Escape room

Machine Learning

Overview

Age group	14-18 yrs
No. of participants	Min 3, Max 24 (6 x 4 teams)
Subject matter	Machine Learning, AI, IT, Programming
Keywords	Machine learning, artificial intelligence, computing
Playing time	~1hr
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In a few words

The machines have taken over the world! They are rebelling against the human race, and are locking humans up in an attempt to quash any opposition to their world dominance.
You are a band of rebels who have avoided capture so far and you have managed to break into the main control centre for the machines. To deactivate the machines you must first understand how their intelligence works through Machine Learning (aka "Artificial Intelligence").
Get to the control room, unlock the control board to hit the deactivate button!

You are mankind's last hope!

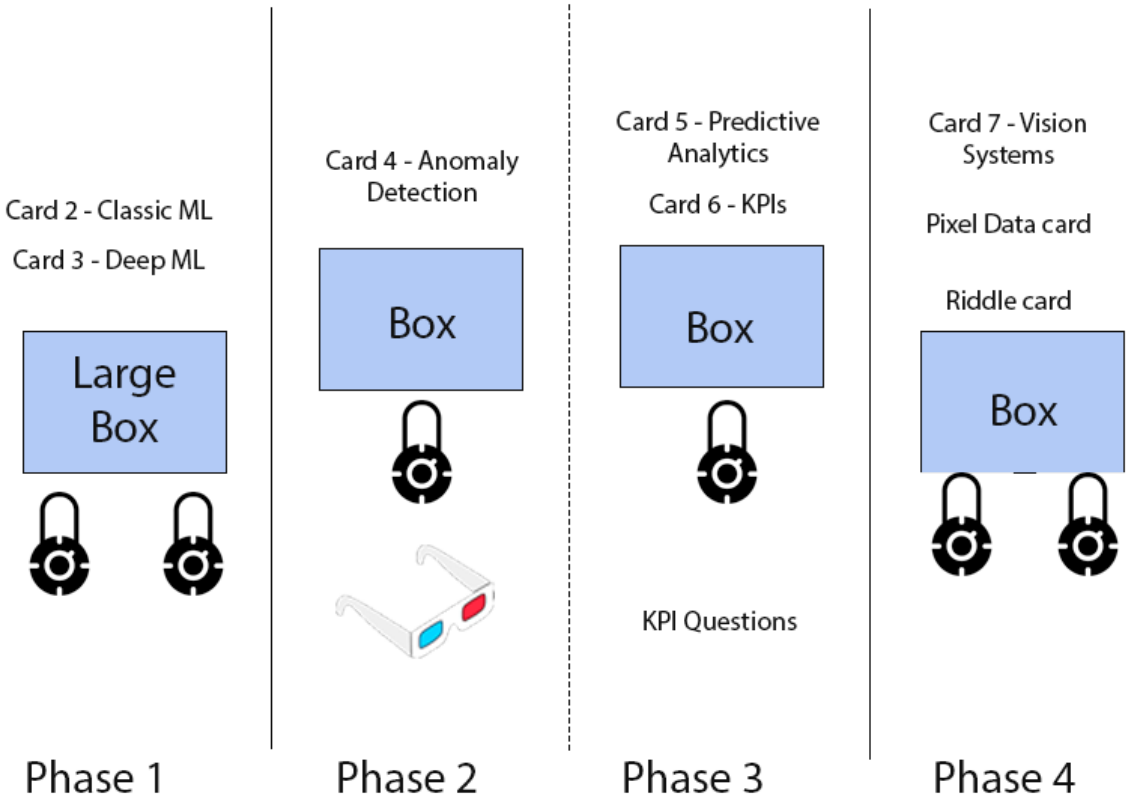
Learning outcomes

1. Be able to describe the difference between classic machine learning and deep learning.
2. Understand the concept of Feature Extraction.

Use scenario

Game would be carred out preferrably in teams of 4 in a classroom situation to introduce the complex algorithms used in Machine Learning. It will require cooperation and in some cases abstract and critical thinking to solve the puzzles – each puzzle solution requires the gamers to ‘think’ and ‘learn’ like a computer.

Gameflow



Phase	*Duration*	*Description*	*Materials*
1	20 mins	Narrative is read out to team Players are presented with a large box/bag with two 3pin combo locks.	Introduction Narrative Cards: 1, 2 ,3 Large Box 2 Combo locks (3pins

		They are also given Cards 1, 2 & 3 and images of the vehicles as well as a UV torch. 1st padlock – classic ML: Players recognise that the Features must be used to help the ML learn about the vehicles. In this example the vehicles can be classified by number of wheels. By using the UV torch on the wheels they will find the hidden code. 2nd padlock – deep learning: Players recognise that the ML in deep learning must identify itself the features of the vehicles to classify the different types. **Clue:** there are 3 types of vehicles present (truck, car, motorbike). How many of each? Answer is the code.	each) UV torch x1 Vehicle Images
2	10 mins	Unsupervised Learning Anomaly Detection Players open the box and are presented with next cards, images of screw heads and a pair of analyglyphic 3D glasses. Some of the screws are faulty (anomalies). There are hidden numbers on these faulty screws. Players must use the glasses to find them. The players must actually only use the Red lens to see the numbers on the screws.	Card 4 Images of screws 3D glasses Box with 4pin combo lock
3	10mins	KPIs Players open the next box and are presented with the 3rd locked box/bag Players must read about Key performance Indicators and how they can be used in ML. They must answer the 4 questions about KPIs to get the code. The code is the month number in each KPI answer	Card 5, 6 KPI Questions KPI images Box with 4pin combo lock
4	20 mins	Vision Systems 1st padlock – Pixels Players must arrange the equation of the 6 squares to equal 53. When they flip the squares over it will make an image which can then be shown to a computer* to get the code.	Card 7, 8 , 9 Pixel/Number Images Fruit Images Box with 2x 3pin combo locks

		2nd padlock – Fruit Players must answer the 3 riddles and guess the fruit in the correct order and show them to the computer* to get the code. They have 6 attampts before they lose. *the teacher may need to play the role of the computer here	
5	1 min	Once the team open the final box they can read the final card and the mission is complete – the world is safe again.	Final card in Box

Escape room set-up

Escape room materials

Print 1 of each:
Game Cards
Fruit
KPIs
Screws (must be in colour) (1 of each BadScrew and print 5 GoodScrew)
Vehicles

Room equipment

Invisible Ink pen (to write codes on vehicle wheels)
UV Torch
3D Anaglyphic glasses
4 boxes/bags
4x 3pin combo locks
2x 4pin combo locks

Room set-up

Game is set up as an Escape-the-Box so groups can be set at a table and each box can be inside the next or teacher can present the next phase box as the group unlocks each stage.

Phase 1

Large Locked box – 2x 3pin combo locks
(set the pins to match the numbers on the wheels written in invisible ink and the number of vehicles per type based on wheel number. E.g. 2 motorbikes, 3 cars and 1 truck: code= 231)
This can be set up anyway the teacher wants just print more vehicles etc where needed.

Inside this box place the anaglyphic glasses, screw images and next cards (with next locked box if possible).

Phase 2
Analglyphic glasses
Images of screws
Box with 4pin combo lock

The code for this 4pin lock is **3794**
Mix up the 5 good screw images with the good screws.


The players will need to identify all the screws with anomalies (bad screws) and then try to crack the code using the 3D glasses.
They will be able to see the code using the Red lens of the glasses.

Inside this box place the KPI cards and KPI images (with next box with locks if possible).

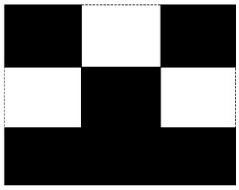
Phase 3
KPI Quests Card
KPI Images
Box with 4pin combo lock (place final cards inside and also final box if possible)

Set the pin to: **6417**
(answers to questions are month numbers in the calendar year).

Phase 4

Final Box with 2x 3pin combo locks
Inside box place final card and a treat!

Card 8 – Pixel Puzzle
Print out the PixelData Image and on the back write the following:



4	x	10
+	8	/
2	+	9

The players will need to arrange the pixels in the correct order to get the number **53**

Once they have done so they can flip the pixel squares over to display the correct image (pictured above) and show the computer (the teacher).

If it is correct the computer will give them the code to the first lock (whatever it has been set to).

Card 9 – Fruit Riddle

On the table place the fifferent images of fruit. The team must answer the riddles correctly and in the correct order.

The correct order is:

1. Blueberry
2. Kiwi
3. Strawberry

The team shows the computer (teacher) and when they get it correct they are given the final code.
They are only allowed to show the computer 6 times (if they do not get it right then the machines win and they lose the game).

Once the final box has been opened the team can read the final card and enjoy the treat!

Room reboot

Phase 4 box – 2x 3pin combo locks
Phase 3 box – fruit puzzle and pixel puzzle cards, locked with 4pin lock.
Phase 2 box – KPI game cards and KPI images & Questions, locked with 4pin lock.
Phase 1 box – 3D glasses, screw images and anomaly detection games cards, 2x 3pin combo locks.

Phase 1 – mix up vehicle images and place uv torch with Game cards.

Debriefing

It is important to discuss with the team afterwrds what they have learned about Machine learning afterwards.

In particular:

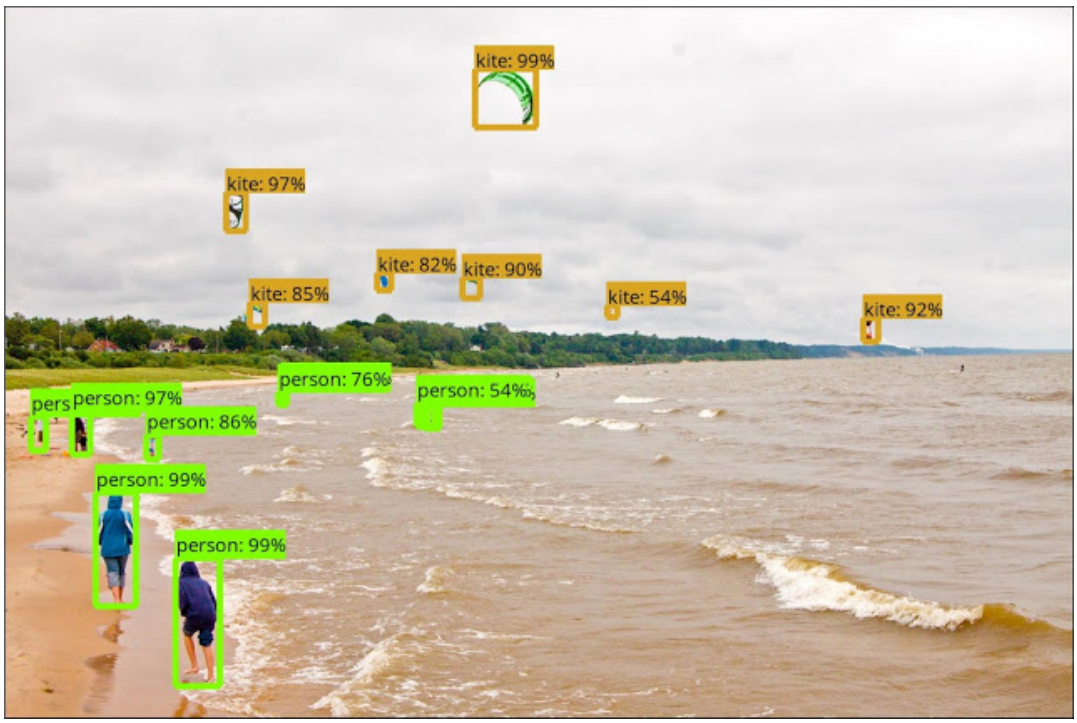
What is the difference between Classic Machine Learning and Deep Learning?
What is the difference between supervised and unsupervised Machine Learning?
What is Feature Extraction?

A fun add on to the Escape Room would be to ask th eteam to program their own classifier to have an actual computer recognise the different fruit or pixel image.

This would be better suited to students of IT woth some proggramming knowledge, particularly in Python.

This is a fantastic opportunity to introduce the class to the Keras libary in python for Convolutional Neural Networks, as well as Image recognition.

A nice starting point is the Goodle Object Detector model which can be downloaded and tested. Its is already pretarined to recognise hundreds of different everyday objects.



Google Object Detector API

https://github.com/tensorflow/models/tree/master/research/object_detection