VIŠJA STROKOVNA ŠOLA "ACADEMIA"

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ARTIFICIAL INTELLIGENCE

AND

POTENTIAL PROBLEMS

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STATEMENT OF AUTHORITY OF THE THESIS

Signed Viktor Nankovski, I am the author of this thesis titled "Artificial Intelligence and Potential Problems", which I wrote under the supervision of Mag. Dušan Brglez.

With my signature, I guarantee that:

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ABSTRACT

This thesis investigates the complex and evolving landscape of artificial intelligence (AI), and delves into the potential problems associated with its rapid development and widespread deployment. AI has emerged as a transformative technology, impacting various aspects of human life, including healthcare, transportation, finance, and entertainment. However, alongside its numerous benefits, AI also brings forth a host of ethical, social, and technical challenges that demand careful consideration.

The thesis begins by outlining the fundamental concepts and techniques behind AI, providing a comprehensive understanding of its capabilities and limitations. It explores the various forms of AI, including machine learning, natural language processing, deep learning and computer vision, highlighting their respective applications and implications.

One of the key areas of concern addressed in this thesis is the ethical dimension of AI. The thesis examines the potential biases embedded within AI systems, the ethical dilemmas surrounding AI-driven decision-making, and the implications for privacy and security. It also investigates the impact of AI on employment and the potential socio-economic disparities that may arise from widespread automation. This thesis also explores the societal implications of AI, such as its influence on social relationships, human behaviour, and the erosion of privacy. It delves into the ethical considerations of AI in autonomous vehicles, healthcare systems, and military applications, shedding light on the potential risks and consequences.

In addition to ethical and social challenges, the thesis also analyses the technical hurdles that must be overcome for AI to reach its full potential. It examines issues related to data quality and availability, algorithmic transparency and interpretability, and the limitations of current AI technologies. Furthermore, it explores the risks associated with AI development, including malicious use, unintended consequences, as well as the need for robust governance frameworks. Finally, the thesis concludes by proposing a multidisciplinary approach to address the potential problems associated with AI. It emphasizes the importance of collaboration among researchers, policymakers, industry stakeholders, and the public to develop ethical frameworks, regulations, and guidelines for a responsible AI deployment. It also highlights the need for ongoing research, education, and public engagement to ensure ethical and equitable development of AI technologies.

Keywords: *artificial intelligence, digitalisation, problems, challenges, machines*

POVZETEK

UMETNA INTELIGENCA IN MOREBITNE TEŽAVE

Diplomska naloga raziskuje kompleksno in razvijajočo se področje umetne inteligence (UI) ter se poglablja v morebitne težave, povezane z njenim hitrim razvojem in široko razširjenostjo. Umetna inteligenca se je pojavila kot transformativna tehnologija, ki vpliva na različne vidike človeškega življenja, vključno z zdravstvenim varstvom, prevozom, financami in zabavo. Vendar pa umetna inteligenca poleg številnih prednosti prinaša tudi vrsto etičnih, družbenih in tehničnih izzivov, ki zahtevajo skrbno obravnavo.

Diplomsko delo se začne z orisom temeljnih konceptov in tehnik, ki stojijo za UI, ter zagotavlja celovito razumevanje njenih zmogljivosti in omejitev. Raziskuje različne oblike UI, vključno s strojnim učenjem, obdelavo naravnega jezika in računalniškim vidom, s poudarkom na njihovih aplikacijah in posledicah.

Eno ključnih področij, ki jih diplomska naloga obravnava, je etična razsežnost UI. Prispevek preučuje morebitne pristranskosti, vgrajene v sisteme UI, etične dileme, povezane z odločanjem na podlagi UI, ter posledice za zasebnost in varnost. Raziskuje tudi njen vpliv na zaposlovanje in morebitne socialno-ekonomske razlike, ki lahko nastanejo zaradi razširjene avtomatizacije. Diplomska naloga raziskuje tudi vpliv UI na družbene odnose, človeško vedenje in zmanjševanje zasebnosti ter se poglablja v njene etične vidike v avtonomnih vozilih, sistemih zdravstvenega varstva in vojaških aplikacijah ter osvetljuje možna tveganja in posledice.

Poleg etičnih in družbenih izzivov diplomska naloga analizira tudi tehnične ovire, ki jih je treba premagati, da lahko UI doseže svoj polni potencial. Preučuje vprašanja v zvezi s kakovostjo in razpoložljivostjo podatkov, algoritemsko preglednostjo in interpretativnostjo ter omejitvami trenutnih tehnologij UI. Poleg tega raziskuje tveganja, povezana z razvojem UI, vključno z zlonamerno uporabo, nenamernimi posledicami in potrebo po trdnih okvirih upravljanja.

Diplomska naloga se zaključi s predlogom multidisciplinarnega pristopa za reševanje morebitnih težav, povezanih z UI. Poudarja pomen sodelovanja med raziskovalci, oblikovalci politik, zainteresiranimi stranmi v industriji in javnostjo za razvoj etičnih okvirov ter predpisov in smernic za odgovorno uvajanje UI. Poudarja potrebo po stalnih raziskavah, izobraževanju in sodelovanju javnosti, da se zagotovi etičen in pravičen razvoj tehnologij UI.

Ključne besede: *umetna inteligenca, digitalizacija, težave, izzive, stroji*

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I INTRODUCTION

Artificial intelligence (hereinafter AI) has emerged as a groundbreaking technology with the potential to revolutionise numerous industries and reshape the way we live and interact. AI refers to the development of computer systems that can perform tasks and make decisions that would typically require human intelligence. It involves creating algorithms and models that enable machines to learn from data, recognise patterns, and adapt to new information or situations.

In simple terms, AI is similar to teaching computers to think and learn like humans. It allows machines to process and analyse large amounts of data, identify patterns or anomalies, and make predictions or decisions based on that information. AI can be used in various applications, such as image and speech recognition, natural language processing, robotics, and cybersecurity, to name a few (Motley Fool Staff, 2023).

Overall, AI aims to mimic human intelligence to solve complex problems, automate tasks, and enhance efficiency and accuracy in different fields. From self-driving cars to personalised recommendations and advanced healthcare diagnostics, AI systems have demonstrated remarkable capabilities, propelling us into an era of unprecedented possibilities. However, as AI continues to advance at an accelerated pace, it is crucial to recognise and address potential problems and challenges that accompany this transformative technology.

1.1 Description of the field and definition of the problem

There are multiple types of AI, such as, for example, narrow AI, general AI, generative AI, and others (Hislide, n.d.) (Motley Fool Staff, 2023):

- Narrow AI (ANI) encompasses all forms of AI. They are not sentient and their range is restricted. Voice assistants, chatbots, picture recognition software, self-driving cars, and maintenance models are a few examples of this type of AI (Malwarebytes, n.d.).

- Artificial General Intelligence (AGI) is a self-aware AI that is on par with or even more intelligent than humans. Some scientists think AGI is years or even decades away, while others think it's impossible.

- Generative AI is a branch of AI that deals with the process of creating and producing original content, including text, photos, audio, and even films. It entails teaching models to recognise patterns in already-existing data and then applying this understanding to produce

fresh and unique material that mimics the training set. Generative AI has applications in various domains such as image generation, text generation or music and audio generation. In the realm of cybersecurity, generative AI can be a tool as well as a challenge. It can be used to create realistic synthetic data to train models and enhance security measures, but when used maliciously, e.g. to create convincing phishing emails or deepfake social engineering attacks, it can also be dangerous. This emphasizes how crucial it is to create strong protections and detecting systems to mitigate possible risks (Education, IBM, 2023) (Malwarebytes, n.d.).

- <u>Artificial Superintelligence (ASI)</u> is the pinnacle of AI. It's a fictitious type of AI that is more intelligent than humans. Reaching this point has far-reaching and, for some, worrisome implications. This AI would outperform the best human minds in every way, including social skills and scientific creativity. Super AI would be able to improve itself at an unprecedented rate through recursive self-improvement. Its intelligence might be greater than the strongest intelligence on the planet.

- Two prominent subsets of AI are <u>machine learning</u>, where systems learn from data to improve their performance, and <u>deep learning</u>, a more complex form of machine learning modelled on the human brain (Malwarebytes, n.d.).

The rapid advancement of AI raises concerns about its ethical, social, and technical impacts. Ethical dilemmas surface when AI systems make decisions affecting individuals and society, potentially perpetuating biases learned from extensive data sets. Lack of transparency in AI processes can undermine trust and hinder understanding and accountability. Additionally, AI-generated outputs may pose copyright challenges, as traditional definitions of originality require human authorship, raising questions about ownership and legal implications.

1.2 Purpose, objectives and basic claims

In this thesis I will analyse in depth the problems related to AI, and provide some potential solutions for them. One of the problems surrounding AI that I will tackle is the intellectual property problem, i.e. the copyright problem. One of the fundamental questions in AI and copyright is determining who owns the copyright of a work created by an AI system. Traditional copyright law is based on the idea that a human author creates a work, but AI can generate content autonomously. In some jurisdictions, the creator of the AI may be considered the author, while in others, it may be the user who inputs data or instructions into the AI system.

Some examples of the challenges related to copyright are, as follows:

1) **AI-Generated Art and Music**: AI has been used to generate art, music, and other creative works. These AI-generated works can raise questions about copyright ownership.

2) **Fair Use and Transformative Works**: The concept of fair use in copyright law allows limited use of copyrighted material without permission from the copyright holder. AI-generated content often relies on existing copyrighted material to generate new works. Determining whether such use is fair and transformative can be challenging and subject to legal disputes.

3) **Data Training Sets**: AI models are often trained on large datasets that may include copyrighted materials.

4) **Plagiarism Detection**: AI-powered plagiarism detection tools are widely used in educational institutions to identify copied content. However, these tools can sometimes be too aggressive and incorrectly flag content as plagiarism, potentially harming the reputation of innocent authors.

5) **Automated Content Creation**: AI tools are increasingly used to create content for websites, news articles, and marketing materials. This raises concerns about the originality and quality of AI-generated content, and its impact on the job market for human writers.

6) **Liability**: When AI systems generate content that infringes on someone else's copyright, questions arise about who is liable. Is it the AI system developer, the user, or the AI itself? Establishing liability and accountability remains an ongoing challenge.

7) **International Variations**: Copyright laws vary from country to country, leading to a lack of uniformity in how AI-generated content is treated globally. This can create complexities when AI-generated content crosses international borders.

8) **Policy and Regulation**: As AI technology evolves, policymakers and legal experts are continuously working to update copyright laws and regulations to address the unique challenges posed by AI. These efforts are essential to provide clarity and fairness.

1.3   Assumptions and limitations

There were very few limitations regarding the topic of my thesis. There is a lot of material on AI available to the public; therefore, I had plenty of content to choose from when writing this thesis. When selecting, I made sure to pick correct and reliable data to include in my thesis, which I verified through multiple sources.

Since the pool of data for AI is very large, I tried to stay on topic as much as I could and focus on the AI's potential as well as the problems and challenges that follow; however, I did include some other data in certain chapters where appropriate, such as a brief history of AI. When conducting the survey, I made sure to ask the companies for permission to include their answers in my thesis. Any information I gathered during the survey to be included in this thesis has been approved by the participants. Additionally, I incurred minimal financial or material expenses throughout the process of working on my thesis, with the exception of the proofreading and printing.

Throughout this thesis I have conducted 4 hypotheses, each of which are located in a chapter relevant to them. These 4 hypotheses are:

1. **H1: AI will replace over 300 million jobs in the next few years.**

- I formulated hypotheses regarding the ramifications of AI on the job market and its implications for individuals.

2. **H2: AI can replace humans in repetitive tasks, but it cannot surpass humans in tasks that require creativity and emotional intelligence.**

- In this hypothesis, I delved into identifying tasks that are highly susceptible to AI automation, as well as those that pose greater challenges or may even be impossible for AI to undertake.

3. **H3: By the year 2030, AI will have human-like intelligence.**

- I formulated this hypothesis regarding the timeline for AI to reach parity with human intelligence, and explored the potential for technology to exert a greater influence on our daily lives.

4. **H4: Big Data - The more data we have, the harder it is to sort it.**

- In this hypothesis, I explored the rationale behind advocating for the application of big data practices by companies handling substantial amounts of data.

1.4   Research methods

For my thesis primary and secondary research was conducted.

Primary research refers to the research done first-hand by the author. It is when the source of information is observed and generated directly by the researcher.

Methods used in the primary research can occur in the form of a/an: experiment, survey, interview, focus group or web analytics.

The primary research methods I used were survey, interview, and web analytics.

In the primary research, the author includes a section with details about the research methods used, how data was gathered, participants, etc. Furthermore, the author provides the reader with the data in the results section. The reader, having access to the data, can analyse and interpret these data.

Advantages are, as follows: reliability, customization to personal needs, up-to-date data.

Disadvantages are, as follows: expensive/high costs, time consuming, complex to do, possibly complex to analyse.

<u>Secondary research</u> is when the author of the source used gathers existing data, usually produced by someone else, and then analyses or interprets that other person's data. In this case, the author of the source did not generate the research data s/he is using.

Methods used in the secondary research are: literature review, systematic review, meta-analysis.

Sources for secondary research can be published articles, books, documentaries, blogs, white papers etc.

In secondary research, the author includes little or no details about the research methodology used by the original researchers of the studies they used. In secondary research, the author may generalize the collective results and/or only highlight the results they felt were important. You don't have access to the original data to determine if the generalizations are accurate and/or if results important to your research question were left out. The reader of the secondary resource has no possibility to judge the quality of the research studies unless the reader tracks down the original study.

Advantages are, as follows: accessibility, low cost, short research time.

Disadvantages are, as follows: no control over data quality, not specific to personal need, data might be biased in favour of the author, data might be outdated.

II THE POTENTIAL OF ARTIFICIAL INTELLIGENCE AND DIGITALIZATION

"Any sufficiently advanced technology is indistinguishable from magic."

- Arthur C. Clarke

AI is revolutionizing the way we live and work. By simulating human intelligence, AI systems can analyse vast datasets, make predictions, automate tasks, and even learn from experience. This transformative technology has the potential to enhance productivity, improve decision-making, revolutionize industries, and drive innovation in ways we've never imagined. From healthcare and finance to transportation and entertainment, AI is reshaping the future, offering solutions to complex problems and opening up new frontiers in human achievement (Frankenfield, 2023).
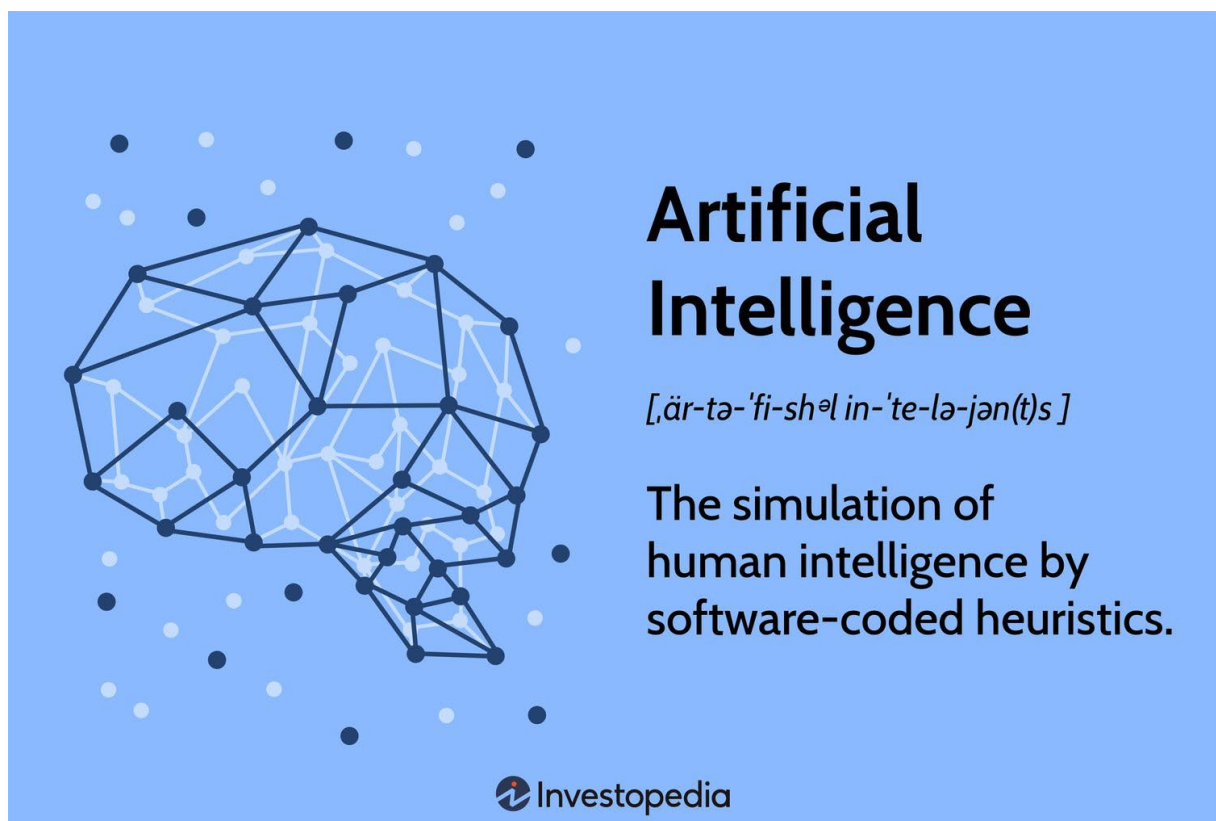
Image 1: Artificial Intelligence

Source: https://www.investopedia.com/terms/a/artificial-intelligence-ai.asp

2.1   First introductions to Artificial Intelligence

Alan Turing's Turing Test (1950): British mathematician and computer scientist Alan Turing proposed a test to determine a machine's ability to exhibit intelligent behaviour indistinguishable from that of a human. While the Turing Test itself isn't AI, it laid the foundation for future AI research by focusing on machine intelligence and natural language understanding (Geere, 2012).

Image 2: The Turing test
Source: https://www.wired.co.uk/article/turing-test

Developed by Allen Newell and Herbert A. Simon in 1955, the **Logic Theorist** was one of the first AI programs. It could prove mathematical theorems by using a formal logic system. This marked an early attempt to automate human-like reasoning.

The first natural language processing computer program or the chatbot **ELIZA** was developed by MIT professor Joseph Weizenbaum in the 1960s. It was created to "demonstrate that the communication between man and machine was superficial". ELIZA used pattern matching and substitution methodology into scripted responses to simulate conversation, which gave an illusion of understanding on the part of the program. This gave name to the ELIZA effect, the tendency to unconsciously assume computer behaviours are analogous to human behaviours; that is, anthropomorphisation, a phenomenon present in human interactions with virtual assistants.

Then, in 2011 Apple introduced the first modern digital virtual assistant **Siri**, as a feature of the iPhone 4S. Siri was an intelligent personal assistant that worked via a natural-language user

interface. In other words, people talked to it just as they would talk to another human being. The software underlying Siri, which originated at the California research institute SRI International and was purchased by Apple in 2010, listened to what iPhone users were saying to it, tried to identify what they wanted, then took action and reported back to them in a synthetic voice (McAfee & Brynjolfsson, 2014). Its aim was to aid in tasks such as sending a text message, making phone calls, checking the weather or setting up an alarm. Over time, it has developed to provide restaurant recommendations, search the internet, and provide driving directions. After Siri had been out for about eight months, Kyle Wagner of technology blog Gizmodo listed some of its most useful capabilities: "You can ask about the scores of live games – 'What's the score of the Giants game?'—or about individual player stats. You can also make OpenTable reservations, get Yelp scores, ask about what movies are playing at a local theatre and then see a trailer. If you're busy and can't take a call, you can ask Siri to remind you to call the person back later. This is the kind of everyday task for which voice commands can actually be incredibly useful (McAfee & Brynjolfsson, 2014).

The Dartmouth Workshop, organized by John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon in 1956 is considered the birth of AI as a formal research field. In a proposal to the Rockefeller Foundation, the team used what was apparently the first appearance of the phrase "artificial intelligence." Their goal was to demonstrate that, in theory, all facets of intelligence, including learning, could be so accurately described that a computer could be trained to mimic them. An effort will be made to figure out how to teach machines to speak, create abstractions and concepts, solve problems that are currently exclusive to humans, and advance themselves. Participants at the workshop explored the idea of creating machines capable of simulating human intelligence (McCarthy, 2001).

Developed at Stanford Research Institute in 1966, **Shakey the Robot** was one of the first mobile robots capable of navigating its environment, making decisions, and manipulating objects. It was a pioneer in the field of robotics and AI. While other robots would have to be instructed on each individual step of completing a larger task, Shakey could analyse commands and break them down into basic chunks by itself. When Shakey the Robot was covered in the 20 Nov 1970 edition of Life Magazine, the machine was referred to as "the first electronic person" (Abby, 2023).

Image 3: Charles Rosen with Shakey the Robot in 1983

Source: https://history-computer.com/shakey-the-robot/

These early examples of AI research laid the groundwork for subsequent advancements in machine learning, neural networks, natural language processing, and robotics. AI has since evolved significantly and has become an integral part of various industries, from healthcare and finance to entertainment and transportation. Today, AI technologies continue to push the boundaries of what is possible, with applications ranging from self-driving cars and virtual assistants to deep learning and computer vision.

2.2 Potential uses and areas

The potential of AI is vast and continues to expand as the field of AI research and development progresses. Here are some key areas where AI is liable to make a significant impact.

🞣 Automation

AI can automate repetitive, manual tasks across various industries and domains, improving efficiency and reducing human error. Some of these areas to be explored are:

1) Customer Service

Chatbots and virtual assistants are taking over routine customer inquiries, resulting in improved response times and reduced human workload. Thanks to natural language processing (NLP), AI can now effectively understand and respond to customer queries, enhancing the overall customer service experience. It can handle customer inquiries, offer customer support and provide information 24/7.

2) Data Entry and Processing

AI is automating data entry and extraction from various sources, reducing errors that can arise from manual data handling. Optical character recognition (OCR) technology is another AI application that converts handwritten or printed text into digital data, further improving data processing efficiency.

3) Manufacturing and Robotics

AI-powered robots are enabling complex manufacturing tasks to be performed with precision and adaptability. With computer vision and machine learning, these robots can recognize and manipulate objects in unstructured environments, making manufacturing processes more efficient and flexible.

4) Human Resources

AI-driven systems are revolutionizing human resources by assisting in candidate screening, resume parsing, and interview scheduling. Chatbots are also playing a significant role in handling HR-related inquiries from employees, improving the efficiency and effectiveness of HR processes.

5) Finance and Accounting

AI is automating financial tasks such as invoice processing and expense management. Machine learning algorithms analyse transaction patterns to detect fraudulent activities, enhancing financial security. These AI-powered applications are revolutionizing the finance and accounting industry.

6) Supply Chain and Logistics

AI is optimizing inventory management, route planning, and demand forecasting. Additionally, autonomous vehicles, such as self-driving trucks, are enhancing the efficiency and safety of transportation. These advancements are streamlining supply chain operations and improving overall logistics.

7) Healthcare

With AI automation, administrative tasks in the healthcare industry can be streamlined, freeing up healthcare professionals to focus more on patient care. Additionally, robotic surgery and diagnostic AI are assisting in medical procedures and disease detection, enhancing accuracy and efficiency in healthcare services.

8) Energy Management

AI optimization of energy consumption in buildings and industrial processes is leading to reduced costs and environmental impact. Smart grids, managed by AI, are efficiently distributing and managing electricity usage. These advancements are crucial for sustainable energy management.

9) Agriculture

AI-driven drones and autonomous machinery are transforming agriculture by automating planting, harvesting, and crop monitoring. Moreover, precision agriculture utilizes AI for soil and crop analysis, resulting in improved crop yields and overall agricultural efficiency.

10) Quality Control and Inspection

AI-based vision systems play a critical role in identifying defects and inconsistencies in manufacturing processes. By ensuring that items meet specific standards, AI improves product quality, leading to increased customer satisfaction and reduced waste.

11) IT Operations

AI is revolutionizing IT operations by monitoring and managing IT infrastructure, predicting and preventing system failures. Chatbots are assisting with IT helpdesk support, troubleshooting, and ticket resolution, improving overall IT service efficiency.

12) Retail

AI-powered recommendation engines personalize product suggestions for customers, enhancing the overall shopping experience. In addition, checkout automation, such as cashierless stores, is streamlining the retail process, making it more convenient and efficient.

13) Legal Services

AI automation in the legal industry can assist with legal document review and contract analysis. Natural language processing helps lawyers in research and case preparation, improving efficiency and accuracy in legal services.

14) Construction

AI is making a significant impact on the construction industry by assisting in project management, scheduling, and resource allocation. Drones and autonomous vehicles are improving site surveys and inspections, increasing efficiency and safety in construction processes.

15) Education

AI automation assists in the administrative tasks of educational institutions, allowing educators to focus more on teaching and mentoring. Personalized learning platforms adapt content to individual student needs, providing a tailored educational experience.

In conclusion, AI has immense potential in various areas of automation. From manufacturing and logistics to healthcare and education, AI-powered solutions are bringing tremendous advancements and transformative changes. As AI continues to evolve, we can expect even more significant improvements in automation and the overall efficiency of various industries.

⬥ Data Analysis and Insights

Many businesses today rely on data to inform their decision-making processes, help identify trends, and formulate strategies. Organizations need to understand the current landscape—from internal business operations to current market trends—to make intelligent choices about their future. Traditional analytics is often a manual process that relies heavily on human data analysts to manipulate data and find patterns. This can be very time-consuming, especially when dealing with large amounts of data.

AI can do these types of tasks and complete them at a speed that humans can't match. AI can analyse vast amounts of data quickly and accurately, uncovering valuable insights and patterns that would be challenging for humans to identify. This is particularly beneficial in fields like healthcare, finance, and marketing. AI data analysis uses automated techniques and data science to improve the processes of cleaning, inspecting and modelling unstructured and structured data. The end goal is to uncover valuable information to support making decisions and drawing conclusions. AI helps by automating a lot of the process. AI helps by automating a lot of the process. Instead of having a human go through everything, businesses can train a computer program to handle the heavy lifting. Since AI is the simulation of human intelligence, it can be used to spot trends and learn from the data it's trained on to provide accurate output.

Understanding the difference between data analytics and data analysis is important when learning about this topic—although the two are often used interchangeably. **Data analytics** is a subset of business intelligence, which uses machine learning to discover new insights into the data.

Data analysis is the process of inspecting, cleaning, and modelling data to discover useful information, draw conclusions, and make informed decisions. The steps are as follows:

a) <u>Data collection:</u> Businesses decide what they want to learn and then collect datasets from trusted sources to analyse.

b) <u>Data cleaning:</u> Data scientists examine their data sources to remove irrelevant information and correct bad input from the raw data.

c) <u>Data analysis:</u> The analysis process comes after properly cleaning the data. Businesses can use this data to look for trends and find insights to use.

d) <u>Data interpretation:</u> Trends learned from the data analysis process can help inform business analytics decisions about the future.

Common AI techniques used in data analysis are:

1) **Machine learning** – Machine learning is a branch of AI and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy. AI uses machine learning algorithms to process large volumes of data to identify patterns and create AI models. The data given to the AI model should relate to the use case—such as social media posts for sentiment analysis. The machine learning model learns based on the information it's fed, displays trends based on what it learned, or gives relevant output based on any requests.

2) **Natural language processing (NLP)** – NLP helps computers interpret and generate human language. AI algorithms read large amounts of text to learn the meaning of the words and how to respond to user input. AI can then analyse input text to generate new content or summarize existing information. This technology is used in chatbots, virtual assistants, and language translation services (Alam, 2023).

Image 4: Natural Language Processing (NLP)

Source: https://datasciencedojo.com/blog/natural-language-processing-applications/#

3) **Computer vision** - Computer vision deals with how computers see and interpret images and videos. Computer vision helps analyse large amounts of image and video content to look for patterns. AI can track motion, identify faces, and extract features from images.

AI and machine learning can automate much of the data analysis process, providing the ability to process vast amounts of data quickly—and often more accurately than humans. AI analytics can identify complex patterns and provide predictive insights that may not be readily apparent through manual analysis.

🔸 **Personalized Experiences**

AI personalization is the use of AI algorithms to tailor a customer's experience based on their individual preferences, history, and behaviour. AI can tailor experiences and recommendations to individuals, whether in e-commerce, entertainment, or education. This personalization enhances user satisfaction and engagement. To achieve effective AI personalization, companies must first collect data from customers through various sources such as website analytics, social media interactions, purchase history, and customer feedback. This data is then analysed to identify relevant patterns and insights that can help personalize the customer experience (AI Contentfy team, 2023).

This is where an ethical problem with the use of AI arises. While AI personalization offers a range of benefits, companies must also address ethical and privacy concerns, technical requirements, and accuracy issues. They need to ensure that personalization is done in a transparent and ethical manner, protect customer data, and avoid biases. To maximize the benefits of AI personalization, companies must also combine it with human interaction and insights.

Overall, AI personalization is a powerful tool that can improve customer experiences and increase engagement and sales for businesses. It is a trend that is expected to continue growing as companies look for innovative ways to stand out in a competitive market.

🔹 Autonomous Systems

AI is crucial for the development of autonomous vehicles, drones, and robots. These systems can improve safety, transportation efficiency, and productivity. Scientists and engineers can develop autonomous technologies with AI that can operate independently and adapt to changing scenarios and environments. Transportation is one area where autonomous computer systems are frequently used. Although they employ automated and assistive technologies, today's consumer cars are not completely autonomous. Six levels of vehicle automation have been developed by the Society of Automotive Engineers and the U.S. National Highway Traffic Safety Administration. The levels range from zero (the system provides momentary driver assistance) to five (the system is fully automated with no human driver needed). In the United States, only cars at levels zero, one, and two can currently be purchased. While self-driving cars may be the focus of most news, AI is also being investigated for use in other automotive applications. Future developments in AI may allow autonomous vehicle systems to replace humans in labour-intensive and occasionally hazardous tasks like flying airplanes, transporting cargo, and even running ambulances. Some experts even claim that these systems could perform these tasks more effectively and safely than humans. Advances in self-driving technology will also open up new possibilities in science, medical research, and robotic space exploration (Caltech's Faculty, n.d.).

🔹 Creative Content Generation

The creative sector is one that is especially susceptible to the threat posed by AI. Machine learning algorithms are becoming increasingly capable of imitating human creativity in domains like writing, music, and visual arts, sometimes even surpassing it. This poses significant queries regarding the creative workforce's future and the likelihood that humans will

be able to compete with robots in the years to come. Despite its benefits, the emergence of AI has also presented a serious threat to the creative industries. While AI has greatly simplified and improved the efficiency of many tasks, it has also sparked worries about the nature of work in the future and the level of creativity in industries like writing, music, and art. It is critical for industry professionals to figure out how to integrate and adapt AI while maintaining the distinct human touch that makes creative works truly exceptional, as the technology develops and becomes more sophisticated. It is feasible to combine the advantages of AI with the preservation of human creativity in the creative industries with thoughtful planning and strategic execution (3DIssue, 2023).

⚜ Security and defence

AI can be used for cybersecurity, threat detection, and military applications such as autonomous drones and advanced analytics for defence strategies. The field of defence continues to be shaped by AI, which presents both new and exciting opportunities as well as a host of challenges.

There is growing concern about how AI's current and future spread may affect things like weaponization, alignment, enfeeblement, eroded epistemics, value lock-in, deception, biases, and possible job loss as the country moves closer to a future in which it will dominate more and more. However, there are also a lot of potential advantages to these difficulties, such as increased precision, efficiency, and tactical advantage in defence applications (Garimella, 2018) (Ram, 2022).
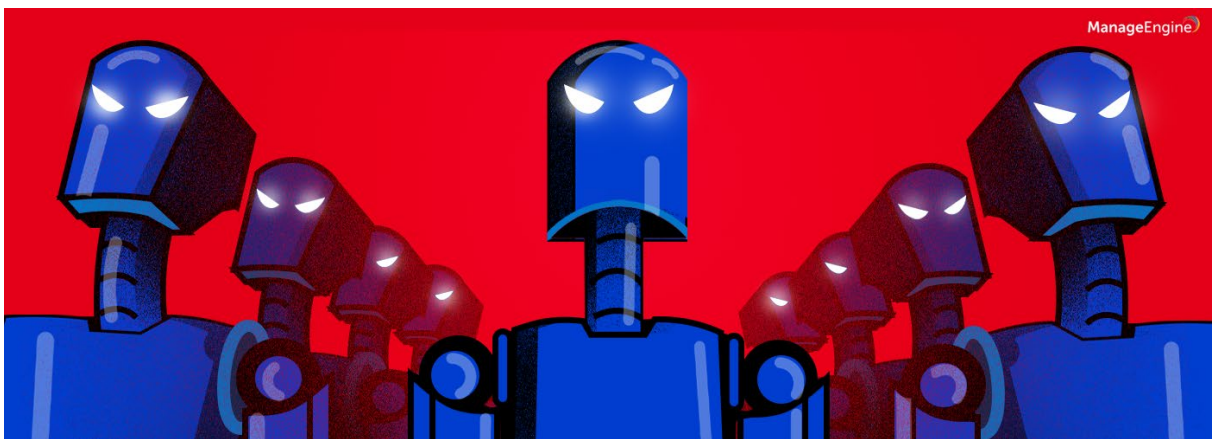

Image 5: Weaponized Artificial Intelligence Robots
Source: https://blogs.manageengine.com/corporate/general/2022/03/25/five-worthy-reads-the-emerging-threat-of-weaponized-artificial-intelligence.html

AI has enormous potential for defence. It can improve decision-making, expedite processes, and raise the precision and potency of military operations. Autonomous vehicles and drones can carry out tasks that humans find hazardous or impractical. By anticipating and recognizing threats, analytics driven by AI can offer strategic benefits. There are currently a number of important developments in AI and machine learning that have the potential to drastically change the military and defence industries. These are:

1) **Autonomous Systems** – One major area of advancement has been the creation of autonomous systems, notably unmanned aerial vehicles and drones. These systems are capable of managing a variety of duties, including combat scenario management, logistics support, and reconnaissance missions. They can manoeuvre through dangerous terrain, saving human soldiers from danger.

2) **Predictive analytics** – To foresee possible threats or maintenance requirements, sophisticated AI/ML models are employed. They can contribute to proactive defence strategy and effective resource allocation by analysing large amounts of data to identify patterns and trends that may be impossible for human analysts to notice.

3) **Cybersecurity** – The battle against cyber threats is increasingly dependent on AI and machine learning. Compared to conventional techniques, these technologies can detect and address possible threats more quickly, frequently in real time. They can also get better at defence by continuously learning from every attack.

The term "alignment" describes the process of making sure an AI system's objectives and behaviour match human intent. Alignment problems are exacerbated by AI's complexity, capacity for autonomous learning, and possible lack of transparency in its decision-making process. Unintended consequences could arise from misaligned AI, harming people even as it accomplishes its intended task. The consequences might be anything from extensive disruptions in defence logistics to collateral damage during military operations. To combat this, AI decision-making must be transparent, human values must be explicitly programmed into it, and feedback mechanisms must be in place to correct the AI's behaviour.

An over-reliance on AI is the root cause of the "enfeeblement" concern, as it may eventually result in a decline in vital human skills and abilities. Military personnel may become less skilled at these tasks as AI takes over more responsibilities, which could have an effect on operational readiness. This calls for a well-balanced strategy that augments rather than replaces human capabilities with AI.

Lastly, there is the worry of "weaponization", that AI will itself become a weapon, surpassing the boundaries of science fiction and becoming a real thing. The programming of weapons to independently choose and engage targets has been made possible by the quick advances in AI and autonomous systems, which have opened a Pandora's box of complex implications. Furthermore, AI-powered autonomous weapons may include anything from sophisticated targeting missile systems to self-governing drones that can conduct reconnaissance or carry out strikes with little assistance from humans (Hiebert, 2022).

Image 6: Killer Robot

Source: https://www.cigionline.org/articles/are-lethal-autonomous-weapons-inevitable-it-appears-so/

AI can also be applied to cyberwarfare, enabling automated attacks or defences that function faster than a human could. AI is also capable of overseeing large-scale data gathering, which helps with threat detection and tactical decision-making.

Notwithstanding these reservations, there is a huge opportunity to apply AI to defence. Instead of trying to stop progress, the objective should be to carefully manage it (Cohen, 2023).

We can help shape a future where AI significantly contributes to defence without compromising security, capability, readiness, or societal values by recognising and proactively addressing these concerns.

✦ Space Exploration

AI's prospects for use in space exploration appear bright. AI systems that can track space debris, forecast space weather, and support extraterrestrial life exploration are being developed by researchers. Future missions to the Moon, Mars, and beyond are anticipated to heavily rely on AI-powered spacecraft. AI is used in autonomous spacecraft, rovers, and space telescopes, expanding our understanding of the universe and enabling space exploration missions.

One of the main goals of space exploration has been the search for **exoplanets**, or planets orbiting stars outside of our solar system. With its ability to analyse data from telescopes like Kepler and TESS, AI has proven crucial in this endeavour. The use of machine learning algorithms enables the detection of hitherto undiscovered worlds by detecting minute variations in a star's brightness brought about by an exoplanet's transit.

Moreover, by examining their atmospheres, AI is assisting astronomers in characterizing exoplanets. Scientists can ascertain an exoplanet's composition, temperature, and potential habitability by examining its spectral signatures. By automating the analysis of spectroscopic data, AI speeds up this process.

Image 7: AI in Space Exploration
Source: https://www.linkedin.com/pulse/ai-space-exploration-how-advancing-our-understanding/

A new era of space exploration has been brought about by AI, which has enabled scientists to investigate the universe more effectively and efficiently. AI is expanding our knowledge of the

universe at a rate never seen before by automating data analysis, improving spacecraft autonomy, and assisting in the search for exoplanets (Manisha, 2023).

Drug Discovery

The development of AI and its amazing tools continually aims to lessen the difficulties that pharmaceutical companies face, which has an impact on both the drug development process and the product's overall lifecycle. This could account for the rise in industry start-ups. Automation will become even more crucial as a result of the latest AI-based technologies, which will expedite the time it takes for products to reach the market while also improving product quality, safety throughout the production process, and cost-effective resource utilization. AI can also accelerate drug discovery by simulating molecular interactions and predicting potential drug candidates, reducing the time and cost of development.

Moreover, AI can significantly aid in the optimization and continued integration of the developed medication in the appropriate dosage form. AI can facilitate prompt decision-making, which can expedite the production of higher-quality products and ensure batch-to-batch consistency. Through thorough market analysis and prediction, AI can also help establish the product's safety and efficacy in clinical trials and ensure appropriate positioning and costing in the market. AI is not yet on the market, and there are still certain obstacles to overcome before this technology can be widely used, but it is very likely that in the not-too-distant future, the pharmaceutical industry will find AI to be a very useful tool (Paul, et al., 2021).

Coding

Using AI code generation software is generally straightforward and available for many programming languages and frameworks, and it's accessible to both developers and non-developers. Programmers of all skill levels can create code more easily and more efficiently by utilizing generative AI solutions to generate computer code. The generative AI code development tools generate the code automatically when the user fills in a text prompt with the desired functionality or explain the coding solution that the user needs. It can also convert code between other programming languages and update legacy code.

Generative AI for coding is possible because of recent breakthroughs in large language model (LLM) technologies and natural language processing (NLP). It uses deep learning algorithms and large neural networks trained on vast datasets of diverse existing source code. Training code generally comes from publicly available code produced by open-source projects.

One way that AI helps in code generation is the following - coders input simple text prompts that specify the actions they wish the code to perform. By handling repetitive tasks and eliminating human coding, generative AI systems streamline the coding process by suggesting complete functions or code snippets. Additionally, as mentioned, generative AI is capable of translating code between languages, which simplifies modernization or code conversion tasks. For example, it can convert COBOL to Java to update legacy programs.

Another way that coders can utilize AI technologies is by using generative AI **chatbot** tools such as:

- ChatGPT,

- Codesonic,

- Claude,

- Jasper Chat,

- Bard AI,

- Socratic etc.

When using a software like this, the user only needs to explain the problem that they are trying to solve, and the chatbot provides a solution and explains it. Since they are chatbots, the user can basically converse with them as they would with another human being and explain the problem with relative ease. They can also specify the language in which they want the solution and then proceed to ask for additional solutions or request changes to the provided solution as desired.

The chatbot will provide the user with the requested solution if it is possible, and if he is trained in that particular language, platform or coding software. For example, low-code and no-code platforms rely on prebuilt templates and libraries of components. They enable people without coding skills to use visual interfaces and intuitive controls like drag-and-drop to create and modify applications quickly and efficiently while the actual code remains hidden in the background.

Generative AI software, on the other hand, usually doesn't have much knowledge of those templates and libraries, so it typically can't provide many solutions for platforms of that sort. However, it can still probably help in some cases. Despite this, even as code produced by generative AI and LLM technologies becomes more accurate, it can still contain flaws and

should be reviewed, edited, and refined by people. Some generative AI for code tools automatically creates unit tests to help with this.

There are multiple benefits of using AI code generation software tools, for example:

- They reduce the labour of manually creating lines of code and saves time, enabling developers to write a code more quickly, and allows them to concentrate on higher-value work.

- They can quickly and efficiently debug and test computer code.

- For non-developers, generative AI makes coding easier and more accessible.

While AI holds immense potential, it also comes with ethical, legal, and societal challenges, including concerns about biases, privacy, job displacement, and the responsible development of AI systems. Addressing these challenges is crucial to harnessing the full potential of AI in a way that benefits humanity.

2.3 H1: Artificial Intelligence will replace over 300 million jobs in the next few years.

The preceding content within this chapter illustrates the multifaceted potential of AI across various domains, invariably suggesting its capacity to supplant numerous jobs. This hypothesis presents a specific statistical projection in support of this assertion.

Testing the hypothesis that AI will replace over 300 million jobs in the next few years using a Pearson correlation coefficient (Pearson's r) is not appropriate because Pearson correlation is a statistical method used to measure the strength and direction of a linear relationship between two continuous variables. It is not designed to test hypotheses about future events or predict the number of jobs that AI might replace (Lab 20 Hypothesis testing with correlation).

So instead of this hypothesis, I have conducted a qualitative analysis in several areas.

Qualitative analysis:

I **Automation Potential** – AI and automation technologies have the potential to automate certain tasks and job functions across various industries. The extent of automation varies by industry and job type. Jobs that involve routine, repetitive tasks are more susceptible to automation. This would have a positive effect and serve as a benefit instead of a threat, as it would free humans up to do better things (Times of India, 2023).

II Timing and Timeframe – The hypothesis mentions "in the next few years," which suggests a relatively short timeframe. AI adoption and job displacement due to automation often occur gradually over a more extended period. Short-term predictions may not fully capture the complexity of labour market dynamics. Repetitive tasks are more susceptible to automation rather than tasks that require emotional or creative intelligence.

III Job Displacement vs. Transformation – AI can lead to both job displacement and job transformation. While some jobs may be automated, new job roles related to AI development, maintenance, and oversight may emerge. Additionally, AI can enhance productivity in existing jobs. The impact of AI on jobs is not uniform across industries. Some sectors, such as manufacturing and customer service, may see more significant job displacement, while others, like healthcare and education, may experience more job transformation.

IV Skilled Workforce – The impact of AI on jobs can vary based on the skills and education of the workforce. Jobs that require higher-level cognitive skills, creativity, emotional intelligence, and some problem-solving abilities may be less susceptible to automation.

V Mitigating Factors – Organizations often adopt automation and AI to improve efficiency and reduce costs. However, the decision to implement automation is influenced by factors such as cost-effectiveness, quality control, and customer experience. Some jobs may not be fully replaced due to these considerations.

In conclusion, while AI and automation have the potential to impact the job market, the extent of job displacement is subject to multiple variables, including the pace of AI adoption, economic conditions, and industry-specific factors. Predicting the exact number of jobs that AI will replace in the next few years is challenging, and estimates may vary widely. It's crucial to consider the broader context and potential mitigating factors when assessing the impact of AI on employment (more about this in the second hypothesis) (Rosidi, 2023).

2.4 H2: AI can replace humans in repetitive tasks, but it cannot surpass humans in tasks that require creativity and emotional intelligence.

The hypothesis that AI can replace humans for repetitive tasks, but it cannot surpass humans in tasks that require creativity and emotional intelligence reflects a common perspective on the capabilities and limitations of AI (Simplilearn, 2023) (Rojewska, 2023).

Here an analysis of this hypothesis in more detail:

I Automation of Repetitive Tasks

- **Strengths of AI** - AI excels at automating repetitive and rule-based tasks. Machine learning algorithms and robotic process automation (RPA) can perform these tasks with precision and consistency, often more efficiently than humans.

- **Examples** - AI is used for data entry, quality control in manufacturing, customer service chat-bots, and routine financial analysis.

- **Impact** - The automation of repetitive tasks can lead to increased productivity, reduced errors, and cost savings for businesses.

II Creativity and Innovation

- **AI Limitations** - AI has limitations when it comes to creativity and innovation. While AI can generate content, such as art, music, and literature, it often lacks the ability to produce truly original and groundbreaking creative work.

- **Human Creativity** - Human creativity involves imagination, intuition, and the ability to make connections between unrelated ideas. These qualities are difficult for AI to replicate fully.

- **Examples**: - AI-generated art and music, while impressive, are often based on patterns and styles from existing works.

- **Human Advantage** - Humans continue to excel in creative endeavours such as artistic expression, scientific discovery, and innovation in various fields.

III Emotional Intelligence

- **AI Limitations** - Emotional intelligence involves understanding, interpreting, and responding to human emotions. While AI can recognize and analyse text sentiment, facial expressions, and voice tone, it lacks true emotional understanding.

- **Human Empathy** - Humans possess empathy and the ability to connect emotionally with others, which is crucial in roles such as counselling, healthcare, and social work.

- **Examples** - Chat-bots and virtual assistants may simulate emotional responses but do not genuinely understand or experience emotions.

- **Human Advantage** - Tasks that require empathy, complex interpersonal relationships, and emotional support are areas where humans excel and where AI struggles to replace them.

Collaborative Potential & Ongoing Development of AI:

AI as a Collaborative Tool can complement human capabilities by assisting in tasks that require creativity and emotional intelligence. For example, AI tools can assist artists, designers, and healthcare professionals by providing data-driven insights and suggestions. The combination of human creativity and AI's data-processing power can lead to enhanced productivity and innovation in various fields.
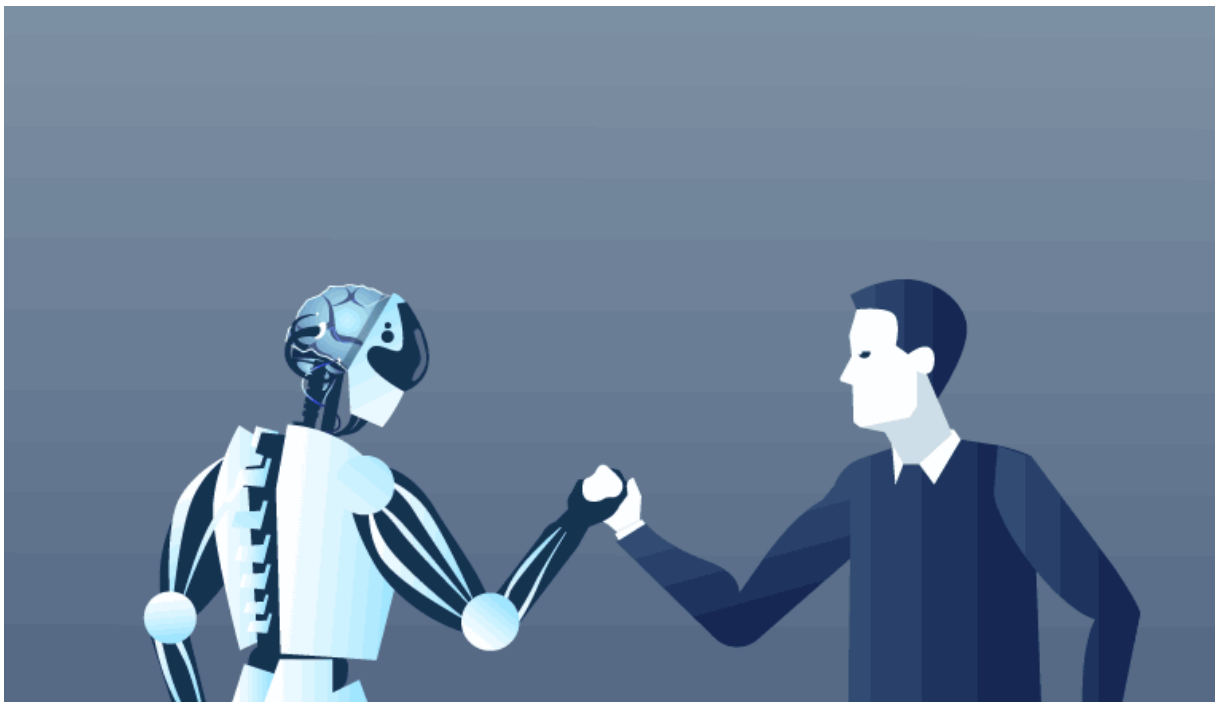
Image 8: AI and human collaboration

Source: https://www.callcentrehelper.com/finding-harmony-between-human-and-artificial-intelligence-117508.htm

AI technologies are continuously evolving. While AI may not currently match human creativity and emotional intelligence, ongoing research and development may lead to improvements in these areas. As AI becomes more capable, ethical considerations regarding its role in creative and emotionally sensitive domains become increasingly important (more about this in the third hypothesis and third chapter) (SwinBurne, 2023) (Coppell, 2017).

In conclusion, the hypothesis that AI can replace humans for repetitive tasks, but it cannot surpass humans in tasks that require creativity and emotional intelligence, aligns with the current capabilities and limitations of AI. AI excels at automating routine tasks but faces challenges in replicating human creativity and emotional understanding. However, AI can serve as a valuable tool to augment human capabilities in various domains, potentially leading to enhanced productivity and innovation through collaboration between humans and AI systems.

III   THE NEGATIVE SIDE OF ARTIFICIAL INTELLIGENCE

While AI offers numerous benefits, it also poses several challenges and negative consequences. As with those mentioned in the previous chapters, the drawbacks of AI include job displacement, ethical concerns regarding bias and privacy, security risks stemming from hacking, and a deficiency in human-like creativity and empathy.

3.1   Job Displacement

One of the most significant issues with AI, if not the most prominent, is that AI and automation technologies can replace human workers in certain jobs, especially those involving routine and repetitive tasks. Tasks that can be easily defined, quantified, and performed algorithmically are more susceptible to automation. This can lead to unemployment and economic inequality if not accompanied by workforce reskilling and job creation. One application of AI is a robot, which is displacing occupations and increasing unemployment (in a few cases). For instance, robots are frequently utilised to replace human resources in manufacturing businesses in some more technologically advanced nations like Japan. This is not always the case, though, as it creates additional opportunities for humans to work while also replacing humans in order to increase efficiency. Workers with the most exposure to AI like ChatGPT and with the most danger of their job to be substituted by automation tend to be higher earners and have a college degree.

While job displacement due to AI is a concern, it is important to recognize that technological advancements have historically transformed the nature of work rather than eliminating jobs entirely. As routine tasks are automated, new job opportunities emerge that require uniquely human skills such as creativity, problem-solving, emotional intelligence, and adaptability. Moreover, AI can augment human capabilities, enabling workers to focus on higher-level tasks that require complex decision-making and critical thinking.
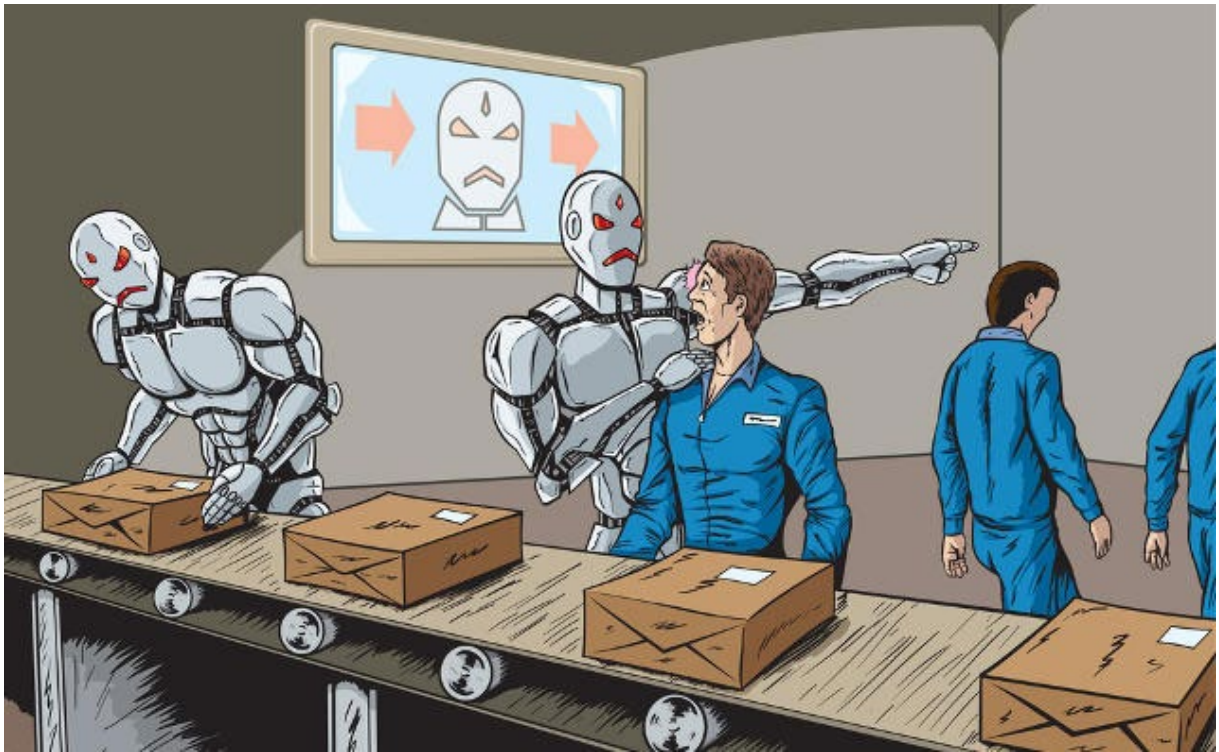
Image 9: AI replacing humans in the workforce

Source: https://www.forbes.com/sites/cognitiveworld/2018/08/07/job-loss-from-ai-theres-more-to-fear/?sh=3effab0623eb

Even though certain job roles may be displaced, AI can also lead to the creation of new jobs. The development, deployment, and maintenance of AI systems require skilled professionals, from AI engineers and data scientists to ethical experts and policy analysts. Additionally, AI can drive economic growth by increasing productivity, fostering innovation, and enabling businesses to offer new services and products. This, in turn, IA can also create employment opportunities in related industries.

Some jobs that can be replaced by AI are:

- data entry clerks,

- telemarketers,

- factory workers,

- cashiers,

- drivers,

- travel agents,

- bank tellers.

While some jobs could be replaced, others have the potential to be transformed using AI. A study found that approximately 80% of the U.S. workforce could witness at least a 10% influence on their work tasks. Furthermore, around 19% of workers may experience a significant impact, with at least 50% of their tasks being affected. Also, according to CNBC, A study released by MIT researchers in March showed that workers were 37% more efficient using ChatGPT.

Some of those jobs are:

- accountants,

- customer support representatives,

- paralegals,

- radiologists,

- librarians,

- market research analysts,

- journalists,

- translators.

3.2   No Creativity

A big disadvantage of AI is that it cannot learn to think outside the box. AI is capable of learning over time with pre-fed data and past experiences, but cannot be creative in its approach. A classic example is the bot Quill who can write Forbes earning reports. These reports only contain data and facts already provided to the bot. Although it is impressive that a bot can write an article on its own, it lacks the human touch present in other Forbes articles.

3.3   Ethical Dilemmas

AI raises several ethical questions, such as the use of autonomous weapons, surveillance systems, and AI in decision-making processes where human lives are at stake. Ethics and morality are important human features that can be difficult to incorporate into an AI. The rapid progress of AI has raised a number of concerns that one day, AI will grow uncontrollably, and eventually wipe out humanity. This moment is referred to as the AI singularity (or technological singularity). This would potentially, among other things, lead to a collapse of the world's economic system, since AI machines and robots would not need money to function. Only when

money is the source of the machine's existence can it be said to be governed by it. That is to say, a machine requires a power source to function, and at the moment, that power comes in the form of electricity delivered through some power grid at a cost. In the event that AI were to become self-sufficient in energy and cease requiring human support, it would also cease requiring financial resources. According to computer scientist, author, and futurist Ray Kurzweil, the exponential rate of technological growth will approach its own event-horizon by 2045 to culminate in an AI singularity. In other words, AI will become so efficient that it will be self-sustaining, thus making a monetary-based culture of capitalism obsolete. According to Kurzweil, "Nonbiological intelligence will have access to its own design and will be able to improve itself in an increasingly rapid redesign cycle. We'll get to a point where technical progress will be so fast that unenhanced human intelligence will be unable to follow it. That will mark the Singularity" (Hinchliffe, 2017).

Given that AI is already predicted to replace hundreds of thousands of jobs, what will people do for income once that number exponentially rises towards a singularity? If no contingency plans are put in place before this occurs, then we would all be in real trouble.

Image 10: AI Singularity
Source: https://sociable.co/technology/artificial-intelligence-singularity/

Ensuring that AI development adheres to ethical guidelines and principles is an ongoing challenge, particularly as AI systems become more autonomous (Cohen, 2023).

3.4   Security Risks

AI can be used for malicious purposes, such as hacking, creating deepfake videos, or launching cyberattacks. The use of AI in cybersecurity is a double-edged sword, as both defenders and attackers can leverage it. You can also use a number of deepfake tools to create surprisingly convincing fake audio tracks or video clips with very little training data. There are also growing privacy concerns as more users grow comfortable sharing sensitive information with AI.

Deep Fakes may become a big problem in society. Fabricating videos can create problems in many serious ways. Although Microsoft and Facebook have created technologies to detect deep fakes and their sources. The damage they might potentially inflict should be considered seriously. Fake video and audio samples might be distributed with the express goal of preying on people's prejudices, anxieties, and suspicions.

In what was an embarrassing bug for OpenAI CEO Sam Altman, ChatGPT leaked bits of chat history of other users. Although the bug was fixed, there are other possible privacy risks due to the vast amount of data that AI crunches. For example, a hacker who breaches an AI system could access different kinds of sensitive information.

The use of AI in systems like self-driving cars, manufacturing and construction machinery, and medical systems can raise the risk of that technology compromising physical safety. For instance, the physical safety of the occupants of a true self-driving car powered by AI may be in danger if there is a cyber security breach. Similar to this, an attacker could manipulate the dataset for maintenance tools at a construction site to create dangerous circumstances (Trend Micro, 2023).

3.5   Data Privacy and Consent

Many AI systems rely on data collected from individuals. Ensuring informed consent and protecting individuals' privacy rights while using their data is a significant challenge. AI often involves the collection and analysis of vast amounts of personal data. There are concerns about how this data is used, who has access to it, and the potential for misuse or data breaches.

This is also where the copyright problems regarding AI arise. Copyright issues related to AI are complex and evolving, as AI technology continues to advance. Generative AI (like ChatGPT, Bard, ChatSonic, Midjourney or DeepMind) can very easily have an intellectual property

problem. When it comes to training AI models, however, the use of copyrighted materials is fair game. That's because of a fair use law that permits the use of copyrighted material under certain conditions without needing the permission of the owner. But pending lawsuits could change this. There are several cases of AI companies being sued due to potentially using copyrighted works to illegally train AI models or generate AI content (Gil Appel, 2023).

It has long been the posture of the U.S. Copyright Office that there is no copyright protection for works created by non-humans, including machines. Therefore, the product of a generative AI model cannot be copyrighted. The root of this issue lies in the way generative AI systems are trained. Like most other machine learning models, they work by identifying and replicating patterns in data. Therefore, in order to generate an output like a written sentence or picture, it must first learn from the real work of actual humans. If an AI image generator produces art that resembles the work of Georgia O'Keefe, for example, that means it had to be trained using the actual art of Georgia O'Keefe. Similarly, for an AI content generator to write in the style of Toni Morrison, it has to be trained with words written by Toni Morrison (Glover & Whitfield, 2023).

Legally, these AI systems — including image generators, AI music generators and chatbots like ChatGPT and LaMDA — cannot be considered the author of the material they produce. Their outputs are simply a culmination of human-made work, much of which has been scraped from the internet and is copyright protected in one way or another (Whitfield, 2023).

3.6   Loss of Human Touch and Emotion

As AI is integrated into various industries, there's a risk of losing the human touch in areas like customer service, healthcare, and education, potentially leading to reduced empathy and personalization. Since early childhood, we have been taught that neither computers nor other machines have feelings. Humans function as a team, and team management is essential for achieving goals. However, there is no denying that robots are superior to humans when

functioning effectively, but it is also true that human connections, which form the basis of teams, cannot be replaced by computers (Needle, 2023).
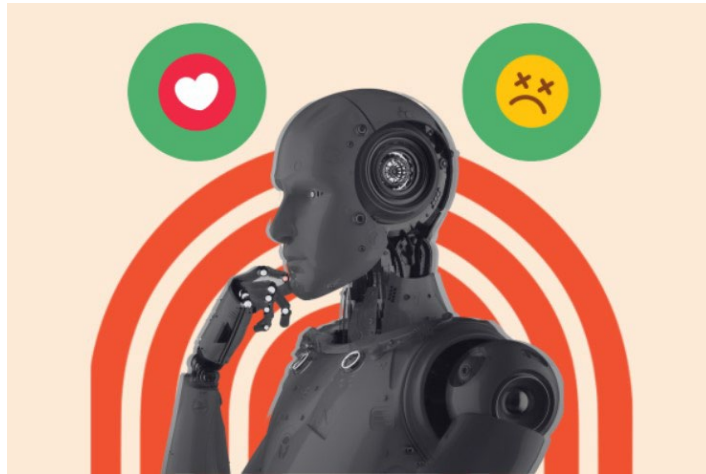
Image 11: Non-sentient AI
Source: https://blog.hubspot.com/marketing/sentient-ai

3.7   Bias and Fairness

AI systems can inherit biases present in their training data, leading to discriminatory outcomes in areas like hiring, lending, and criminal justice. Addressing bias and ensuring fairness in AI algorithms is a significant challenge (Reagan, 2021).

Bias in data can show up in several forms. Here are the top offenders:

- Historical bias is a bias that has already existed in the world and crept into our data. This bias tends to manifest itself in groups that have historically been marginalized or disadvantaged, and it can happen even in the case of ideal feature selection and sampling environments.

- Representation bias on the other hand, results from the methods used to define and sample a population in order to produce a dataset. For instance, problems identifying faces with darker skin tones resulted from the majority of the data used to train Amazon's facial recognition system being based on white faces. Datasets gathered by smartphone apps, which may underrepresent older or lower-income groups, are another example of representation bias.

- Measurement bias occurs when selecting or gathering characteristics or labels for use in predictive models. Easily accessible data is frequently a noisy surrogate for the relevant features or labels. Moreover, data quality and measurement procedures frequently differ

amongst groups. This bias has the potential to seriously harm people's lives as AI is used for more and more purposes, such as predictive policing.

3.8 Validation and Accountability

Ensuring the accuracy and accountability of AI systems, particularly in high-stakes applications like healthcare or autonomous vehicles, is a critical challenge. Relying solely on AI for critical decisions, such as medical diagnoses or legal judgments, can lead to issues of responsibility and accountability if errors occur. Accountability is one of the cornerstones of the governance of AI. This is, among other reasons, because of the delegation of tasks (e.g., prediction or decision-making) to AI systems. Current AI policies, especially in the European context, acknowledge this aspect:

"If we are increasingly going to use the assistance of or delegate decisions to AIs, we need to make sure these systems are fair in their impact on people's lives, that they are in line with values that should not be compromised and able to act accordingly, and that suitable accountability processes can ensure this" (HLEG, AI, 2019).

Despite its significance, the concept of accountability in AI is frequently overly vague, referring to a broad range of principles, procedures, and metrics. This is brought about by the complex relationship between accountability and context, the ambiguity of political processes, and the sociotechnical structure of AI. Sociotechnical systems involve the blending of norms and practices from various contexts, which will have significant effects on accountability. In conclusion, in order to address the problem of accountability in AI, the broad definition of accountability and the opacity of AIs are two challenges that must be overcome (C. Novelli, 2023).

IV SURVEY – USAGE OF AI TECHNOLOGIES

Within this thesis, I conducted a survey where I aimed to collect information about the usage of AI technologies in various IT companies today.

4.1 Questions

I contacted numerous IT companies in the country of Macedonia and asked them the following questions:

1. Have they used AI or AI technologies in their company in the last year for certain tasks?

- If so, what kind of technologies have they used/do they use?

- What type of AI have they employed?

2. Have there been any major changes in their company due to AI?

- If so, what kind of change and with what type of AI?

- Was the impact mostly positive or negative?

3. Do they have a positive outlook on AI or a negative one?

- What are the reasons behind their outlook?

4. Has the implementation of AI in their company led to a loss of certain job positions?

5. Has the implementation of AI in their company opened up new job positions?

6. Do they plan to implement more AI technologies in their company in the future?

7. Do they have a need for any specific AI technology that they don't currently have but wish to implement?

4.2 Results

This has led me to the following results:

- **20%** of the companies said that they regularly use AI technologies, and that their usage hasn't led to a loss of job positions or opening new ones. An example of the technologies they use is ChatGPT, which is generative AI. They plan to continue implementing more technologies in the future but don't have any pressing need for a specific AI technology, and most problems and challenges they face can be solved with the technology they currently have available. They have a positive outlook on AI.

- **50%** of the companies haven't implemented or used any AI technology because they haven't had a need for it. If they have a need in the future, they would implement them. They have a neutral outlook on AI.

- **30%** of the companies I contacted couldn't give me a clear answer, or the person I spoke to didn't know whether the company uses them or not, and didn't know who to ask about that. One company said they couldn't share such information as it was private.

4.3 Conclusion

This leads to the conclusion that (at least in Macedonia) the majority of companies currently have no specific need for AI technologies or are uninformed about them. The ones that have used AI technologies have had a positive outlook on them and plan to continue using them, therefore the changes AI brought have been positive for them so far. As technology progresses, I believe more AI technologies will become available to the general public, and more companies will get to know AI, implement the new AI technologies and use them more frequently.

V POTENTIAL SOLUTIONS TO THE PROBLEMS

By addressing the potential challenges and problems coming along with AI's potential, we can better understand how to maximize the benefits of AI and minimize its drawbacks. Possible solutions to some of the stated problems are, as follows:

5.1 Biases and Fairness

To solve the issue of biases in AI systems, numerous solutions may be used:

- Diversify testing and training data – a simple solution to the bias problem would be to introduce more variability in the testing data to include people of all races, professions, ages etc. according to the population for which the algorithm is intended.

- Manually check the results by humans – another good enough solution for this problem would be for a human overseer to check the results that the AI program produced and fix the irregularities accordingly.

5.2 Ethical Concerns

To address the ethical concerns the measures that can be taken are:

- Establishing clear guidelines and policies – these policies can address issues such as data privacy, data security and the use of AI for decision making.

- Establishing an ethical committee.

5.3 Security Vulnerabilities

There are several security dangers in AI systems, like data breaches, cyberattacks or malicious AI. To address the vulnerabilities several measures can be taken, for example:

- Regular testing and maintenance – regular testing and maintenance can help take care of any upcoming problems and help resolve them.

- Secure data – ensuring that the data used to train the algorithms comes from a secure source that can prevent the intrusion of malware.

5.4 Job Displacement

Methods that can be used to regulate job displacement are:

- Retraining programs – providing retraining problems for workers who are affected by the revolution of AI can help ensure that they transition into new roles. These programs should be funded by the government.

- Investing in education and skills development – investing in education and the development of skills can also help workers stay relevant and up-to-date with the current technologies and market transformations caused by AI. This way they are able to adapt the required skills to work in the new or transformed industries.

5.5 Validation and Accountability

The following measures can be taken to solve this problem:

- Implementing human overwatch – a way to solve the problem of accountability is by introducing a human checkup on any results produced by AI. If the results are too large, this can be done by multiple workers.

- Running multiple tests – running multiple types of tests or the same test multiple times and then cross-referencing the results.

5.6 Data Privacy

Since AI content cannot be copyrighted for now, potential solutions to the data privacy problem could be:

- Referencing the generated content – when generative AI programs generate a text, for example, for a certain request from a user, the program should reference from where it got the base of the generated text, or in whose style it was trained to write it. This way, when the user uses the generated text for their needs (for example, writing an article or a paper) they can also reference who the writer of the original work is.

- Using sufficient General Adversarial Networks (GANs) – GANs consist of two neural networks: a generator network and a discriminator network. The generator network creates new content, while the discriminator network evaluates and distinguishes between the generated content and real content. The two networks work in a competitive manner, with the generator attempting to produce content that the discriminator cannot distinguish from real data.

5.7   No Creativity

Potential solutions to the creativity problem are:

- Collaborative work with humans – people could use AI for certain type of problems, like more repetitive ones, but still do the creative work themselves.

- Continuous improvements in the AI industry – as AI continues to improve, it can learn to be more and more creative and increasingly solve different types of problems. It is expected that by the year 2030 AI could have human-like intelligence (more about this in the third hypothesis).

5.8   H3: By the year 2030, AI will have human-like intelligence.

According to futurist and engineer Ray Kurzweil, AI will achieve human-level capability by the year 2030. This point will be reached when AI is capable of passing a legitimate Turing test. By 2030, it is expected that AI will be an essential component of the day-to-day company operations, assisting individuals in their creative activities, producing new ideas, and solving previously unachievable technologies. In some cases, collaborating with AI will be needed.

It is also expected for most devices to be embedded with AI. According to Peter Diamandis, the cost of specialist machine learning processors is falling quickly as worldwide demand rises. Specialized AI chips might cost as little as $5, enabling economical AI for toys, appliances, drones, video game controllers, and other devices. This would be aided further by the proliferation of low-cost tiny sensors and the deployment of high-bandwidth networks (Kumar, 2023).

It is expected as well for AI to have an impact on the automotive industry. Because of breakthroughs in AI, such as Tesla's recently released Dojo supercomputer, completely autonomous vehicles might be fully operational in at least certain geographic areas within the next decade. However, other scientists say they are decades away. In any case, they may result in a progressive drop in total transportation costs in impacted geographic regions, as well as the gradual disruption of businesses such as urban planning, delivery services, trucking, and others (Kumar, 2023).

According to ChatGPT, AI is expected to have a significant impact on various aspects of our lives by 2030, including automation in the job market, healthcare, transportation, education, and customer service. It also predicts the implementation of smart homes and cities, a concept commonly referred to as the Internet of Things (IoT).

The IoT describes the network of physical objects as "things" that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. These devices range from ordinary household objects to sophisticated industrial tools. With more than 7 billion connected IoT devices today, experts are expecting this number to grow to 10 billion by 2020 and 22 billion by 2025 (Oracle, n.d.) (Amazon AWS, n.d.).

All in all, ChatGPT seems to be of the opinion that the development of AI will continue and that the technology will play an increasing role in our future. And by the pace AI advances today, it's hard to see a reason that won't hold true. People are already using ChatGPT and related extensions to boast productivity by handling routine tasks quicker and easier (Georgiev, 2023).

VI BIG DATA

6.1   What is Big Data?

Big Data is a growing area of information technology that is expanding rapidly in businesses. Large data sets require specialized techniques and instruments to divide and combine them. Big datasets go through a specific lifecycle that includes data intake, data visualization and, at the end, data reduction, cleaning, and processing for future use. The situation could spiral out of control if one does not fully comprehend the various big data methods. For this reason, decisions should be made logically before the data is processed and visualized to prevent inconsistent results.

The most frequent issue that arises in organizations is the fact that data can occasionally be collected incorrectly due to improper methods or processed irregularly during its normal lifecycle. It may occur when big data handlers make mistakes in the metrics process or when they lack sufficient expertise in delivering data validity and, ultimately, value. Here I will explain the most important and popular Big Data practices, which are essential to the survival of businesses (BasuMallick, 2022).
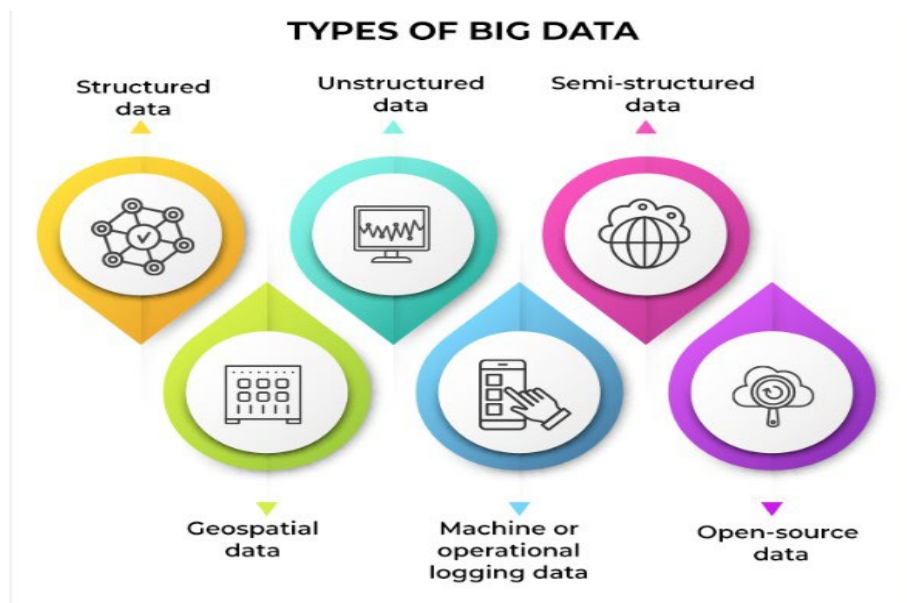

Image 12: Types of Big Data

Source: https://www.spiceworks.com/tech/big-data/articles/what-is-big-data/

6.2 Characteristics of Big Data (The 5Vs of Big Data)

In order to create systems that can manage the massive and dynamic nature of this data, it is crucial to comprehend the following five essential features of big data, commonly referred to as the 5Vs (Agiliway, 2023).

1) Volume

Volume refers to the vast amounts of data generated and collected every day from various sources. This data could be anything from customer behaviours to transaction records and social media data. Since volume refers to the initial size and amount of data collected, it can be thought of as the foundation of big data. If the volume of data is large enough, it can be considered big data. But the definition of big data is subjective and subject to change based on the amount of processing power made available to the market.

A company that runs hundreds of stores in multiple states, for instance, completes millions of transactions every day. This is considered big data, and its volume is represented by the average daily total of all transactions across all stores.

2) Value

Value is about using a large amount of data to extract insights that can be applied to make better decisions. This calls for effective data processing methods and algorithms capable of spotting business-relevant patterns and trends. Value is a term used to describe the advantages that big data can offer and is closely related to the uses that companies can make of the data that is gathered. Big data gets much more valuable based on the insights that can be drawn from it, so being able to extract value from it is essential.

Big data tools can be used by organizations to collect and analyse data, but their own methods for extracting value from it should be distinct. These enormous amounts of data can be stored, cleaned, and processed quickly by organizations with the use of tools like Apache Hadoop.

A great example of big data value can be found in the gathering of individual customer data. When a company can profile its customers, it can personalize their experience in marketing and sales, improving the efficiency of contacts and garnering greater customer satisfaction, and allowing it to select specific customers when needed (customers with a certain value).

3) Variety

Variety in data refers to the various forms that data can take, including unstructured, semi-structured, and structured forms. In other words, it refers to the diversity of data types. An organization might obtain data from several data sources, which might vary in value. Data can come from sources in and outside an enterprise as well. The challenge in variety concerns the standardization and distribution of all data being collected.

As mentioned earlier, the data that is gathered may be semi-structured, structured, or unstructured:

- Data that is disorganized and comes in various files or formats is referred to as <u>unstructured data</u>. Because unstructured data doesn't fit into traditional data models, it usually isn't a good fit for a mainstream relational database.

- Data with associated information, like metadata, but not yet arranged into a specific repository is referred to as <u>semi-structured data</u>. Processing it is therefore simpler than with unstructured data.

- <u>Structured data</u> is information that has been arranged into a formatted repository. In other words, the data is now easier to access for efficient data processing and analysis.

- <u>Raw data</u> also qualifies as a data type. While raw data can fall into other categories – i.e., structured, semi-structured or unstructured – it's considered *raw* if it has received no processing at all. Most often, raw applies to data imported from other organizations or submitted or entered by users. Social media data often falls into this category.

4) Velocity

Velocity refers to the speed and pace at which the data is being generated, stored, and accessed. It also refers to how fast the data moves. This is an important aspect for organizations that need their data to flow quickly, so it's available at the right times to make the best business decisions possible.

An organization that uses big data will have a large and continuous flow of data that's being created and sent to its end destination. Data could flow from sources such as machines, networks, smartphones or social media. Velocity applies to the speed at which this information arrives – for example, how many social media posts per day are ingested – as well as the speed at which it needs to be digested and analysed; often quickly and sometimes in near real time.

As an example, in healthcare, many medical devices today are designed to monitor patients and collect data. From in-hospital medical equipment to wearable devices, collected data needs to be sent to its destination and analysed quickly.

5) Veracity

Veracity relates to the quality, accuracy, integrity, credibility and reliability of data and the processes used to analyse them. Gathered data could have missing pieces, might be inaccurate or might not be able to provide real, valuable insight. Veracity, overall, refers to the level of trust there is in the collected data.

Data can sometimes become messy and difficult to use. A large amount of data can cause more confusion than insights if it's incomplete. For example, in the medical field, if data about what drugs a patient is taking is incomplete, the patient's life could be endangered.

6) The 6th V: Variability

The 5 V's above cover a lot of ground and go a long way in clarifying the proper use of big data. But there's another V worth serious consideration, and that is variability, which doesn't so much define big data as it emphasizes the need to manage it well.

Variability refers to inconsistencies in either the usage or the flow of big data. In the case of the former, an organization might have more than one definition in use for particular data. For instance, an insurance company could have one department that uses one set of risk thresholds while another department uses a different set. In the second set, data that's flowing into company data stores in a decentralized fashion – with no common entry point or upfront validation – might find its way into different systems that modify it, resulting in conflicting sources of truth on the reporting side.

Minimizing variability in big data requires carefully constructing data flows as data moves through the organization's systems, from the transactional to the analytical and everything in between (Robinson & Gillis, 2023).

6.3 Big Data Practices

Certain practices can help businesses put their big data strategy on the right track to meet analytics needs and produce the expected business benefits (Agiliway, 2023) (Famuyide, 2018) (Farmer, 2021).

1) Identify business goals

When it comes to revealing the various levels of information flow that impact a company, big data can be highly descriptive. That being said, this is not the main goal. The first thing you should consider is how big data can assist in achieving particular business goals. Big data analytics and statistics need to produce a tangible result, serving as a tool for the company's general improvement.

That is, after all, the main purpose of big data. You can gain insights through traditional business intelligence activities and tools, but you want to go one step further and leverage big data to enhance our organization's capacity for wise decision-making.

2) Choose a strategy and encourage team collaboration

Big data process assessment and control involve multiple roles and call for several parties to monitor the project. Typically, it is overseen by the data owner, who manages a particular IT department, an IT vendor, which supplies the technology needed for data mining, or a consultant who offers extra assistance in managing the issue.

To prevent having to redo the work, go back to the beginning, make a plan on how to organize the data and stick to it, and make corrections repeatedly. Make sure your data is valid before ingesting it into the system. Verifying the data gathered and gaining new insights throughout the project are crucial.

3) Detect and follow trends

Your business will succeed in the long run if you stay current and adhere to industry trends. However, it is even more advantageous to be a trendsetter, and this is where big data excels. For instance, if you were a digital retailer keeping an eye on online shoppers' behaviour, you would need to spot trends early and take swift action.

Big data insights can frequently assist companies in identifying shifts in consumer behaviour patterns and alerting them in advance to trends that could change the game. Under such conditions, an enterprise may modify its sales protocols to align with the novel framework and secure a substantial edge over rivals who must adjust after the trend has been established.

4) Begin with small projects and use the Agile approach to ensure high quality

Starting large projects when you lack experience could be challenging. In addition, if the big data solution is flawed or does not function as intended, it could be a risk to your company. To get better and take on more difficult tasks, there is always a learning curve.

Begin with a small pilot project and concentrate on the potential trouble spots. Create a plan in case an issue emerges to prevent any issues. An Agile approach is one of the most popular methods; it involves segmenting the project into stages and incorporating new client changes as they arise. To make sure the data is accurate in this situation, big data analysts may test it multiple times a week.

5) Establish and maintain connections

Relationship building between various business components is one area in which big data analytics excels. Information clusters should always be analysed in relation to other procedures, influencing factors, and levers.

For instance, while marketing is meant to assist sales, it occasionally provides sales representatives with nothing more than worthless leads. Analysing all leads with the aid of big data analytics can help identify which ones yield the best outcomes and which ones need to be discarded. By doing so, you can effectively link two or more business divisions, increasing the productivity of each division.

6) Opt for Cloud solutions

You might be concerned about the costs associated with storing so much data around given the incremental nature of data management and the requirement to store very large volumes of data for potential future uses. Cloud services can truly assist your big data strategy, rather than acting as an expensive roadblock.

One reason is that data storage is priced as a commodity by cloud platform providers, which usually means it's much less expensive than purchasing your own on-premises storage equipment. Furthermore, they handle on your behalf data security, availability, backup and restore, replication, and archiving. Not only does a cloud-based big data platform probably have more processing power, but it also probably has better tools and a more knowledgeable staff supporting it than your company can afford.

As a lot of data should be processed and tested, you may opt for different cloud services like Google BigQuery or Amazon EMR. You might choose any data cloud tools developed by Amazon or Microsoft, the choice of which usually depends on the data scope and project itself.

6.4   H4: The more data we have, the harder it is to sort it.

Big data represents a massive volume of both structured and unstructured data that is so large, it is difficult to process it using traditional database and software techniques. A new model of

analysing information is required by businesses to manage the huge data volume, velocity and versatility of information generated as part of business operations.

Here are some statistics that give an idea of how large the Big Data market is:

- The annual revenue from the global big data market surpassed $33 billion last year.

- At the same time, spending on big data technology reached $57 billion.

- Only 23% of companies plan their strategies based on big data findings.

We can draw two important conclusions from these figures:

Big data is a massive industry but a lot of companies are still not using it optimally to improve performance. Also, if you want to stay one step ahead of competitors, you should apply basic big data principles to your daily work.

VII CONCLUSION

In this thesis, I discussed the escalating potential of AI, while also addressing the associated risks and challenges. Utilizing both primary and secondary research methodologies, I examined the aforementioned topic, gathering the most relevant and reliable information available. Subsequently, I proposed potential solutions to the identified risks and challenges, leaving room for interpretation and enhancements by future readers. Ensuring precision, credibility, and factual accuracy, I meticulously curated the information and facts presented in this thesis. My objective was to make this thesis engaging, comprehensible, and logically coherent for readers of varying familiarity levels with the subject matter, catering to both experts and those with a burgeoning interest in the topic.

In this thesis, I formulated and investigated 4 hypotheses, yielding the following results:

Hypothesis	Result
H1	The hypothesis was partially confirmed, indicating the need for additional data to accurately predict the statistic.
H2	The hypothesis was confirmed, at least with the existing AI technologies.
H3	The hypothesis was partially confirmed, with indications suggesting its likelihood to hold true given the trajectory of advancements in AI technologies.
H4	The hypothesis was confirmed.

Table 1: Hypotheses results

From all this information, it is evident that AI will undeniably have a substantial impact in the future. Whether the impact of AI is positive or negative hinges on various factors such as the context, execution, and our readiness as individuals and society for this digital revolution. As seen in historical precedents like the industrial revolution, today's era lays the groundwork for an imminent digital revolution. Technology has already initiated transformations across numerous sectors, and its momentum shows no signs of slowing down, promising further acceleration in the future. It is up to each individual to learn how to leverage it to their benefit and adapt to the digital era. Technological companies and research laboratories are constantly enhancing humanity's technological arsenal, leading to an increasing digitization of various aspects of our lives.

As elaborated in greater detail in preceding chapters, the most significant threat to individuals, over which they can exert influence, is the issue of job displacement. AI has an increasing effect on many jobs that are related to technology, as it may complete tasks faster and more efficiently than humans. To safeguard against this threat, individuals should strive to remain continuously informed about the latest technological advancements and use them to their advantage. Alternatively, they can pursue careers that are less susceptible to technological displacement.

A more global threat would be the weaponization of AI and reaching the AI singularity. That is hopefully a distant threat, which is currently only present in science fiction, and would take years to become reality. To protect humanity from those threats is a bigger task and would definitely be an important one. To do that, researchers and developers of AI should aim to instil very strict ethical guidelines and rules for any intelligent machines that they create. If AI is weaponized in wars the consequences would be catastrophically, and if another war breaks out using weaponized AI, given the advances that humanity has right now, might mean the last war of humanity as we know it today. Likewise, if the AI singularity becomes a reality, then we would rely on any ethical guidelines that have been instilled in the machines, and also on other defences that would be essential to be prepared, if or when this threat becomes a close possibility.

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