purposely emulating unfavorable human biases, and transferring blame for machine faults to the human operator instead are examples of these. AI may potentially result in physical hazards such as human-robot collisions and ergonomic problems associated with control interfaces and human-machine interactions. Cyber-security and information privacy safeguards, communication and transparency with workers regarding data usage, and constraints on mutual or collaborative robots are all examples of risk controls.[286] Only 'weak or narrow' AI that is specialized to a single task is relevant from the standpoint of workplace safety and health, as there are many instances that are presently in use or are projected to come into use in the near future. 'Strong or general' AI is not projected to be practical in the near future, and discussing its risks is more appropriate for futurists and philosophers than industrial hygienists.[287]

Certain digital technologies are expected to reduce job opportunities. In recent years, the use of advanced robotics has resulted in net job growth. Many organizations, however, believe that automation or the use of robots would result in job losses in the near future. This is especially true for businesses in developed and developing nations.[288] Platforms and big data, for example, are expected to have a more neutral impact on employment. Some ML training methods are prone to unpredictability and mystery in their decision-making,

[280] Yudkowsky Eliezer, (2008). "Artificial Intelligence as a Positive and Negative Factor in Global Risk" (PDF). Global Catastrophic Risks: 308–345

[281]Russell Stuart, et al, (2015), "Research Priorities for Robust and Beneficial Artificial Intelligence" (PDF). AI Magazine. Association for the Advancement of Artificial Intelligence: 105–114. arXiv:1602.03506

[282] Dowd Maureen, (April 2017), "Elon Musk's Billion-Dollar Crusade to Stop the A.I. Apocalypse". The Hive. Archived from the original on 26 July 2018,

[283] Turing A M, (1996), "Intelligent Machinery, A Heretical Theory". 1951, Reprinted PhilosophiaMathematica. 4 (3): 256–260. doi:10.1093/philmat/4.3.256

[284] Graves Matthew, (8 November 2017). "Why We Should Be Concerned About Artificial Superintelligence". Skeptic (US magazine).Vol. 22, no. 2. Archived from the original on 13 November 2017,

[285] Bank European Investment, (2022-05-05). Digitalisation in Europe 2021-2022: Evidence from the EIB Investment Survey. European Investment Bank. ISBN 978-92-861-5233-7

[286]Parschau Christian; and Hauge Jostein, (2020-10-01). "Is automation stealing manufacturing jobs? Evidence from South Africa's apparel industry". Geoforum. 115: 120–131

[287] Genz Sabrina, (2022-05-05). "The nuanced relationship between cutting-edge technologies and jobs: Evidence from Germany". Brookings.

[288] Gianatti Toni Louise, (2020-05-14). "How AI-Driven Algorithms Improve an Individual's Ergonomic Safety". Occupational Health & Safety

which might pose risks if managers or workers are unable to foresee or understand the behavior of an AI-based system. There are various major characteristics of AI that could result in distinct risks. The hazards are determined by implementation rather than the presence of AI. Systems that use sub-symbolic AI, such as ML, may exhibit unpredictable behavior and are more prone to mystery in their decision-making. This is especially true if a situation is encountered that was not part of the AI's training dataset, and it is exacerbated in less organized situations.Unwanted behavior can also be caused by defects in the system's perception, knowledge representation, and reasoning, as well as by software bugs. They may result from insufficient training, such as when a user applies the same method to two tasks with different criteria. ML used during the design phase may have distinct consequences than ML used at runtime. Systems that use symbolic AI exhibit less unexpected behavior.[289] The use of AI also raises cyber-security risks in comparison to platforms that do not employ AI, and concerns about data privacy may endanger workers.

The implementation of new AI-enabled technologies may result in changes in work practices that pose psychosocial risks, such as the necessity for retraining or the fear of technological unemployment. AI is projected to transform the abilities required of workers, necessitating employee training, flexibility, and adaptability. Existing workers may find it difficult to combine traditional expertise with digital abilities. Overreliance on AI technologies may result in the de-skilling of certain professions.[290]Psychosocial hazards are those that come from the design, organization, and management of labor, as well as its economic and social surroundings, rather than from a physical substance or object. They can induce physical harm or illness as well as psychiatric and psychological effects such as occupational burnout, anxiety disorders, job stress, anxiety, and depression.[291] Many AI dangers are psychological in character, owing to their ability to generate changes in work structure in terms of increased complexity and interaction between various organizational aspects. However, designers of complex industrialized or manufacturing systems frequently neglect psychosocial concerns. Increased monitoring may result in micromanagement and, as a result, stress and worry. A sense of being watched can also cause worry. Controls for these include worker group consultation, comprehensive testing, and sensitivity to induced bias. Wearable sensors, activity trackers, and augmented reality (AR) may further contribute to stress from micromanagement, affecting both assembly line workers and gig workers. Gig workers do not have the same legal protections and entitlements as full-time employees.As we all know, a temporary or freelance worker, particularly an independent contractor working on an informal or on-demand basis. There is also the possibility that people will be forced to work at a robot's pace or to oversee robot performance at unusual hours.[292]

Algorithmic bias refers to persistent and recurring flaws in a computer system that result in 'unfair' outcomes, such as 'privileging' one category over another in ways that are inconsistent with the algorithm's intended function.[293]In situations ranging from election outcomes to the propagation of online hate speech, algorithmic bias has been mentioned. It has also manifested itself in criminal justice, healthcare, and hiring, exacerbating existing racial, socioeconomic, and gender prejudices.[294]Algorithms trained on previous decisions may mirror undesirable human biases, such as previous biased hiring and firing practices. If workers do not have access to the data or algorithms that are used to make decisions, information asymmetry between management and workers may cause stress.[295]Intentional discrimination may occur in addition to developing a model with inadvertently discriminatory features by establishing metrics that secretly result in discrimination through associated variables in a non-obvious way.[296]

[289]Standards by ISO/IEC JTC 1/SC 42 - Artificial intelligence, (2020-08-06) International Organization for Standardization

[290]Howard John, (2019-11-01), "Artificial intelligence: Implications for the future of work". American Journal of Industrial Medicine. 62 (11): 917–926. doi:10.1002/ajim.23037. ISSN 0271-3586

[291]Ferguson Murray, (2016-04-19), "Artificial Intelligence: What's To Come for EHS… And When?". EHS Today

[292] https://www.theguardian.com/technology/2017/mar/24/millions-uk-workers-risk-replaced-robots-study-warns, accessedon 25 June 2023

[293]Hickman Leo, (1 July 2013). "How algorithms rule the world". The Guardian

[294]Kitchin, Rob (25 February 2016). "Thinking critically about and researching algorithms" (PDF). Information, Communication & Society. 20 (1): 14–29. doi:10.1080/1369118X.2016.1154087

[295]Warner, Emily; Hudock, Stephen D.; Lu, Jack (2017-08-25). "NLE Calc: A Mobile Application Based on the Revised NIOSH Lifting Equation". NIOSH Science Blog

[296]Howard, John (2019-11-01). "Artificial intelligence: Implications for the future of work". American Journal of Industrial Medicine. 62 (11): 917–926. doi:10.1002/ajim.23037. ISSN 0271-3586

Some techniques to accident analysis in complex humanmachine interactions may be skewed to protect a technical system and its developers by blaming the individual human operator instead.[297]We could use AI ethics guidelines to solve such a dilemma. AI ethics standards emphasize the need of responsibility and propose that actions be taken to improve the interpretability of results.[298]Such options include incorporating the "right to understanding" into machine learning algorithms and resisting machine learning deployment in situations where judgments cannot be explained or reviewed.[299]From a regulatory standpoint, the Toronto Declaration, for example, argues for the application of a human rights framework to harms caused by algorithmic prejudice.[300] This includes requiring algorithm designers to exercise due diligence and establishing accountability when private actors fail to protect the public interest, while noting that such rights may be obscured by the complexities of determining responsibility within a web of complex, intertwined processes.[301] Introducing new technology, rules, or procedures to our workforce should be done carefully and strategically. Again, as the integration of robots in our workplace is considered, safety and job security are going to be heated themes among our employees. To alleviate some of these worries, we will begin by implementing thorough training programs and safety regulations, as well as educating our personnel on the benefits of collaborative robotics, such as protection against injury and burnout. Emphasize how robots and cobots will alleviate pain spots in an employee's employment, making it less stressful, safer, and more pleasurable.[302] Cobots are designed to engage directly with human employees, with the primary goal of optimizing procedures and efficiency through collaboration rather than acting as a replacement for the human employee entirely. Cobots in general usage today include automated guided vehicles. The use of artificial intelligence to operate these robots may increase the potential of physical risks, such as the robot or its moving parts colliding with workers.[303]

Physical hazards from human-robot collisions may develop from AI-powered robots, particularly collaborative robots (Cobots). Cobots are designed to work in close proximity to humans, making the conventional hazard control method of isolating the robot using fences or other barriers, which is extensively employed for traditional industrial robots, unfeasible. Automated guided vehicles are a sort of cobot that is widely used in warehouses and factories as forklifts or pallet jacks as of 2019. Sensor failures or unanticipated work environment conditions in cobots can result in unpredictable robot behavior and, as a result, human-robot collisions.[304]Another example of AI-enabled robots is self-driving cars. Furthermore, the ergonomics of control interfaces and human-machine interactions may pose risks.[305]

It was inevitable that as more versatile and clever robots became available, employees would begin to wonder if their jobs were in peril. In some circumstances, robots are designed to operate in lieu of human employees, however this is usually done to remove the person from a potentially hazardous workplace and lessen the chance of injury. Traditional robots have a generally accepted applicability in performing duties that humans would regard to be dangerous, dirty, dull, and dear (expensive).[306] Robotic cattle drivers, for example, keep human workers safe. However, the employee must operate the robot from a safe distance and supervise the herding process.[307] Many cobots are programmed using human instruction. The human employee manipulates the robotic hardware manually to complete the operation correctly, and the robot "memorizes" the actions, later mimicking the human's example - yet another reassuring case for employees concerned about job displacement.

[297]Brun, Emmanuelle; Milczarek, Malgorzata (2007). "Expert forecast on emerging psychosocial risks related to occupational safety and health". European Agency for Safety and Health at Work

[298]The Internet Society (18 April 2017). "Artificial Intelligence and Machine Learning: Policy Paper". Internet Society

[299]White Paper: How to Prevent Discriminatory Outcomes in Machine Learning. World Economic Forum. 12 March 2018.

[300] The Toronto Declaration: Protecting the rights to equality and non-discrimination in machine learning systems. Human Rights Watch. 2018-07-03

[301] The Toronto Declaration: Protecting the Right to Equality and Non-Discrimination in Machine Learning Systems (PDF). Human Rights Watch. 2018

[302] Accident Search Results: "robot." United States Department of Labor; Occupational Safety and Health Administration

[303]Meyers Alysha R., (2019-05-01). "AI and Workers' Comp". NIOSH Science Blog, accessed on 23 June 2023

[304] Moore, Phoebe V. (2019-05-07). "OSH and the Future of Work: benefits and risks of artificial intelligence tools in workplaces". EU-OSHA

[305]Badri Adel et al, (2018-11-01). "Occupational health and safety in the industry 4.0 era: A cause for major concern?". Safety Science. 109: 403–411. doi:10.1016/j.ssci.2018.06.012

[306]The 4 Ds Of Robotization: Dull, Dirty, Dangerous And Dear, by Bernard Marr. Forbes. October 16, 2017

[307]Meet the robot that's making cattle herding safer. Cargill. October 18, 2018

While optimization is fundamental to cobot integration, employee safety is a critical factor for organizations who deploy cobots in the workplace.[308] Amazon CEO Jeff Bezos has deployed robots and cobots built expressly to reduce staff ailments such as repeated usage injuries.[309] Bezos intends to reduce employee injuries by half over the next three years through the project, which is just one example of the proactive approach employers everywhere are adopting to improve employee safety rather than replace people with robots. Amazon, for its part, claims that since putting robots into its facilities in 2012, the company has added more than one million jobs globally.[310]

The Occupational Safety and Health Administration (OSHA) presently does not have specific guidelines governing the use of robots in the workplace; It does, however, include vital information on hazard recognition, hazard evaluation, and hazard treatments, which can be found here.[311] Eight primary robot application hazards are recognized by OSHA, including:

- Impact, collision, or other "struck-by/caught-between" hazards
- Crushing and trapping hazards
- Struck-by projectiles hazards
- Electrical hazards
- Hydraulic hazards
- Pneumatic hazards
- Slipping, tripping, and falling hazards
- Environmental hazards

According to studies, the majority of workplace robot-related injuries occur during the assembly, installation, testing, or maintenance of a robot, rather than under typical operating conditions. As a result, more measures should be used throughout these activities. According to OSHA, "proper design, testing, integration, operation, and maintenance of the robot and the robot application can address some or all of these issues."[312] Education and training are essential components of overall workplace injury prevention, and preventing robot-related injuries is no exception. All personnel who will be working alongside robots and cobots should participate in comprehensive and ongoing safety training courses.[313] Despite the rising ubiquity of robots in the workplace, OSHA injury statistics indicates that there have been fewer than 50 recorded occurrences of injury or fatality caused by robots since 1984.[314] OSHA also recognizes eight common sources of robot application hazards, and those are:

- Human error
- Control errors
- Unauthorized access
- Mechanical failures
- Time pressure
- Environmental sources
- Power system failures or malfunctions
- Improper assembly and installation

How can we control such a hazard posed by robots or cobots? AI, like other computational technologies, necessitates cyber-security measures to prevent software breaches and intrusions, as well as information privacy

[308]From Body Mechanics to Mindfulness, Amazon Launches Employee-Designed Health and Safety Program called WorkingWellAcross U.S. Operations. Amazon. May 17, 2021

[309]Collaborative and traditional industrial robots. International Federation of Robotics (IFR). World Robotics 2022; slide 14. October 2022.

[310] New technologies to improve Amazon employee safety," written by Amazon Staff. Amazon News: Innovation at Amazon. June 13, 2021.

[311]https://en.wikipedia.org/wiki/Workplace_impact_of_artificial_intelligence, accessed on 25 June 2023

[312]Industrial Robot Systems and Industrial Robot System Safety. Occupational Safety and Health Administration (OSHA). OSHA Technical Manual (OTM) Section IV: Chapter 4, accessed on 25 June 2023

[313]Preventing the Injury of Workers by Robots. The National Institute for Occupational Safety and Health (NIOSH); Centers for Disease Control and Prevention (CDC). Last reviewed: 6 July 2014, accessed on 25 June 2023

[314]Center for Occupational Robotics Research. The National Institute for Occupational Safety and Health (NIOSH); Centers for Disease Control and Prevention (CDC). Last reviewed: July 2, 2021

safeguards. Communication and transparency regarding data usage with employees is one way to mitigate psychosocial risks associated with security and privacy concerns. Employersponsored worker monitoring programs should follow best practices such as employing only validated sensor technologies, assuring voluntary worker participation, terminating data collecting outside the workplace, revealing all data uses, and ensuring safe data storage.[315] For industrial cobots equipped with AI- enabled sensors, the International Organization for Standardization (ISO) recommended:

- Safety- related monitored stopping controls.
- Human hand guiding of the cobot.
- Speed and separation monitoring controls.
- Power and force limitations. Networked AI-enabled cobots may share safety improvements with each other. Human oversight is another general hazard control for AI.[316]

AI applications and dangers can be incorporated into existing frameworks for workplace health and safety risk management. Risk identification, like other dangers, is most effective and least expensive when done during the design phase. Workplace health surveillance, or the collection and analysis of health data on employees, is challenging for AI because labor data is frequently reported in aggregate, does not provide breakdowns of different types of work, and is focused on economic data such as wages and employment rates rather than job skill content. Educational qualifications and classifications of routine versus non-routine, cognitive versus physical employment are proxies for skill content.However, these may not be detailed enough to distinguish certain jobs with diverse AI impacts. The Occupational Information Network of the United States Department of Labor is an example of a database containing a full taxonomy of abilities. Furthermore, data are frequently provided on a national scale, despite significant geographical variance, particularly between urban and rural areas.[317]

As of 2019, ISO was working on a standard for the use of metrics and dashboards in the workplace, which are information displays that convey firm metrics to managers. The standard will include recommendations for acquiring data as well as displaying it in a readable and useful format. While aimed at consumer data, the General Data Protection Regulation (GDPR) in the European Union is also relevant for workplace data collecting.[318]Workers and other data subjects have the "right not to be subjected to a decision based solely on automated processing."[319]This regulation inspired numerous additional laws around the world, including those in Turkey, Mauritius, Chile, Japan, Brazil, South Korea, South Africa, Argentina, and Kenya.[320]The California Consumer Privacy Act, enacted on June 28, 2018, takes effect on January 1, 2020; it offers rights to transparency and control over the acquisition of personal information by businesses in a manner similar to GDPR.[321] The European Council has declared that the GDPR should be considered "a prerequisite for the development of future digital policy initiatives" in an early review.[322]

Future SafeUse of AI

AI assures that humans' relationships with machines, knowledge, and even themselves are transformed. AI supporters argue that technology has the capacity to tackle major challenges like as generating new pharmaceuticals, designing new materials to combat climate change, and unraveling the complexity of fusion power. An automated information system (AIS) is defined as any combination of hardware, software, and

[315]Jansen Anne, et al, (2018-08-28), "Emergent risks to workplace safety: working in the same space as a cobot". Netherlands Organisation for Applied Scientific Research (TNO)

[316]Moore Phoebe V., (2019-05-07). "OSH and the Future of Work: benefits and risks of artificial intelligence tools in workplaces". EU-OSHA

[317] Frank Morgan R, et al, (2019-04-02), "Toward understanding the impact of artificial intelligence on labor". Proceedings of the National Academy of Sciences. 116 (14): 6531–6539

[318]The Proposed EU General Data Protection Regulation. A guide for in-house lawyers, Hunton& Williams LLP, June 2015

[319]Moore Phoebe V., (2019-05-07). "OSH and the Future of Work: benefits and risks of artificial intelligence tools in workplaces". EU-OSHA

[320]Data protection reform – Parliament approves new rules fit for the digital era – News – European Parliament". 14 April 2016

[321]U.S. News Outlets Block European Readers Over New Privacy Rules. The New York Times. 25 May 2018. ISSN 0362-4331

[322] Council position and findings on the application of the General Data Protection Regulation (GDPR), 19 December 2019, Consilium

equipment that processes data with minimal human interaction. AIS capabilities are already outpacing their creators' knowledge of hazards, bringing to life the science-fiction nightmare scenario of the machine that outperforms its creator, often fatally.[323]This seething blend of enthusiasm and terror makes weighing the opportunities and hazards difficult. However, lessons can be drawn from other businesses and previous technology transitions.AI safety is an interdisciplinary topic concerned with preventing accidents, abuse, and other negative outcomes from AI systems.[324]It includes machine ethics and AI alignment, which strive to make AI systems moral and beneficial, and AI safety, which includes technical issues such as monitoring for hazards and making systems very trustworthy. It entails building norms and regulations that encourage safety in addition to AI research.[325]

The fear that machines would take people's work (known as extinction) is centuries old. However, new technology has so far produced new jobs to replace those it has eliminated. Machines can accomplish some things but not others, increasing the necessity for skilled individuals who can do the jobs machines cannot. A sudden disruption in job markets cannot be ruled out, even if there is no evidence of one thus far. Previous technologies tended to replace unskilled tasks, but LLMS can undertake some white-collar tasks, such as document summarization and code creation. The level of existential threat presented by AI has been hotly disputed. Experts are split.In a study of AI researchers conducted in 2022, 48% believed there was at least a 10% probability that AI's influence would be 'very catastrophic (means human extinction)'. Whereas 25% believed the risk was 0%, the median researcher stated it was 5%. It is important to recall that AI hazards (and technical risks in general) are frequently classified as abuse or mishaps.[326]The worst scenario is that a powerful AI causes widespread harm by creating toxins or viruses or convincing humans to perform terrorist attacks. It does not have to be malicious: academics are concerned that future AI may have aims that differ from those of their human founders.

Such scenarios should not be ruled out. All of these, however, require a significant amount of guesswork and a jump beyond current technology. Many people believe that future AIS will have unrestricted access to energy, money, and computing power, all of which are current limits that could be denied to a rogue AI in the future. Furthermore, when compared to other forecasters, professionals tend to exaggerate the hazards in their field. Elon Musk, who is establishing his own AI startup, is interested in his competitors' downing tools. Imposing significant control, or even a pause, now appears to be an overreaction. A pause would be unenforceable as well. Regulation is required, but for purposes other than safeguarding humanity.[327]Existing artificial intelligence systems pose legitimate issues regarding prejudice, privacy, and intellectual property rights. Other issues may become apparent as technology improves. The trick is to weigh the benefits of AI against the hazards, and to be prepared to react.

Governments have taken three main tactics thus far. At one end of the scale, the United Kingdom (UK) has advocated a 'light-touch' strategy that includes no new rules or regulatory organizations but instead applies current regulations to AI systems. The goal is to increase investment and transform Britain into a "AI Superpower." The United States of America (USA) has chosen a similar route, albeit the Biden administration is now soliciting public input on what a rulebook might look like. The EU, on the other hand, is taking a harsher stance. Its proposed regulation classifies different uses of AI based on their level of risk, requiring increasingly severe monitoring and transparency as the level of risk goes from, say, music recommendations to self-driving automobiles.[328]Some applications of AI are outright prohibited, such as subliminal advertising and remote biometrics. Firms that violate the restrictions will be penalized. According to some opponents, these laws are overly stringent. Others argue that governments should handle Al like a pharmaceutical, with a specialized regulator, strict testing, and pre-approval before public dissemination. China is already doing part of this, forcing enterprises to register AI products and submit them to a security evaluation before they are released.

[323]https://www.techslang.com/definition/what-is-an-automated-information-system/#, accessed on 25 Jun 2023

[324] Zhang Baobao, et al, (2021-05-05), Ethics and Governance of Artificial Intelligence: Evidence from a Survey of Machine Learning Researchers, accessed on 25 June 2023

[325]Russell Stuart J., (2020), Human compatible: Artificial intelligence and the problem of control, Penguin Random House, ISBN 9780525558637

[326]Zwetsloot Remco, and Dafoe Allan, (2019-02-11). "Thinking About Risks From AI: Accidents, Misuse and Structure". Lawfare. Archived from the original on 2022-11-24, accessed on 25 Jun 2023

[327]Brundage Miles, et al, (2018-04-30). "The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation". Apollo-University of Cambridge Repository, Apollo-University Of Cambridge Repository. Apollo - University of Cambridge Repository. doi:10.17863/cam.22520

[328]Carlsmith Joseph, (2022-06-16), "Is Power-Seeking AI an Existential Risk?", accessed on 25 June 2023

However, safety may be less important than politics; a major need is that AIS output represent the "core value of socialism."[329]


Figure 4: AI will power the city tomorrow[330] and Green AI Transformation[331]

The gentle approach is unlikely to suffice. If AI is as vital a technology as cars, planes, and medicines--which there is reason to believe it is--then it, too, will require new regulations. As a result, the EU's model is the most accurate, however its classification system is very complex, and a principles-based approach would be more adaptable. Compelling information regarding how systems are trained, operated, and monitored, as well as inspection requirements, would be akin to similar rules in other industries. If necessary, this might allow for tighter regulation over time. We know that CERN, or the European body for Nuclear Research, is an intergovernmental body that maintains the world's largest particle physics laboratory.[332]It was founded in 1954 and is headquartered in a northwestern suburb of Geneva, on the France-Switzerland border. It has 23 member countries.[333] Israel is the only non-European full member, having been joined in 2013. CERN is an official observer at the United Nations General Assembly.[334]

If credible proof of existential risk emerges, a specialized regulator may appear suitable, as may intergovernmental conventions comparable to those that govern nuclear weapons. To monitor that danger, governments may establish an organization similar to CERN, a particle-physics laboratory that could also study AI safety and ethics-areas where firms lack incentives to invest as much as society would like. AI is a formidable technology that brings new hazards while also providing incredible potential.[335]It is critical to walk cautiously while balancing the two means. A careful approach now can provide the groundwork for additional laws in the future. But the moment has come to lay those foundations.[336]The creation of rules, standards, and regulations to regulate the use and development of AI systems is at the heart of AI governance.[337] It entails developing and executing concrete recommendations, as well as undertaking more fundamental research to inform these recommendations. The research on AI safety governance goes from fundamental studies into the potential implications of AI to specific applications. On the theoretical side, academics have suggested that AI,

[329]Shermer Michael, (2017), "Artificial Intelligence Is Not a Threat---Yet". Scientific American. Archived from the original on 2017-12-01.

[330] https://eandt.theiet.org/content/articles/2021/09/how-will-artificial-intelligence-power-the-cities-of-tomorrow/,

[331]https://lunna.ai/green-ai/, accessed on 25 June 2023

[332]James Gillies, (4 October 2018). CERN and the Higgs Boson: The Global Quest for the Building Blocks of Reality. Icon Books Limited. ISBN 978-1-78578-393-7

[333]CERN (2020), "Governance". CERN Annual Report.CERN. 2019: 50. doi:10.17181/ANNUALREPORT2019

[334]History of CERN. Hermann, Armin, 1933-, Belloni, Lanfranco.,Krige, John., European Organization for Nuclear Research. Amsterdam: North-Holland Physics Pub. 1987. ISBN 0-444-87037-7

[335]Dafoe Allan, (2016). "Yes, We Are Worried About the Existential Risk of Artificial Intelligence". MIT Technology Review. Archived from the original on 2022-11-28, accessed on 25 June 2023

[336] The Economist, April 22-28th 2023

[337]Future of Life Institute (2019-03-27). AI Strategy, Policy, and Governance (Allan Dafoe). Event occurs at 22:05. Archived from the original on 2022-11-23

given to its vast applicability, has the potential to revolutionize many parts of society.[338] Some academics are afraid that artificial intelligence would exacerbate the already unbalanced game between cyber attackers and cyber defenders.[339] This would boost 'first strike' incentives, potentially leading to more aggressive and destabilizing attacks. Some have recommended a greater emphasis on cyber protection to mitigate this risk. Furthermore, software security is critical for avoiding strong AI models from being stolen and misappropriated.[340]

Future Concerns of AI and Proposition

People will experience a lack of control over their lives in the future. Key aspects of digital life will be automatically delegated to code-driven, 'black box' solutions. People will lack feedback and will not learn how the technologies work in context. We will give up our independence, privacy, and control over our choices. We will have no say in these processes. This effect will become more pronounced as AI-powered or automated technologies become more prevalent and diverse. Data use and surveillance in the future will be in complicated systems built for profit or power. In the future, most AI technologies will be in the hands of profit-driven businesses or power-hungry governments.Values and ethics will not always be incorporated into the digital systems that make decisions for individuals. These systems will be globally networked and difficult to regulate or restrain. In the future, AI will take over jobs, deepen economic divides, and cause societal unrest. Code-based machine intelligence's efficiency and other economic benefits will continue to disrupt all elements of human work. However, some predict new jobs to arise, while others anticipate enormous job losses, as well as deepening economic divides and societal unrest, including an unwelcome revolution.

AI will degrade people's cognitive, social, and survival skills in the future. However, although most people anticipate AI augmenting human capabilities, some of us anticipate the opposite. Some experts believe that people's increasing reliance on machine-driven networks will erode their ability to think for themselves, causing them to fail to act independently, become overly reliant on automated systems, and fail to interact effectively with others in any crisis or critical situation. AI will lead to self-driving cars, cybercrime, and weaponized data.Few analysts expect that the fast rise of autonomous military applications will result in further collapse of established sociopolitical frameworks and the likelihood of significant loss of life. The use of weaponized information, misinformation, and propaganda in the future will dangerously destabilize human groups. Some are also concerned about cybercriminals' ability to penetrate economic systems. Nuclear weapons, biological agents, and chemicals may be deployed against the general population, putting humanity in danger.

AI will change economic and political structures to help humans compete with machines. AI will rearrange economic and political systems with the purpose of increasing human powers and capabilities in order to increase human/AI collaboration and halt trends that would jeopardize human relevance in the face of programmed intelligence.[341] We can't anticipate how technology will grow, but most experts believe that 'commonsense' professions will become easier for computers to handle. As a result, robots will be extremely beneficial in everyday life. 'AI is beginning to make what was once thought impossible realistic, such as self-driving cars,' said Russell Glenister, CEO and founder of Curation Zone. 'Driverless automobiles are only a reality because of the availability of training data and fast graphic processing units (GPUs),' he explained. To train autonomous vehicles, a tremendous amount of trustworthy data is necessary, and speed is key to the training process. Processors were too slow five years ago, but the emergence of GPUs enabled it all'. Glenister noted once more, "GPUs will only get faster, improving AI software applications across the board." AI success necessitates quick processes and a big volume of clean data.

Dr. Nathan Wilson, co-founder and CTO of Nara Logics, believes that artificial intelligence (AI) is on the cusp of revolutionizing everyday activities like dining. Wilson predicted that a restaurant could use AI to choose which music to play based on the interests of the patrons. AI may even adjust the wallpaper's design based on what the technology anticipates the crowd's aesthetic preferences would be. If that isn't far enough in the future for us, artificial intelligence will free digital technology from the two-dimensional, screen-imprisoned

[338]Center for Security and Emerging Technology; Rudner, Tim; Toner, Helen (2021). "Key Concepts in AI Safety: Interpretability in Machine Learning". doi:10.51593/20190042. S2CID 233775541. Archived from the original on 2022-11-24, accessed o 25 June 2023

[339]Center for Security and Emerging Technology; Hoffman, Wyatt (2021). "AI and the Future of Cyber Competition". doi:10.51593/2020ca007. S2CID 234245812. Archived from the original on 2022-11-24,accessed on 25 June 2023

[340]Hendrycks Dan, et al, (2022-06-16). "Unsolved Problems in ML Safety". arXiv:2109.13916

[341]5G mobile network architecture for diverse services, use cases, and applications in 5G and beyond. EU co-funded project. https://www.5gmonarch.eu, accessed on 14 June 2023

shape to which humans have been accustomed. The physical environment surrounding an individual will become the primary user interface in the future. To play a game, interact with a website, or read an e-book nowadays, we mainly rely on a two-dimensional display. In the near future, AI and IoT will combine to make the environment the primary interface rather than the display. People, whether in connected buildings or connected boardrooms, will create experiences around them. We will be able to sense 3D experiences in the near future'. AI will surely pervade all facets of existence. As this technology progresses, the world will witness the formation of new enterprises, the proliferation of commercial applications and consumer uses, employment displacement, and the creation of entirely new ones.Along with IoTs, AI has the ability to drastically reshape the economy; we'll have to wait and see how the drama of AI unfolds. The widespread adoption and progress of AI necessitates a high level of security assurance. Because AI will be used in transportation and medical care in the future years, the technology'must be introduced in ways that create trust and understanding, and protect human and civil rights'.[342] Policies and protocols, on the other hand, should handle ethical, privacy, and security concerns. As a result, multinational communities should work together to push AI to progress in a way that benefits humanity.

We need to strengthen human collaboration across borders and stakeholder groups by making the best use of AI.[343]The development of digital cooperation in the service of humanity's best interests should be our top focus. We must identify the best means for people all around the world to reach shared understandings and agreements, as well as join forces to facilitate the development of widely accepted approaches to tackling wicked problems and preserving control over complex human-digital networks. We must design policies to ensure that AI is geared toward 'humanness' and the common good. As we all know, the power to create the impossible is referred to as moonshot thinking or mentality. Some of the world's most significant discoveries have been made by people who resolved to think that what seemed unattainable was, in fact, feasible. They had the bravery to strive for something bigger than themselves. They were curious and wanted to see and believe things in a different way. [344] We need to adopt a 'moonshot mentality'[345]to create open, decentralized, intelligent digital networks 'imbued with empathy'[346]that assist humans in aggressively ensuring that technology meets social and ethical duties.[347]To ensure the best use of AI for the entire human species, we need a new and effective level of regulatory and certification process.[348]

II. Conclusion

Already, the digital revolution has altered how people live, work, and communicate. And it's only just beginning. However, the same technologies that have the potential to improve the lives of billions of people by making them happier, healthier, and more productive are also posing new problems to citizens and governments around the world. Recent events have proved that technology is transforming how we think about privacy, national security, and perhaps even democracy itself, from election meddling to data breaches and cyberattacks. The impact of automation and AI on the job market, identity, and privacy will determine the digital age and the twenty-first century.AI is a computer system that can perform tasks that would normally require human intelligence or intervention. Today, we'll look at some of the fields of artificial intelligence. As a subset of AI, ML enables software applications to become increasingly accurate at forecasting outcomes without being specially coded for it. ML is a branch of artificial intelligence that focuses on building and implementing algorithms that allow computers to learn from data. One of the most common AI benefits is automation. Transportation, communications, service industries, and consumer products have all benefited greatly from technological advancements.

Businesses in the previously stated categories can benefit from enhanced productivity and higher production rates thanks to automation. However, it also promises more efficient raw material utilization, shorter lead times, higher product quality, extended service, ease of everyday living, and greater safety. Automation frees up resources that can be employed for more important tasks. Companies that develop and use AI will aid in ensuring 24-hour service availability and consistent consistency and performance throughout the day. The advantage of AI is that it handles all repetitious activities. As a result, we may increase corporate efficiency

[342] A definition of AI: main capabilities and disciplines. High-Level Expert Group on Artificial Intelligence, European Commission, April 2019

[343] A definition of AI: main capabilities and disciplines. High-Level Expert Group on Artificial Intelligence, European Commission, April 2019

[344] https://paolasantanam.com/thoughts/moonshotmindsetability, accessed on 23 June 2023

[345] https://x.company/moonshot/, accessed on 23 June 2023

[346] https://dharmaseed.org/talks/26820/, accessed on 23 June 2023

[347] https://theshillongtimes.com/2022/10/16/we-care-foundation-philanthropy-imbued-with-empathy/, accessed on 23 June 2023

[348] https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai, accessed on 23 June 2023

while decreasing employee stress. Our personnel will be able to complete difficult business tasks that previously required manual intervention.AI will increasingly need them to consider not only how to use AI devices, but also what to do with the data and how to protect it from dangers. Similarly, AI will dominate every element of human life in the twenty-first century. Intelligence will shape the future. Improving operator network intelligence is a long-term undertaking that will not be completed overnight. Several proprietary AI for 5G systems solutions have been studied, and some are already commercially accessible at the time of writing.Furthermore, many AI sub-disciplines, such as computer vision, speech recognition, natural language processing (NLP), cognition and reasoning, and game theory, are still in their infancy. Deep learning systems that use BD for statistical analysis have pushed the bounds of AI, but they are also widely regarded as 'lacking common sense,' which is the most significant barrier to contemporary AI research.

AI could be data-driven as well as knowledge-driven. The next-generation AI breakthrough is knowledge inference and its application to all contexts. Several significant concerns with machine learning in 5G and future networks may give rise to new areas of research and extensions of present standards to support future networks. As a result, the widespread adoption and progress of AI necessitates adequate security assurance. Since AI will be used in many sensitive industries such as transportation and medical care in the next years. As a result, the technology "must be introduced in ways that foster trust and understanding while respecting human and civil rights." Policies and protocols, on the other hand, should handle ethical, privacy, and security concerns. As a result, multinational communities should work together to push AI to progress in a way that benefits humanity. As AI becomes more incorporated into the workforce, it seems doubtful that all human employment will be eliminated. Instead, many experts believe that the workforce will become increasingly specialized in the future. These professions will necessitate more of what automation cannot currently deliver, such as creativity, problem-solving, and qualitative skills. Essentially, there will always be a need for people in the industry, but their responsibilities may change as technology advances. The demand for specialized abilities will shift, and many of these positions in the twenty-first century will require a more advanced, technical ability and knowledge.

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