DRIVES

Development and Research on Innovative Vocational Education Skills

U1 INTRODUCTION TO AI

U1.E2 AI APPLICATIONS, USE CASES AND REAL-LIFE EXAMPLES

Artificial Intelligence Technician

March 2021, Version 1

Co-funded by the Erasmus+ Programme of the European Union

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LEARNING OBJECTIVES

The student is able to

AIT.U1.E2.PC1	Know the different application domains of artificial intelligence.
AIT.U1.E2.PC2	Analyse and discuss several examples and applications of artificial intelligence.
AIT.U1.E2.PC3	Recognizes the challenges surrounding artificial intelligence approaches.
AIT.U1.E2.PC4	Assess the impact of artificial intelligence on the future of work and society.
AIT.U1.E2.PC5	Reflect about the future of artificial intelligence.

Marketing

PROBLEM: Dealing with data - Most obvious advantage an AI can give to a business in every area

Traditional ways of gathering and analyzing data, have the scope a little superficial compared with what is possible today.

SOLUTION: Combining automation and humanization - The balance between reaching a larger audience and still being personalized enough, so each of them feel special, is a tricky one for marketers.

EXAMPLE: Netflix

Banking

PROBLEM: Event Traders - Even the best traders are currently limited, though. There are limits to the amount of knowledge that the human brain can successfully process.

SOLUTION: Machine learning algorithms now offer traders the chance to analyze more information at a much greater rate of speed

EXAMPLE: HDFC Bank

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Finance

PROBLEM: Spending vast amounts of money and time on analyzing tons of data.

SOLUTION: Machines are great because they can crunch a huge amount of data in a short span. Machines can also learn to observe patterns in past data and predict how these patterns might repeat in the future.

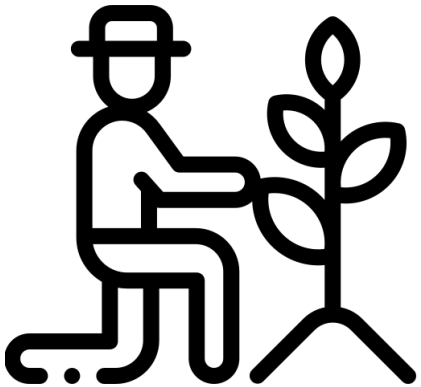
EXAMPLE: Analyze the insights of experienced stock traders with the help of computers

Agriculture

PROBLEM: The world will need to produce 50 percent more food by 2050 because we're literally eating up everything

SOLUTION: Use our resources more carefully. AI can help farmers get more from the land while using resources more sustainably. Organizations are using automation and robotics to help farmers find more efficient ways to protect their crops from weeds.

EXAMPLE: Blue River Technology has developed a robot called See & Spray which uses computer vision technologies like object detection to monitor and precisely spray weedicide on cotton plants.



Healthcare

PROBLEM: Disease diagnosis is a challenging and time-consuming process in healthcare. It takes doctors years of medical training to be able to diagnose diseases accurately.

SOLUTION: Artificial intelligence uses CT scans, electrocardiograms (ECG), cardiac MRI images, skin images, retinal scans, and X-Ray scans to detect cancer, stroke, diabetes, and other diseases. AI algorithms make use of large volumes of high-quality healthcare data to classify or predict diseases with comparable or even better accuracy than human experts

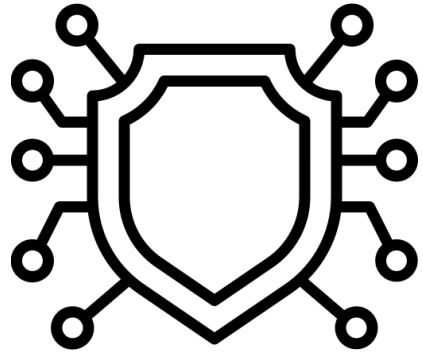
EXAMPLE: Coala life which is a company that has a digitalized device that can find cardiac diseases.

Cybersecurity

PROBLEM: The cybersecurity faces significant challenges in the form of large-scale hacking attacks of different types that harm organizations of all kinds and create billions of dollars in business damage.

SOLUTION: Artificial intelligence and Natural Language Processing (NLP) has begun to be used by security companies. AI algorithms automatically sort the data in networks into high risk and low-risk information.

EXAMPLE: SIEM (Security Information and Event Management) solution



Education

PROBLEM: The number of students in a classroom does not always allow for special attention to be given to everyone. Managing a class of 30 students makes personalized learning almost impossible.

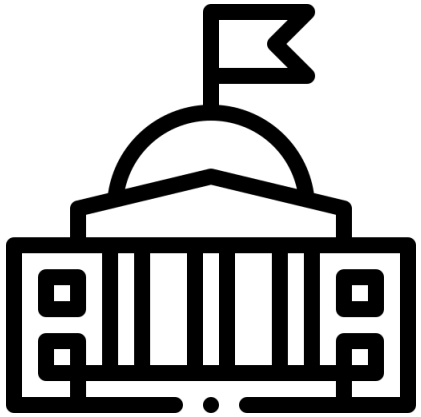
SOLUTION: Personalized learning: AI can provide a level of differentiation that personalizes learning specifically to the weaknesses and strengths of an individual student

EXAMPLE: CodeBuddy

Government

PROBLEM: Coordination of sensors and effectors, threat detection and identification, marking of enemy positions

SOLUTION: Artificial intelligence in government consists of applications and regulation. Artificial intelligence paired with facial recognition systems may be used for mass surveillance.



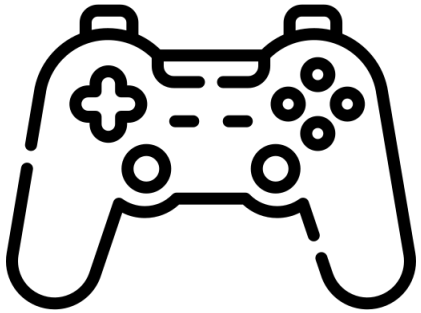
EXAMPLE: Resource allocation - such as where administrative support is required to complete tasks more quickly.

Gaming

PROBLEM: Rudimentary gaming

SOLUTION: Artificial Intelligence has become an integral part of the gaming industry. This makes the game very challenging and prompts the players to constantly switch strategies and never sit in the same position.

EXAMPLE: DeepMind's AI-based AlphaGo

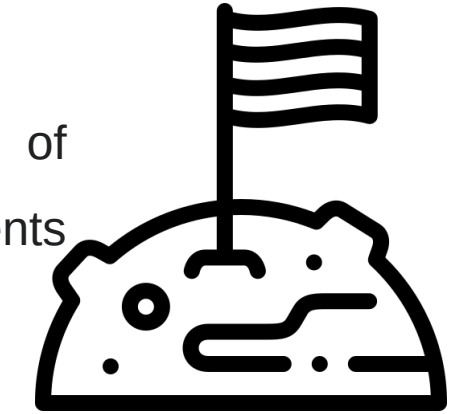


Space Exploration

PROBLEM: Until today, scientists have explored about 4% of the visible universe, which leaves 96% of the universe (which may bring important explanations) unexplored.

SOLUTION: With the help of robots, sensors, satellites and other devices, this percentage would be significantly reduced.

EXAMPLE: Earth Observer 1 (EO-1), SKICAT, ENVISAT are some of the examples of surrounding satellites that use AI to provide actionable insights to agencies, governments and businesses, and help them make accurate decisions.

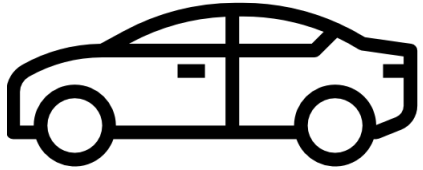


Autonomous Vehicles

PROBLEM: Volatile weather conditions, obstructions in the road like potholes, and other drivers can make a pure drive to the store a stressful event.

SOLUTION: AI will destress every drive, with the help of internal systems like cameras, sensors and communication systems

EXAMPLE: Tesla, Google

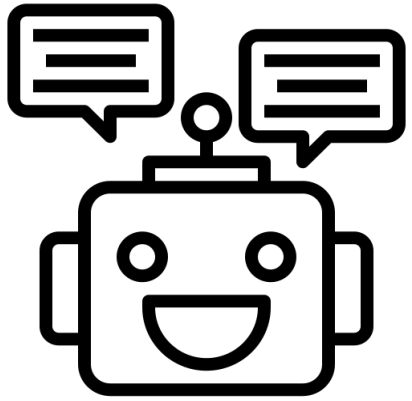


Chatbots

PROBLEM: Increasing number of messages received by an organization due to the emergence of e-commerce

SOLUTION: AI is used in chatbot to determine the meaning of the question and see in your database if you already have an answer to that question

EXAMPLE: AdmitHub

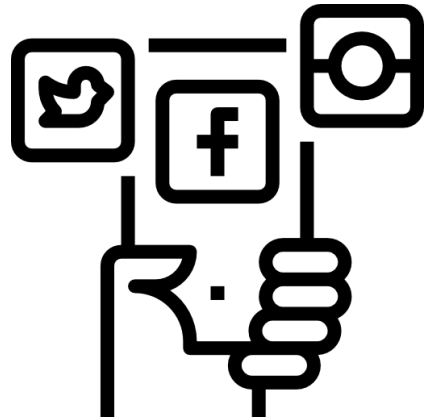


Social Media

PROBLEM: There are 3.81 billion (continuing to grow) active social media populations worldwide. This has made social networking a business market, it's not just about connecting with friends or family, but becoming a perfect place for companies to find new customers or nurture their relationships with existing ones.

SOLUTION: AI is contributing to the giant management of human data reaching these platforms.

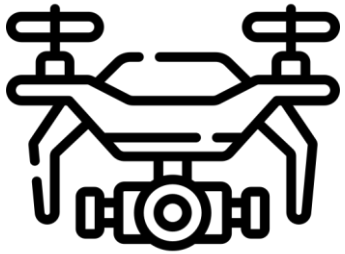
The AI is helping companies understand the data generated by the user to manage their activities.



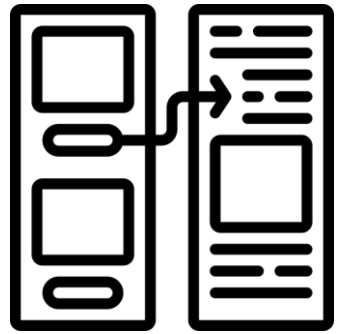
EXAMPLE: Text and image analysis algorithms

HOW AI IS USED IN OUR DAILY LIFE

Smartphones



Smart Cars and Drones



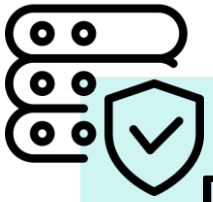
Social Media Feeds

Music and Media Streaming Services

Video Games

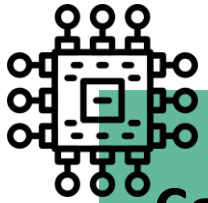
Online Ads Network

CHALLENGES OF ARTIFICIAL INTELLIGENCE



Data Quality

Black Box Effect



Computing Power

Legal Issues

Integration

Trustability

CHALLENGES OF ARTIFICIAL INTELLIGENCE

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AI-Human Interaction

Investment + Cost

Expectations

Ethical Issues

Transparency

Narrow Focus

ADVANTAGES OF ARTIFICIAL INTELLIGENCE

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Reduction of Human Error

Humans make mistakes. Computers do not make mistakes, if they are programmed properly. With Artificial intelligence, the decisions are taken from the previously gathered information applying a certain set of algorithms.

Availability 24 x 7

An Average human will work for 4–6 hours a day excluding the breaks. But using AI we can make machines work 24x7 without any breaks and they don't even get bored.

Daily Application

Computed methods have become a common phenomenon in our everyday lives.

Examples: Siri or Cortana

ADVANTAGES OF ARTIFICIAL INTELLIGENCE

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Repetitive Jobs

Using artificial intelligence, we can productively automate these mundane tasks and can even remove "**boring**" tasks for humans and free them up to be increasingly creative.

Digital Assistance

Highly advanced organizations use digital assistants to interact with users which saves the need for human resources. The digital assistants also used in many websites to provide things that users want.

Faster Decisions

Using AI alongside other technologies we can make machines take decisions faster than a human and carry out actions quicker.

DISADVANTAGES OF ARTIFICIAL INTELLIGENCE

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High Cost

Creation of artificial intellige nce requires huge costs as th ey are very complex machin es. Their repair and mainten ance require huge costs.

Making Humans Lazy

AI is making humans lazy with its applications automating the majority of the work. Humans tend to get addicted to these inventions which can cause a problem to future generations.

Unemployment

As AI is replacing the majority of the repetitive tasks and other works with robots

DISADVANTAGES OF ARTIFICIAL INTELLIGENCE

No Emotions

Machines cannot develop a bond with humans which is an essential attribute when comes to Team Management.

No Original Creativity

These are not the forte of artificial intelligence. While they can help you design and create, they are no match to the power of thinking that the human brain has or even the originality of a creative mind.

Machines do not understand ethics

Morality is absent in a machine and it is also hard to design and convey through technology.

IMPACT OF ARTIFICIAL INTELLIGENCE ON THE FUTURE

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Increasing the ease with which people can access the knowledge, credit and other benefits of contemporary global society.

It may require radical innovations in the way we govern, and particularly in the way we increase revenue for redistribution

Extends and improves what it means to be human and our problem-solving capabilities

It automates simple tasks and dramatically improves our lives.

Possible replacement of the world's current human work by intelligent and/or robust agents (up to 30%).

Liberation of humans to pursue careers that gives them a greater sense of meaning and well-being.

Marketing

Content Generation and Curation

An AI writing program can draft content on an upcoming event, financial report, or some market trend.

Personalized Marketing

Users leave traces of their internet usage in the form of cookies and cyber footprints. AI can help websites track user preferences and even search history to understand their behavior.

Voice and Text Recognition

More and more programs and software are being developed to increase its functionality.

Understanding User Behavior

Algorithms could filter leads to saving time and efforts that are best utilized elsewhere.

Banking and Finance

Customer Service

Using built-in chatbot and artificial intelligence technology, banking professionals could guide customers through different touchpoints of the buyer's journey, capitalizing on rapid response times...

Fraud and anti-money laundering (AML)

AI could drive significant efficiencies in operations verification procedures and transaction monitoring controls through machine learning and automating formerly manual workflows.

Risk management

AI helps lenders distinguish between high-default risk applicants and those who are credit-worthy yet lack an extensive credit history.

Compliance

By automating the flow of information between parties, data is transferred securely and quickly on one centralized platform.

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Healthcare

Virtual assistants

AI technology could help people with Alzheimer's disease with their daily activities.

Drug discovery

Artificial Intelligence could help with drug discovery and improve the lengthy timelines and processes tied to discovering and taking drugs all the way to market

Pain management

Virtual reality combined with artificial intelligence, coul create simulated realities that can distract patients from the current source of their pain.

Patient Risk Identification

By analysing vast amounts of historic patient data, AI solutions can provide real-time support to clinicians to help identify at risk patients.

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- Artificial intelligence has different application domains such as Marketing, Banking, Finance, Agriculture, Healthcare, Cybersecurity**,** etc.
- The advantages are Reduction of Human Error, Availability 24 x 7, Daily Application, Repetitive Jobs, Digital Assistance and Faster Decisions
- The disadvantages are High Cost, Making Humans Lazy, Unemployment, No Emotions, No Original Creativity and Machines do not understand ethics.
- Artificial Intelligence extends and improves what it means to be human and our problem-solving capabilities, it automates simple tasks and dramatically improves our lives.

REFERENCES

- Sterne, J. (2017). *Artificial intelligence for marketing: practical applications*. John Wiley & Sons.
- Chitra, K., & Subashini, B. (2013). Data mining techniques and its applications in banking sector. *International Journal of Emerging Technology and Advanced Engineering*, *3*(8), 219-226.
- Injadat, M., Moubayed, A., Nassif, A. B., & Shami, A. (2021). Machine learning towards intelligent systems: applications, challenges, and opportunities. *Artificial Intelligence Review*, 1-50.
- Mhlanga, D. (2020). Industry 4.0 in finance: the impact of artificial intelligence (ai) on digital financial inclusion. *International Journal of Financial Studies*, *8*(3), 45.
- Talaviya, T., Shah, D., Patel, N., Yagnik, H., & Shah, M. (2020). Implementation of artificial intelligence in agriculture for optimisation of irrigation and application of pesticides and herbicides. *Artificial Intelligence in Agriculture*.
- Ellahham, S., Ellahham, N., & Simsekler, M. C. E. (2020). Application of artificial intelligence in the health care safety context: opportunities and challenges. *American Journal of Medical Quality*, *35*(4), 341-348.
- Ganasegeran, K., & Abdulrahman, S. A. (2020). Artificial intelligence applications in tracking health behaviors during disease epidemics. In *Human Behaviour Analysis Using Intelligent Systems* (pp. 141-155). Springer, Cham.
- Soni, V. D. (2020). Challenges and Solution for Artificial Intelligence in Cybersecurity of the USA. *Available at SSRN 3624487*.
- Knox, J. (2020). Artificial intelligence and education in China. *Learning, Media and Technology*, 1-14.

REFERENCES

- Ma, Y., Wang, Z., Yang, H., & Yang, L. (2020). Artificial intelligence applications in the development of autonomous vehicles: a survey. *IEEE/CAA Journal of Automatica Sinica*, *7*(2), 315-329.
- Riedl, M., & Bulitko, V. (2012, July). Interactive narrative: A novel application of artificial intelligence for computer games. In *Proceedings of the AAAI Conference on Artificial Intelligence* (Vol. 26, No. 1).
- Langton, C. G. (Ed.). (1997). *Artificial life: An overview*. Mit Press.
- Stead, W. W. (2018). Clinical implications and challenges of artificial intelligence and deep learning. *Jama*, *320*(11), 1107-1108.
- Duan, Y., Edwards, J. S., & Dwivedi, Y. K. (2019). Artificial intelligence for decision making in the era of Big Data–evolution, challenges and research agenda. *International Journal of Information Management*, *48*, 63-71.
- Floridi, L. (2020). What the near future of artificial intelligence could be. In *The 2019 Yearbook of the Digital Ethics Lab* (pp. 127-142). Springer, Cham.
- Borges, A. F., Laurindo, F. J., Spínola, M. M., Gonçalves, R. F., & Mattos, C. A. (2020). The strategic use of artificial intelligence in the digital era: Systematic literature review and future research directions. *International Journal of Information Management*, 102225.
- Bundy, A. (2017). Preparing for the future of Artificial Intelligence.
- Baldassari, P., & Roux, J. D. (2017). Industry 4.0: preparing for the future of work. *People & Strategy*, *40*(3), 20-24.

REFERENCE TO AUTHORS

Regina Sousa

- PhD student in Biomedical Engineering
- Research Collaborator of the Algoritmi Research Center

0000-0002-2988-196X

Diana Ferreira

- PhD student in Biomedical Engineering
- Research Collaborator of the Algoritmi Research Center

0000-0003-2326-2153

Ana Luísa Sousa

- PhD student in Information System and Tecnologies
- Research Collaborator of the Algoritmi Research Center

0000-0001-5731-3583

REFERENCE TO AUTHORS

António Abelha

- Assistant Professor at the University of Minho
- Integrated Researcher of the Algoritmi Research Center

0000-0001-6457-0756

José Machado

- Associate Professor with Habilitation at the University of Minho
- Integrated Researcher of the Algoritmi Research Center

0000-0003-4121-6169

Victor Alves

- Assistant Professor at the University of Minho
- Integrated Researcher of the Algoritmi Research Center

0000-0003-1819-7051

REFERENCE TO AUTHORS

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Thank you for your attention

DRIVES project is project under **The Blueprint for Sectoral Cooperation on Skills in Automotive Sector**, as part of New Skills Agenda.

The aim of the Blueprint is **to support an overall sectoral strategy and to develop concrete actions to address short and medium term skills needs.**

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