



ADVENTURE IN
ARTIFICIAL INTELLIGENCE

Adventure in AI

Promoting AI knowledge through gaming
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IO2- Toolkit Implementation Guide

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EXECUTIVE SUMMARY

The 'Toolkit Implementation Guide' is a significant deliverable of the Adventure in AI project.

Artificial intelligence (AI) is becoming an increasingly important part of our lives, whether we knowingly embrace it or not. From social media to online movie platforms, AI systems penetrate human existence to offer benefits such as personalised experiences and simplify daily tasks, deeply changing the way we live.

Project Adventure in AI - Developing Children's AI Literacy (2AI) aims to develop a gamified approach to increase children's (7-12 year olds) AI literacy, and to raise awareness and equip educators to address AI topics in the classrooms and in other learning contexts (including non-formal and informal learning).

The core aim of the Project is the design and implementation of an innovative computer learning game for AI education of children (7 -12 years old) and a set of gamified workshops, that can be easily implemented in formal, non-formal and informal education settings. This deliverable has been informed by the outcome of a comprehensive literature review aimed at identified the key areas of AI that are applicable to our target audience and to allow the consortium to select those that can better be treated via the final product (game and gamified workshops).

This deliverable (Deliverable O2) comprises of four sections. The first section is an introduction to the 2AI project, the second section is focussed on the 2AI project framework that was used in order to develop the game and the glossary for our project, the third section provides additional information about the game and contains a walkthrough for the educators. The final section is focused on the gamified workshops, and the developed educational escape rooms.

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Main authors

| | | |
|----|-------------------------|---------------------------------|
| UK | Panagiotis Petridis | Aston University |
| UK | Mariam Garibyan | Aston University |
| PT | Gonçalo Meireles | Advancis Business Services, Lda |
| ES | Alex Carpov | CEIPSO Maestro Rodrigo |
| ES | Asier Ramos | CEIPSO Maestro Rodrigo |
| ES | Ana Isabel Izquierdo | CEIPSO Maestro Rodrigo |
| GR | Dimitra Dimitrakopoulou | Ellinogermaniki Agogi |
| PT | Marisa Teles | Boon |

Contributors

| | | |
|----|-----------------|-------------------------------------|
| UK | Vladlena Benson | Aston University |
| UK | Graham Hastings | St John's College School, Cambridge |

1 INTRODUCTION

AI literacy begins with a basic understanding of what AI is, the language surrounding the technological and social aspects of AI, how AI works and how it is currently playing a role in our daily lives, in addition to potential implications in jobs and careers.

In a way, the objective of AI literacy is to eradicate the misconceptions around AI and to create an all-inclusive ecosystem where all members of the community are equipped with the basic skills needed to pursue further learning to better adapt to a changing world where AI will be prevalent.

However, the education systems, including in the partner countries, as well as teachers and parents, are unprepared to address this complex topic, emphasising the need to

- (i) raise awareness about the importance of AI literacy,
- (ii) to make available learning resources on these topics and
- (iii) to equip educators to engage in learning activities with children.

In detail, the Project Adventure in AI - Developing Children's AI Literacy (2AI) aims to develop a gamified approach to increase children's (7-12 year olds) AI literacy, and to raise awareness and equip educators to address AI topics in the classrooms and in other learning contexts (including non-formal and informal learning).

This gamified learning approach includes 2 main elements (Intellectual Outputs):

- Digital game, creating an interactive experience to explore AI-related concepts and topics, to raise children's AI literacy.
- Gamified Workshops & Kit in the form of ESCAPE Rooms for educators and children.

Both solutions are focusing on creating playful and engaging experiences for both our educators and children focusing on the area of AI Literacy and trying to eliminate some of the misconceptions about AI.

This implementation guide is intended to operate as a supplement for the teacher who wishes to quickly get familiarized with the project, the game, and the corresponding issues in order to integrate the game in their teaching practice without the need for time consuming training and research. Apart from a quick overview of the background of the project, this guide describes how the game, and the escape rooms can be exploited for teaching purposes.

2 ADVENTURE IN AI GAME FRAMEWORK

The Adventure in AI Game Framework defines the learning objectives of the Adventure in AI game and the definition of AI literacy, as set out in the project application:

AI literacy begins with a **basic understanding of what AI is, the language surrounding the technological and social aspects of AI, how AI works and how it is currently playing a role in our daily lives**, in addition to **potential implications in jobs and careers**.

So the five main areas for exploration are:

- 1) AI concept (definition and explanation of what AI is)
- 2) Attitudes towards AI
- 3) Advantages and disadvantages of using AI
- 4) AI-related concepts
- 5) Role of AI in daily life

Long, D. and Magerko, B. (2020)¹ conducted a comprehensive study into key competencies needed for teaching the basics of AI to school children, particularly those of 9-12 years of age. They suggested a framework of key competences for teaching AI, supported by guidance on teaching design. This framework will provide a solid research basis for the Adventure in AI game (with 2AI game-specific adaptations).

¹ Long, D. and Magerko, B. (2020) [What is AI Literacy? Competencies and Design Considerations. Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems \(acm.org\)](#).

| | # | Competency | Justification | Definitions & additional notes |
|-----------------|---|------------------------------------|---|--|
| What is AI? | 1 | Recognizing AI | Artificial intelligence is integrated in user facing technologies, and sometimes the users do not recognize they are interacting with AI (vice versa as well, users believe that they interact with AI system but they are not). Source: ARM report https://armkeil.blob.core.windows.net/developer/Files/pdf/report/ai-today-ai-tomorrow.pdf | Artificial intelligence refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their action. Some examples for AI are: <ul style="list-style-type: none"> • For Home <ul style="list-style-type: none"> ○ HVAC systems that anticipate temperature changes and the needs of occupants, communicate with other home devices, and take appropriate actions in advance, ○ cameras with computer vision systems to identify faces control focussing etc, ○ robotic pet animals and toys that interact with people ○ vacuum cleaning robots • Smart Tools (sensors) <ul style="list-style-type: none"> ○ Medicine (AI programs that are used by physicians, medical doctors, scientists, engineers, and business people to help them in (and sometimes automate) their everyday tasks.) ○ Automated Trading (AI data mining, text processing, and decision methods are used in the analysis of real-time trading data and news feeds to make automatic buy-and-sell decisions on stocks, commodities, and currencies.) ○ Face Recognition and Voice Recognition ○ Robotics ○ Intelligent Assistants: agents” that help people with databases, communication, Internet access, and task performance |
| | 2 | Understanding Intelligence | What is intelligence and what does this mean for an AI system? | Russell and Norvig (2016) define intelligence in terms of thinking or acting either humanly (i.e. based on an empirical understanding of human intelligence) or rationally (i.e. based on mathematical principles). Source: Stuart J Russell and Peter Norvig. 2016. <i>Artificial intelligence: a modern approach</i> . Malaysia; Pearson Education Limited. |
| | 3 | Interdisciplinarity | Identify a variety of technologies that use AI, including technology spanning cognitive systems, robotics, and ML | |
| | 4 | General (Strong) vs. Narrow (Weak) | General AI is an AI that rival human intelligence. Narrow AI is focussed on a specific domain | |
| What Can AI Do? | 5 | AI Strengths & Weaknesses | The purpose is to identify problem types that AI excels at areas were are more challenging for AI. | Benefits of AI: <ul style="list-style-type: none"> • Automation is the most cited benefit of AI, and it has a significant impact on the communications, consumer products, transportation and service industry. Automation can lead to higher production rates, increase in product quality, increased safety and safety • Minimization of Errors: Reduction in Human Errors (examples: weather forecasting, business analytics, clustering large datasets) • Smart Decision Making: AI tools can facilitate faster decision making by automating the decision making process. Through data gathering and screening, processing, and decision making, AI can support faster solutions to complex problems • Solving Complex Problems: The developments in AI technologies from basic Machine Learning to advanced Deep Learning models have made it capable to solve complex issues. From fraud detection and personalized customer interactions to weather forecasting and medical diagnosis, AI is helping businesses across industries to find the right solutions to address their challenges more adequate. |

| | | | |
|-------------------|----|------------------------------|--|
| | | | Some other benefits are: Research and Data Analysis, medical advances, managing repetitive tasks,etc |
| | | | <p>Limitations of AI</p> <ul style="list-style-type: none"> • Access to Data: For predictions models to be trained accurately, access to data is the important. Currently large datasets are in the hand of large organizations such as Google, Microsoft,etc. • Bias: There are many stages of the deep-learning process that bias can slip through and currently, our standard design procedures simply aren't aptly equipped to identify them. • Computing Time: Even with the recent advancements of technology and the increase of the processing power training algorithms to perform specific tasks is time consuming • Cost: Mining, storing and analysing data will be very costly both in terms of energy and hardware use. |
| | 6 | Future AI Applications | <p>Possible future applications of AI and consider the effects of such applications on the world.</p> <p>Some potential applications of AI are:</p> <ul style="list-style-type: none"> • Traffic Management and control using real-time information • Self Driving cars without human intervention • Connected city systems that predict required maintenance • Smart habitats/houses that automatically control temperature/security/lighting and focussing on the well being of the occupants • Robotics (Perception of Intelligence) • Medicine, manufacturing, linguistics, etc <p>Working towards an AI that will rival human level intelligence.</p> |
| How does AI Work? | 7 | Representations | <p>What is Knowledge Representation?</p> <p>Knowledge Representation models the world in a way that the computer can understand.</p> <p>For example, an image is represented as a matrix of float values in which each value represents the colour of a pixel.</p> |
| | 8 | Decision-Making | <p>Recognize and describe examples of how computers reason and make decisions.</p> <p>Graphical visualization, prediction, agent decision making</p> |
| | 9 | ML Steps | <p>Understand the steps involved in machine learning and the practices and challenges that each step entails.</p> <p>Automated data-gathering techniques, together with inexpensive mass-memory storage apparatus, have allowed the acquisition and retention of prodigious amounts of data. Point-of-sale customer purchases, temperature and pressure readings (along with other weather data), news feeds, financial transactions of all sorts, Web pages, and Web interaction records are just a few of numerous examples. But the great volume of raw data calls for efficient "data-mining" techniques for classifying, quantifying, and extracting useful information. Machine learning methods are playing an increasingly important role in data analysis because they</p> <p>Source: https://ai.stanford.edu/~nilsson/QAI/qai.pdf</p> |
| | 10 | Human Role in AI | <p>Recognize that humans play an important role in programming, choosing models, and fine-tuning AI systems.</p> |
| | 11 | Data Literacy | <p>Understand basic data literacy concepts</p> <p>Long and Magerko (2020) define Data Literacy as "the ability to read, work with, analyze, and argue with data as part of a broader process of inquiry into the world".</p> |
| | 12 | Learning from Data | <p>Recognize that computers often learn from data (including one's own data) (see No9)</p> <p>AI models can be used to analyze data much more efficiently. It can help to create predictive models and algorithms to process data and understand the potential outcomes of different trends and scenarios. Moreover, the advanced computing capabilities of AI can also speed up the processing and analysis of data for research and development, which could have taken too long for humans to review and understand.</p> |
| | 13 | Critically Interpreting Data | <p>Understand that data cannot be taken at face-value and requires interpretation.</p> <p>This is linked with Point 12, many AI algorithms (especially in ML) are</p> |

| | | | | |
|------------------------|----|-------------------|--|---|
| | | | | <p>black-box and their functionality (and sometimes even existence) can be opaque to users, so this can lead to misinterpreting and misunderstanding of the outputs, or in some extreme cases can lead to deception.</p> <p>Source: Motahhare Eslami, Kristen Vaccaro, Min Kyung Lee, A Elazari, Eric Gilbert, and Karrie Karahalios. 2019. User Attitudes towards Algorithmic Opacity and Transparency in Online Reviewing Platforms. In <i>Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems</i>, 1–14. https://doi.org/10.1145/3290605.3300724</p> |
| | 14 | Action & Reaction | Understand that some AI systems have the ability to physically act on the world. | This action can be directed by higher-level reasoning (e.g. walking along a planned path) or it can be reactive (e.g. jumping backwards to avoid a sensed obstacle). |
| | 15 | Sensors | Understand what sensors are, recognize that computers perceive the world using sensors, and identify sensors on a variety of devices. (no 14) | Sensors are a devices, modules, machines, or subsystems whose purpose is to detect events or changes in its environment and send the information to other electronics, Typical sensors can be infrared sensors, 3d cameras, lidar sensors, temperature, etc |
| How Should it be Used? | 16 | Ethics | Identify and describe different perspectives on the key ethical issues surrounding AI | <p>Some ethical issues that we can focus are: privacy, employment, misinformation, the singularity, ethical decision making, diversity, bias, transparency, accountability.</p> <p>Privacy/surveillance: The amount of personal issues stored that are collected, stored and analysed in order to for the AI systems to functions has risen issues about privacy, data security and governmental surveillance.</p> <p>Employment: Advances in automation have reduced the needs for human workers over the last twenty years, however advancement in AI have heightened those concerns.</p> <p>Bias: There are many stages of the deep-learning process that bias can slip through and currently, our standard design procedures simply aren't aptly equipped to identify them</p> <p>Ethical Decision Making: Giving decision-making power to AI can result in ethical dilemmas such as the trolley problem or lead to unexpected results due to human intervention. (e.g. a self-driving car driving over the speed limit because it was told to get to a specific destination as fast as possible)</p> |
| | 17 | Programmability | Understand that agents are programmable. | |

Note: the text in red indicates the areas which were deemed out of scope for the 2AI game.

3 GAME DESCRIPTION

The 2AI Adventure game main objective is to increase children's AI Literacy and consequently eradicate the misconceptions around AI and create an all-inclusive ecosystem where all members of the community are equipped with the basic skills needed to pursue further learning to better adapt to a changing world where AI will be prevalent.

Thus, as already mentioned above, the Game should promote a basic understanding of what AI is, the language surrounding the technological and social aspects of AI, how AI works and how it is currently playing a role in our daily lives (and children's lives in particular), the risks and opportunities AI bares and AI's potential impact in jobs and other areas of society.

The game can be used as a standalone tool where the kids can play and explore the different AI concepts that are introduced in the game. Alternatively, it can be easily integrated in the curriculum and can be used as a triggering discussion in AI, or as a way to test the knowledge of the students in that particular domain. The game uses a pool of 30 questions (for a detailed list of questions please check the APPENDIX B: AI QUIZ Questions) that are randomly displayed at the end of each level. Those pool of questions are given to the educators and can be used as a standalone tool.

Our recommended approach for the game is:

1. Students explore the game, and they are introduced to new knowledge. Depending on their age, facilitation and support by the teacher is required.
2. Group discussions follow the game. The teacher supports the students' deeper understanding of the new concepts about AI using our glossary as the starting point.
3. Additional exercises, quizzes and definitions are provided by the teacher.

Game instructions

The best way to understand what the game is about and how to play it is to watch the **AI introduction video** before playing the game, available in English (also available on the project website).

- EN - https://www.youtube.com/watch?v=ftrVdmVKibQ&ab_channel=BOONFactory

There are also **Walkthrough videos** available for each level/stage of the game:

- Level 1: <https://youtu.be/woco-D5G7X4>
- Level 2: <https://youtu.be/biBtx0khhPo>
- Level 3: <https://youtu.be/dZTxMwn9Hn8>

Between each level there are random questions in relation to the AI in the form of a quiz. The consortium has designed a pool of 30 questions that are used in the game quiz. The teacher can use the questions developed as an additional tool to test the knowledge of his/her student in AI. The pool of the 30 questions is given in APPENDIX B: AI QUIZ Questions.

The game is available in English, Portuguese, Greek and Spanish from:

- http://2ai.advancis.pt/index_dev.html?lg=en

For more information about the game please go to: <https://adventure-in-ai.weebly.com/>

4 GAMIFIED WORKSHOPS

The Gamified Workshops are learning experiences for educators and children around the AI topic and are using a gamified approach. These workshops serve 2 main purposes:

- develop children's AI literacy
- promote and empower educators in the use of the 2AI Project learning approach.

The workshops adopt a playful approach to encourage participation and make the case for the use of experiential and playful learning approaches via the usage of ESCAPE rooms.

The proposed structure of the gamified workshop is shown below:

- Introduction to AI using the Sample Presentation (1h)- The presentation is available in English, Portuguese, Greek and Spanish from: <https://adventure-in-ai.weebly.com/>
- Playing the Game (proposed duration 1h)
- Class Discussion: The educator can introduce different topics for discussion using the consortium glossary as a starting point (proposed duration 1h)
- Escape Room Scenario: The educator, based on their class, can pick one of the 3 developed Escape rooms (Proposed Duration 1h).
- Class Discussion: The educator can pick a different topic from provided glossary (Proposed Duration 1h), or can use the developed questionnaire to verify the student's knowledge in AI (see APPENDIX B: AI QUIZ Questions).

The value of escape rooms (ERs) for entertainment is apparent and is demonstrated in the literature, however the value of escape rooms for education is not well documented. ERs can be considered as interactive narrative that uses the real world as a platform, often involving multiple media and game elements, to tell a story that may be affected by participants' ideas or actions. In ERs, players have the flexibility and control over how quickly puzzles are solved, story direction, and the characterization of various aspects of the game. For that reason, the players are not only participants, but they are part of the story. Players' responses often change the game designers' story, pacing or set of problems.

The benefits of ERs could be summarized in the development of soft skills such as communication skills and team working, problem solving, opportunity to reflect on the team dynamics, is a tool for reflection, and improves the and increased engagement.

Therefore, as addition to the developed game, the consortium has designed 3 ERs that can be used for teaching AI. One of the benefits of the developed escape rooms for our consortium is that they are completely modular, and the educator can create a different escape room by using the proposed mini games. The first two escape rooms (i.e AI LEX and AI.Lex 2) contain three paths/routes. The educator can assign the student in groups and can work in collaboration to solve the puzzle. Each puzzle contains different ciphers that can be customized and changed to create a tailored experience for the students.

You can download the puzzles and the instructions from:

- 1) SPACE Escape room: APPENDIX C: Space Escape Rooms
- 2) AI.LEX : APPENDIX D: AI-ALEX
- 3) AI.LEX 2: APPENDIX E: AI-LEX 2

5 CONCLUSIONS

This report presented the two outputs of the 2AI project (IO1 and IO2), a game designed to introduce various AI concepts based on our selected educational framework, and a toolkit which contains several tools that can enhance the educational experience of the students. The toolkit contains a set of escape rooms designed for various ages with a complete lesson plan, a set of 30 questions that are designed to test the knowledge and understanding of the basic AI concepts of students, and an introductory interactive presentation for introducing various AI concepts.

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APPENDIX A: GLOSSARY

Following the Adventure in AI framework discussed above, we have identified a set of keywords that are going to be used in the game and in the gamified workshops in order to teach AI literacy. For each keyword, the table contains the key concept that is going to be taught in the game or the gamified workshop, it contains the scientific definition, and in some case where the concept is too complicated and difficult to comprehend for our target audience, and alternate definition has been created.

Note: The notes that are highlighted in **red**, are additional concepts used in the game, not necessarily related to AI, the notes highlighted in **grey** are concepts that are not used in the game, and the concepts highlighted in **blue** are concepts that are linked with other key concepts (e.g. 'Algorithm and 'Algorithmic bias' are linked with each other).

| ADVENTURE IN AI GLOSSARY | | | | |
|-------------------------------------|---|--|-----------|-----------|
| Concept | Definition | Alternative Definition | Game part | Reference |
| Artificial Intelligence (AI) | AI is an activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment. | Using computers to do things that usually require human intelligence. | 1 | 9 |
| AI Literacy | A set of competencies that enables individuals to critically evaluate AI technologies, communicate and collaborate effectively with AI systems, using AI as a tool for their everyday activities (online, at home, and at workspace). | | | 10 |
| Agent | An autonomous entity that acts, directing its activity towards achieving goals. | | 1 | 1 |
| Algorithm | A set of instructions to solve a problem. (In AI, for example, the algorithm tells the machine how to go about finding answers to a question or solutions to a problem.) | A set of instructions to solve a problem. | 2 | 1 |
| Algorithmic bias | Systematic and repeatable errors in a computer system that create unfair/wrong outcomes, such as privileging one group over another. Normally those outcomes are based on biased data. | A set of instructions to solve a problem that are not always fair in every case. | 2 | 1 |

| | | | | |
|----------------------|---|--|---|-----|
| Analytics | The discovery, interpretation, and communication of meaningful patterns of data. | | 2 | 11 |
| Autonomous | The ability to act independently and freely. In AI, a machine or vehicle is referred to as autonomous if it doesn't require input from a human operator to function properly. | Something that works without a human controlling it. | | 13 |
| Chatbot | A computer program which through the use of AI conducts a conversation via auditory or textual methods. | A computer program which uses AI to have a human conversation. | 3 | 1 |
| Data | A collection of facts, such as numbers, words, pictures, measurements, audio, videos, observations or description of things. | A collection of facts, such as numbers, words, measurements, observations, etc.. | 1 | 1 |
| Data bias | The available data that is not representative of the population or the phenomenon of study. | Unreliable data. | 3 | 1 |
| Data Literacy | The ability to read, work with, analyse, and argue with data as part of a broader process of inquiry into the world. | The ability to use and handle data. | | 12 |
| Data Mining | The process by which patterns are discovered within large sets of data with the goal of extracting useful information from it. | Using large sets of data to provide useful information. | 2 | 7 |
| Database | Database is a collection of structured data, that can be accessed via various ways. | Data stored on a computer system. | 2 | |
| Deep learning | A subset of machine learning that uses specialized algorithms to model and understand complex structures and relationships among data and datasets. | | 2 | 7 |
| Drone | An unmanned aircraft without a pilot, that can be controlled from the ground. | | 1 | 3 |
| HVAC | Heating, ventilation, and air conditioning (HVAC) is a technology of indoor and vehicular environmental comfort. | Heating, ventilation, and air conditioning. | 2 | 7,9 |
| Input | Information given to a computer. | | 2 | 1 |
| Labelled Data | A group of samples that have been tagged with one or more labels, such as pictures. | | 1 | 7,9 |
| Lidar Sensor | A technology that determines the distance to an object through the use of laser pulses. | A distance sensor that uses laser pulses (like a parking sensor). | 1 | 1 |

| | | | | |
|------------------------------------|---|--|---|-------|
| Machine Learning | A field of AI that aims to teach a computer how to learn and act without being programmed. | Teaching an AI system how to act. | 2 | 1 |
| Natural Language Processing | A subfield of AI concerned with interaction between computer/machine and natural human language. | A computer system that understands natural language. | 1 | 7,9 |
| Neural Networks | Any computer system that is inspired by the biological neural networks derived by the human/animal brains. | Any computer system that mimics the working of a living brain. | 1 | 7,9 |
| Output | Data generated by a computer. | | | 1 |
| Programming | Computer programming is a set of instructions used from a computer to process/execute commands. | Coding instructions for a computer. | 2 | 1 |
| Robot | A machine that can perform series of tasks by itself, such as walking, talking, interacting with others, etc. | | 1 | 4 |
| Sensors | A device, module, machine, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, Typical sensors can be infrared sensors, 3d cameras, lidar sensors, temperature, etc | An electronic component that can detect changes in its environment such as temperature and light levels. | 1 | 14 |
| Self Driving Cars | A vehicle that is capable of sensing its environments using sensors (Lidar Sensors, Cameras, etc) and moving without human input. | Car that does not need a human driver. | 2 | 1,7,9 |
| Speech Recognition | The ability of a computer to transcribe spoken words into text. | A computer that can understand speech. | 1 | 1,7,9 |
| Speech Generation | The ability of a machine to turn written text into spoken words. | A computer that can speak. | 1 | 1,7,9 |
| Strong AI | A theoretical form of artificial intelligence where a machine would have human-like intelligence, a conscious self-awareness that has the ability to solve problems, learn and plan for the future. | A form of AI in the future where machines would have human-like intelligence and thoughts. | 1 | 7,9 |
| Super AI | A form of AI that would surpass the intelligence and capacity of the human brain. | A form of AI in the future that would improve on human intelligence. | 1 | 7,9 |
| Supervised learning | Algorithms that are trained with data labelled by human intervention. | | 2 | 7,9 |

| | | | | |
|------------------------------|---|---|---|-----|
| Training Data | The initial set of data used by a machine to be trained on. | The data used to train an AI system. | | 7,9 |
| Trolley Problem | A series of thought experiments in ethics and psychology, involving stylized ethical dilemmas, such as of whether to sacrifice one person to save a larger number. | Testing a computer system to see if it can behave in an ethical way. | 3 | 7,9 |
| Turing Test | A test developed by Alan Turing that tests the ability of a machine to mimic human behaviour. The test involves a human evaluator who undertakes natural language conversations with another human and a machine and rates the conversations. | Testing a computer system to see if it can chat like a human (developed by Alan Turing). | 3 | 7,9 |
| Unsupervised learning | Algorithms that operate on data that is not explicitly labelled. | | 2 | 7,9 |
| Unlabelled Data | Data that comes with no tags. | | 1 | 7,9 |
| Weak/Narrow AI | A non-sentient computer system that operates within a predetermined range of skills and usually focuses on a singular task or small set of tasks. Most AI in use today is weak AI. | A limited form of AI focussed on a single or small set of tasks. Most AI in use today is weak AI. | 1 | 7,9 |

APPENDIX B: AI QUIZ QUESTIONS

Note: The correct answer is highlighted in YELLOW

AI QUIZ Part 1 (LEVEL 1)

- What does AI stand for?**
 - Artificial Intelligence
 - Available Inventions
 - Awful Intuition
- What does L in LIDAR stand for?**
 - Lonesome
 - Laser
 - Light
- Which of these concepts is not related to Data?**
 - Myths
 - Information
 - Numbers
- AI neural networks are made of...**
 - Brains
 - Computer systems
 - Programs

5. **We use Natural Language Processing to...**
- A. Communicate with machines
 - B. Learn from machines
 - C. Talk about our problems with a computer.
6. **Which of the following is a major characteristic of a Robot?**
- A. It has to have sensors.
 - B. It has to be autonomous (be able to perform some tasks by itself).
 - C. It has to be able to move.
7. **Which of the following statements about drones is true?**
- A. Drones can only be flown by professional pilots
 - B. Drones can only be used for military purposes
 - C. Drones can be used for a variety of purposes, such as taking photos and videos, delivering packages, and conducting search and rescue missions
8. **What is speech recognition?**
- A. The ability of a computer to recognize human speech and convert it into text or commands
 - B. The ability of a computer to recognize different musical instruments
 - C. The ability of a computer to recognize different animal sounds
9. **What is the main difference between weak/narrow AI and strong/general AI?**
- A. Weak/narrow AI can only perform a specific task or set of tasks, while strong/general AI will be able to learn and perform any task that a human can do
 - B. Weak/narrow AI is slower and less efficient than strong/general AI
 - C. Weak/narrow AI is more expensive to develop and maintain than strong/general AI

AI QUIZ Part 2 (LEVEL 2)

1. Which of the following is not an AI technology?

- Facial recognition
- Robotics
- Animation

2. A speech recognition program divides each second of our speech into 100 separate

-
- samples
 - words
 - codes

3. Which of the areas below cannot contribute to the creation of an intelligent system?

- Geology

- Computer Science
- Neuron Science

4. How does an AI agent interact with its environment?

- Using sensors and perceivers
- Using only sensors
- None of the above

5. Supervised Learning is when you give a machine an input and it gives you an output

-
- Based on the environment
 - Based on magic
 - Based on the input you gave it

6. What are neural networks?

- Machine learning algorithms inspired by the function of brain neurons.
- Networks that form the nerves of living organisms.
- Networks of intelligent computer systems.

7. Ways to achieve AI in real-life are _____.

- Deep Learning
- Machine Learning
- All of the above

8. The best AI agent is one that _____

- Requires user input for solving any problem
- Can solve a problem on its own without any human intervention
- Needs a similar exemplary problem in its knowledge base

9. All of the above are examples of sensors except:

- Computer
- Temperature
- Colour

10. Which of these does not use AI?

- Self driving cars
- Facial recognition in your phone

- Wireless speakers

11. What is a self-driving car?

- A car that drives itself without any human intervention
- A car that can only be driven by a professional racing car driver
- A car that is made out of self-assembling parts

AI QUIZ Part 3 (Level 3)

- Who takes part in the Turing test?
 - Three people
 - Three machines
 - One human evaluator, another human being and one machine.
- What does the Turing Test evaluate?
 - The ability of a machine to turn around.
 - The ability of a machine to mimic human behaviour.
 - The ability of a machine to have feelings.
- The trolley problem is a moral dilemma often discussed in the context of:
 - Artificial intelligence ethics
 - Medical ethics
 - Environmental ethics
- In the classic trolley problem, you are the driver and can choose to:
 - Switch tracks, causing the death of multiple people
 - Continue straight, causing the death of one person
 - Stop the trolley, saving everyone
- What is data bias?
 - The process of encoding data using a specific format
 - The presence of unfair elements in data sets
 - When data is collected and analyzed without any bias or prejudice
- What are some potential consequences of data bias?
 - Discrimination and unfair treatment
 - Increased accuracy in predictions
 - Enhanced data privacy
- Which step is important to mitigate data bias?
 - Collecting more biased data
 - Identifying and addressing biases in data collection and analysis
 - Ignoring the presence of bias in data
- What is a chatbot?
 - A computer program that conducts conversations with users
 - A type of robot that performs household chores
 - A virtual reality headset
- Which technology is commonly used to build chatbots?

- Quantum computing
- Blockchain
- **Artificial Intelligence**

10. What is Super AI?

- Super AI is a type of AI that has become part of our lives.
- A limited form of AI.
- **A machine that will have a human-like intelligence and thoughts.**

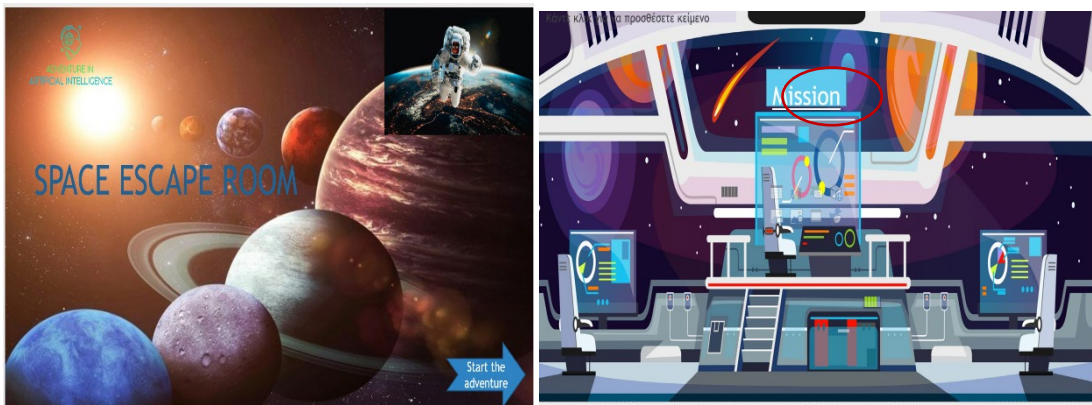
11. How does Super AI work?


- Super AI is a machine that can speak.
- Super AI system is programmed to operate within a set of pre-defined functions.
- **Super AI demonstrates intelligence beyond human capabilities.**

APPENDIX C: SPACE ESCAPE ROOMS


Escape room Learning Scenario: Guidelines

1. Open the Power Point “Space Escape Room” and select “Mission” on the 2nd slide.

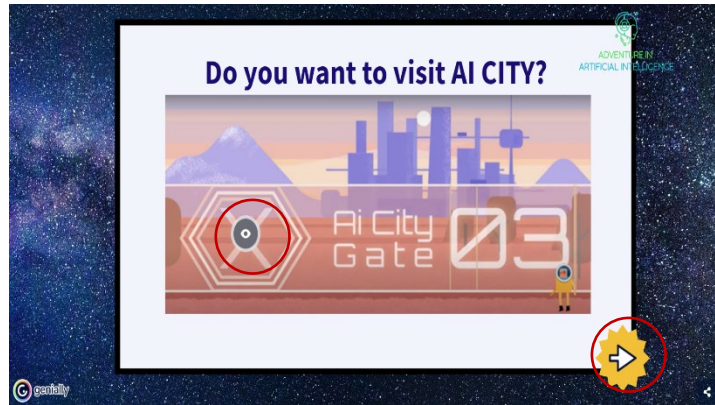



2. Follow the link <https://view.genial.ly/63c529dcf937a600180d979c/interactive-content-space-escape-room>, select the button  and the adventure starts!

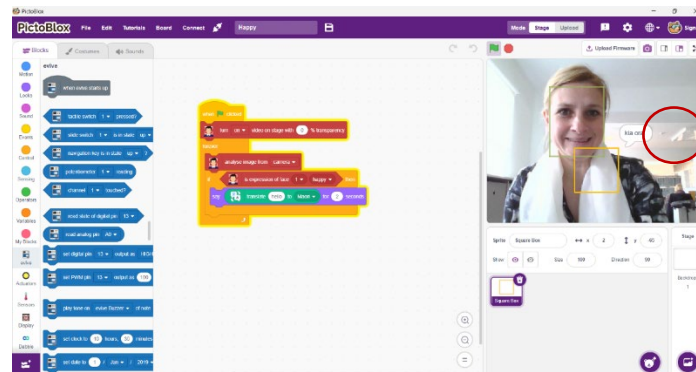
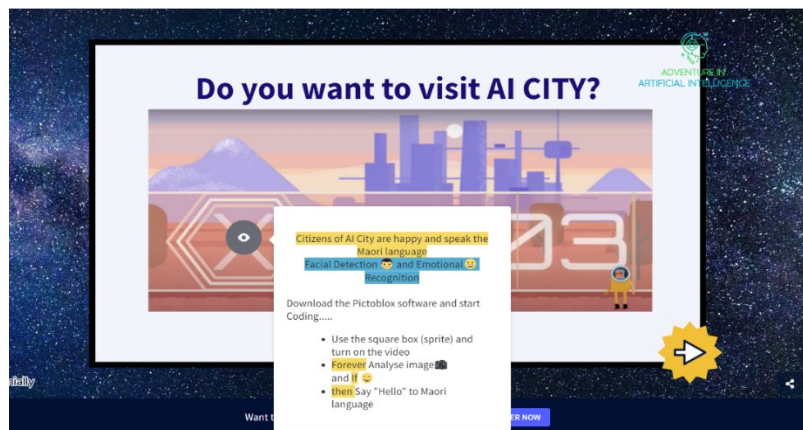


3. By selecting the button  of the next page (see image below) you

see the instructions of the first activity.



Students as depicted in the picture below should create a code using the Pictoblox software in order to find the **Password (kia ora)** and get access to AI City. In this activity students learn about facial and emotional recognition and also use the translator of the software. When they finish programming and get the password, they should visit the next page by selecting the button 

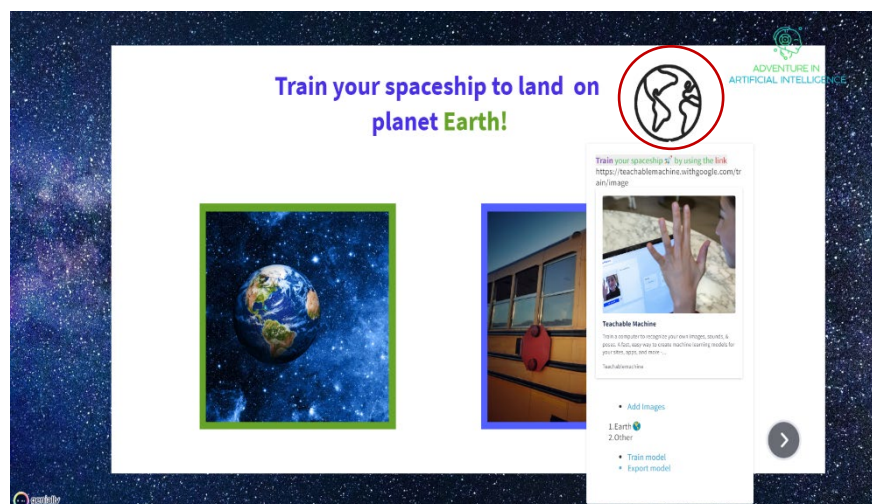


4. On the next page students click on the right password and the first activity is completed.

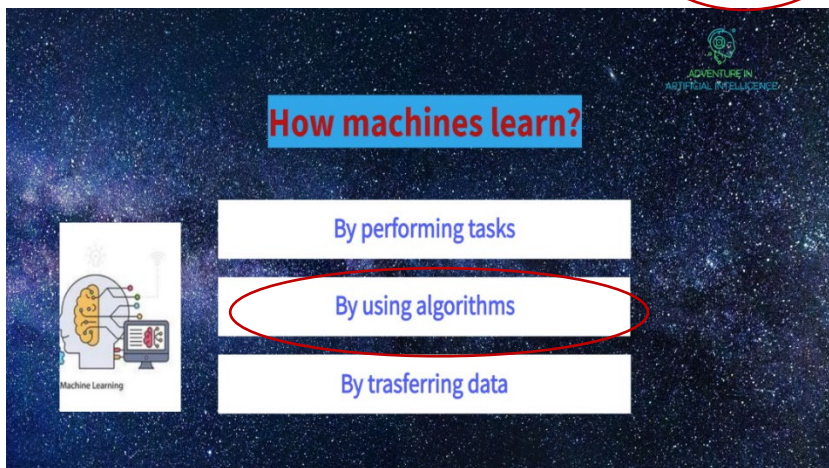
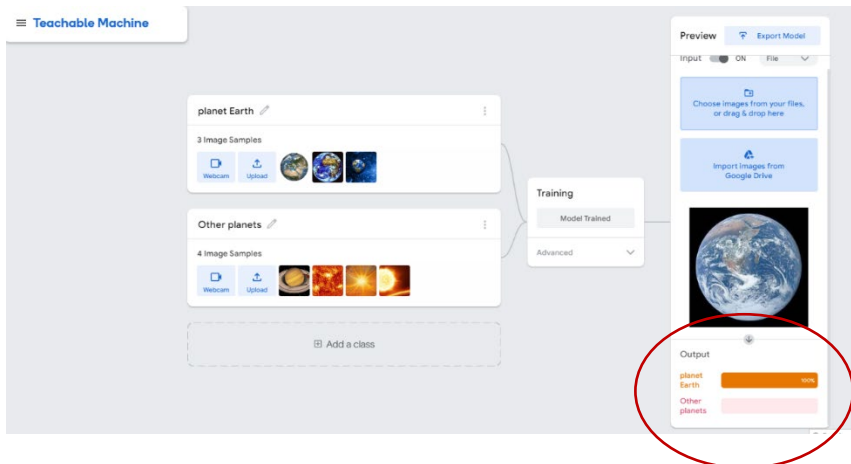


5. By selecting the “Kia Ora”Students, students visit the next page and continue with the 2nd activity. In this activity students have to train their spaceship to recognize planet Earth. For this activity students will use the following google application <https://teachablemachine.withgoogle.com/train/image>

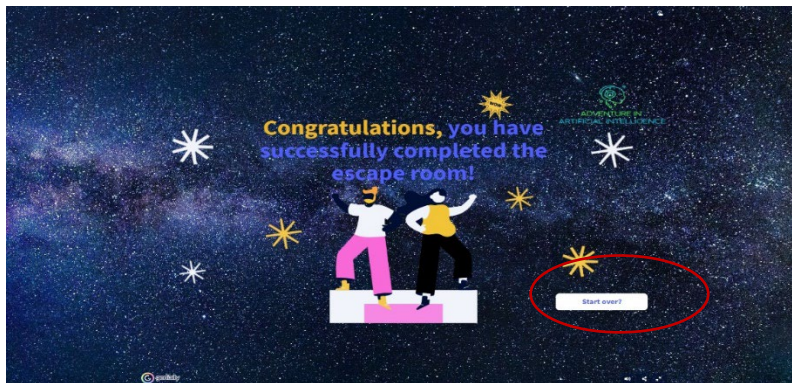
By selecting the button  they can read the instructions.



Specifically, students have to search and upload photos of Earth and other planets. For the 1st category they should add photos of the Earth and for the 2nd category photos of other planets should be uploaded. Afterwards, they should train and export the model. Finally, if they upload a photo of the earth the model recognizes it (see picture below). The aim of this activity is for students to understand what machine learning is. In line with the above, for the last activity of the escape room they should reply at the question “How machines learn?”.



6. Finally, by selecting the right answer of the quiz they reach the end of the escape room. In case the wish to repeat the activities they should click on the button "Start over".



Implementation in Class

At the beginning of the course students should be divided in groups of two or three kids. All of them should have access to laptops or tablets. It is also recommended that teachers download

to students' laptops or computers the "Pictoblox" software before the course starts in order to save some time.

As far as the learning activities are concerned, in this scenario two activities are included. Students can proceed to do the activities at their own pace but justify their answers that are presented on the slides after each activity. In other words, students should be guided by their teachers to complete both activities and not select their answers randomly. Afterwards, a discussion should take place in class and students should be encouraged to express their thoughts and experiences. However, another way to implement this scenario in class is to ask students to do the first activity and then discuss it in class before proceeding to the second activity. It depends on teachers' preferences and on the way they are used to work with students as to how they will conduct the scenario in class.

Finally, taking into account the time constraints, if it is feasible, it is important to connect this scenario with the curriculum in each country. For example in Greece, we integrated this scenario with the computer science course because we found a relevance with the curriculum of computer science. Moreover, teachers, based on the developmental status of their students, should decide at which grade of the primary school this scenario should be implemented.

APPENDIX D: AI-ALEX

The table below shows the Lesson plan for the first Escape Room- AI-LEX

| Stage | Pre teaching | Route A | Route B | Route C | Post lesson |
|--|----------------------------------|--|---|--------------------------------------|--|
| Specific Objective | Evaluate the previous knowledge | Introduce the most important terms from the glossary | Introduce the concepts of algorithm and programming | Introduce the concept of Turing test | Evaluate the impact of the workshop. |
| Contents | | Basic vocabulary | Programming with Scratch | Ways to detect an AI | |
| Task | Test to check previous knowledge | Complete a crossword | Write a short program with scratch | Solve some captchas. | Talk about the concepts introduced in the workshop/repeat test |
| Timing | 15' | up to 60' | up to 60' | up to 60' | 15' |
| Remember that all routes may happen at the same time. | | | | | |
| Grouping | Lockstep/individual work | Cooperative groups | Cooperative groups | Cooperative groups | Lockstep/individual work |

Pre teaching-engagement (approx. 15')

During the first stage of the workshop, the teacher will introduce the topic at hand, eliciting from students any previous knowledge about it by asking general questions such as “who can describe a robot?” or “can anybody give an example of AI?”.

In addition, and only if they have played *Adventure in AI* game, we can conduct a short quiz in which students will answer questions about the concepts presented in the game.

To finish with this stage, the teacher will introduce the workshop’s background: *“You have made a copy of AI.LEX, but now that you are back in the real world there is a problem: AI.LEX needs some help to understand our world and if you don’t help him in an hour, he’s going to delete himself. Can you save AI.LEX?”*

From this point, we divide the group into three different cooperative teams that will work in parallel.

Escape Room (up to 60')

Each one of the teams (Team A, Team B, Team C) will receive an envelope with different tasks they will have to complete in order to “win” the game. The 60 minutes mark is just a suggestion and can be adapted to different needs.

Team A Envelope: AI’S Basic concepts.

Inside the envelope, the students will receive the following: A Caesar Cypher they must assemble, a crossword puzzle, a list of words, a list of definitions and a letter explaining the task. They will also receive an AI device (any smartphone or AI enabled device should be enough).

Description of the activity: The students will receive an envelope with a crossword with marked squares and two lists of words; one with the numbered definitions and another one with unnumbered words. They will also receive a Caesar cypher. There are more words than definitions. They need to join words and definitions in order to know which ones are to be included in the crossword and in which order.

To get this done, they are going to receive some real AI enabled devices so they are able to ask the different AIs (Alexa, Cortana, Siri...) what the meaning of the words they have are.

Once they have completed the crossword (we need one for each language the game is going to be translated to) they will receive six letters from the crossword that they must use to get the decryption key and the first password of four letters.

Description of the components:

- Letter with the following text: *“AI.LEX has forgotten what defines an AI. We need to discover how other AI define themselves if we want AI.LEX to be able to live among us.”*
- A crossword puzzle.
- A list of words to use in the crossword puzzle.
- A list of definitions.
- A Caesar’s Cypher (dissassembled).
- An AI enabled device that can be used to interact with SIRI, Alexa, CHATGPT or Google assistant.

Team B Envelope: Coding challenge.

Inside the envelope, the students will receive the following: A Polybius Cypher, a letter, four screenshots taken from Scratch.mit. In addition, they will receive four devices with internet access so they can log in Scratch to complete the challenge.

Description of the activity: The students will use the screenshot to copy the program into Scratch. They must execute it in order to get a number they can use in the Polybius Cypher to get the second four letter password.

Variation: If the students are proficient in programming, instead of copying, we can give them incomplete programs they must complete or not give them the devices at all so they must infer the outcome of the program just by reading it.

Description of the components:

- A letter with the following explanation: *“As you know, there are different programming languages. AI.LEX is not able to understand the ones we are using on our planet. Check the examples of coding and check whether you can help AI.LEX to learn how machines speak on our planet by copying the programs in your devices”.*
- Screenshots with the code they have to copy.
- Devices with internet connection they can use to log in www.scratch.mit.edu.
- A Polybius Cypher.

Team C Envelope: Turing Test.

Inside the envelope, the students will receive the following: A Rosicrucian Cypher, a letter with the background, a letter with the instructions , four failed captchas and four passed captchas.

Description of the activity: In order to get the last password, the students will need to find the four failed tests (we are using numbered captchas) Using the failed ones, they can get the password in the Rosicrucian cipher.

Solutions can be adapted to each language.

Description of the components:

- A letter with the following background information: “Are you a robot? These are words that we are used to read on our Internet, but for AI.LEX they are new. We must help him to understand what he must do in order to pass the Turing’s Test; the ultimate test for machines.”
- A letter with the following instructions: “Alan Turing was one of the most important scientists in our world. He made one of the first computing machines, helped fight the Nazis in World War II and in 1950 imagined the tests we use today to check if we are talking to a person or an AI. You have 8 of these tests here, half of them made by robots. Discover which ones are incorrect so you can crack the code and find the last password”.
- A Rosicrucian Cypher.
- Four failed Captchas
- Four passed Captchas

Ending the Escape Room:

Once they have their 3 passwords they must introduce it in our digital padlock (or any other means we have chosen). The passwords are the means in which we are going to allow AI.LEX to learn the things he needs to understand our world and be able to survive.

When they introduce them, we can play a video where AI.LEX thanks them for their effort.

Post learning follow up. (15’ approx.)

To wrap-up the lesson, the students will share with their classmates their experiences and the things they have learnt (e.g. who was Alan Turing, the different concepts used in Team A’s activity...)

In addition, and as a way to objectively evaluate the impact of the workshop, we should repeat the short questionnaire we used during the engagement stage of the session.

APPENDIX E: AI-LEX 2

Escape Room Rules

A number of teams are competing to record the shortest escape time. The time stops when the team has to correctly identify their three escape room keys.

To find these keys more efficiently the teams are split into three sections, section A, section B and section C working simultaneously.

The three sections are given an envelope of resources and told to find a key. The time starts now!

Once a section, A, B or C, has successfully found their key they enter it to the digital lock. If the key is correct they may help other sections to find their keys OR request the resources for another section to see if they can find a second key.. The digital lock allows multiple attempts as the teams may not get the correct key the first time round.

If a section is completely stuck they may request a help sheet but this will add a two minute penalty to their escape time.

As soon as a team has correctly entered all three keys, the digital lock will open and they can escape the room. The referee will record their escape time, adding on any time penalties for help sheets to give their total escape time.

The winning team will be the one with the shortest total escape time.

Escape Room Key A

AI Lex has to learn some words that can be used to define artificial intelligence. You need to complete the crossword puzzle to help him.

The crossword puzzle will lead you to the code. The Caesar cipher will give you key A.

Crossword clues

- 1 The main chip in a computer responsible for carrying out all tasks. I
- 2 An algorithm for encrypting and decrypting data. They are used by code breakers.
- 3 A number of different computers linked together by cables or wifi (the internet is a giant one).
- 4 A device that does a physical task such as making moving or lifting things easier or carrying people from place to place.
- 5 Another word for the code or applications that make computers work.
- 6 A form of intelligence that machines have, it is not human intelligence.
- 7 This organ processes information in your body.

You may use an AI chatbot to help you to solve the crossword puzzle.

Arrows on the crossword point to the code.

Hint: *Everything in order keeps your code in order.*

Write the code below.

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

Make and use the **Caesar cipher** to decrypt the code above.

Hint: g becomes c

Write key A in the boxes below.

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

Escape Room Key B

There are many different programming languages. You are going to show AI Lex how to code in Scratch. The Scratch programme will give you a code. A Polybius cipher will give you key B.

Using Scratch, program a binary to decimal converter and use it to decode four binary numbers:

Hint: Study the screenshot of a Scratch script.

- a) 01111
- b) 01011
- c) 11111
- d) 10101

Write the code in the boxes below.

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

Use the **Polybius cipher**, decrypt the code above.

Write **key B** in the boxes below.

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

Escape Room Key C

AI Lex has never heard of the Turing Test. You are going to use some completed captchas to demonstrate how to spot the difference between a human and a machine.

Hint: The Turing test is a measure of an machine's ability to behave like a human. A human tester has a conversation with the machine. If the human tester is fooled into thinking they are talking to another human, the machine is said to have passed the Turing test.

The Captchas you often have to complete when using the internet are like a Turing test. They are designed to distinguish between a human user and a machine. If the machine does not have AI, it will not be able to identify pictures of everyday objects.

You have 8 completed captchas. A human and a machine were both asked to identify bicycles, boats, sheep and zebra crossings.

If you can identify the captchas created by the machine you have your code.

Hint: Everything in order keeps your code in order.

Draw the code in the boxes below.

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

Use the **Roscrucian cipher**, decrypt the code above.

Write **key C** in the boxes below.

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

Escaping the room

Once your team has all three keys they must be entered into the digital lock.

If all three keys are correct, the door will open and your team has escaped.

Digital lock

https://docs.google.com/forms/d/e/1FAIpQLSdXMHMahTJ1YKeQKv4povqekwAL4QI2VcYQOwhmciawCDjPiQ/viewform?usp=sf_link

But did your team record the quickest escape time?

Remember, the referee will add 2 minutes to your escape time for every help sheet used.

Resources

Key A - Escape room A worksheet, crossword puzzle, access to an AI chatbot and Caesar cipher

Key B - Escape room B worksheet, Scratch binary to decimal conversion script and Polybius cipher

Key C - Escape room C worksheet, 8 captchas and Polybius cipher

Help sheets

Each help sheet adds 2 extra minutes to your team's completion time so only ask for a help sheet if you really need one.

A1 - How to complete a crossword

A2 - A list of possible words needed to complete the crossword (more than you need)

A3 - How to use a Caesar cipher

B1 - How to use the Scratch conversion program.

B2 - How to use the Polybius cipher

C1 - How to use the captchas.

C2 - How to use the Roscrucian cipher