



TASK

Machine Learning I

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Introduction

WELCOME TO THE FIRST MACHINE LEARNING TASK!

The objective of the next few tasks is to give you a holistic understanding of machine learning; covering theory, application, and the inner workings of supervised and unsupervised learning algorithms.



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INTRODUCTION TO MACHINE LEARNING

You may have noticed in recent years that technology has become more and more tailored to the individual. Have you ever gone onto someone else's Netflix account? They're recommended shows that you never knew existed! This is all thanks to Machine Learning. Machine Learning is used to filter and classify your email inbox, to target you for certain adverts online, help you find articles you might find interesting and to enable you to play chess against your computer, to name a few.

WHAT IS MACHINE LEARNING?

According to Hackeling (2014, p. 8), "Machine learning is the design and study of software artefacts that use past experience to make future decisions; it is the study of programs that learn from data." That is to say, the software uses past data to create a rule that is then applied to current data to make predictions. For example, if you watch a lot of action movies on Netflix, you are likely to be recommended more action movies than romance movies. This is because the past data shows you watched *Die Hard* and *The Bourne Identity*, it will most likely recommend *The Equalizer* over *The Notebook*.



A note from our coding lecturer

Thabiso

*Let's look deeper into the Netflix example. Back in 2006 when Netflix was a simple DVD rental service, they held a competition to determine an algorithm that would increase the accuracy of their recommendations by 10 percent. The test? Who could accurately predict if someone will like the film *Napoleon Dynamite*. It wasn't until September 2009 that the algorithm was finally completed and validated. It was created by BellKor Pragmatic Chaos who won after a tie-breaker with *The Ensemble* who perfected the algorithm just 20 minutes later. Both companies heavily relied on their knowledge of machine learning to make an accurate predictor to recommend movies and TV series.*

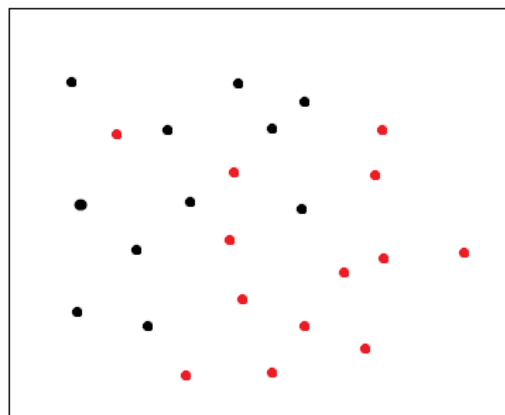
The type of machine learning that was used is called supervised machine learning, which is discussed in more detail below.

SUPERVISED AND UNSUPERVISED MACHINE LEARNING

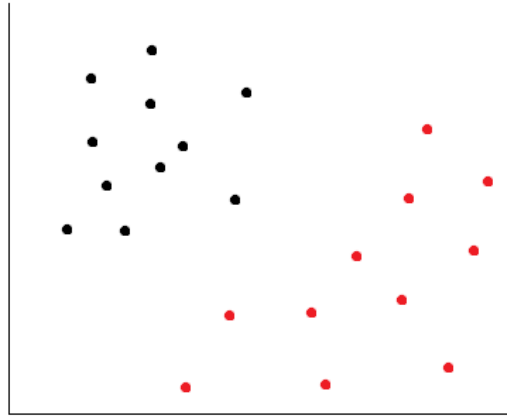
Supervised and unsupervised learning sit on opposite sides of the spectrum.

Supervised learning, learns from pairs of inputs and outputs. In the Netflix example, that would be movies they recommended and whether or not you added it to your Watch List. The algorithm then learns which types of movies to recommend the next time. In summary: the algorithm learns from examples of correct predictions.

Unsupervised learning, on the other hand, simply finds patterns in a given dataset and creates groups, or clusters. An example of this would be targeted advertising. Machine learning can identify groups of people with similar demographics and similar buying habits and put them into a cluster where a certain advert will be targeted. For example, people between the ages of 18 and 35 who buy running shoes may be targeted by advertisers for other fitness gear, protein powder, health supplements and vitamins because the assumption might be that they are striving to live a healthy lifestyle. This clustering process is not supervised by humans; the machine teaches itself to find and refine patterns in the data. Below is an example of unsupervised learning and cluster analysis.



Dataset before unsupervised learning and clustering



Dataset once unsupervised learning and clustering has been applied

As you may have already deduced, machine learning involves applying statistical learning techniques to identify patterns in data. These techniques can be used to make highly accurate and objective predictions.

MACHINE LEARNING IN PYTHON

In the upcoming tasks, you will be learning about the basics of machine learning, namely linear and polynomial regression, and how to work these out in Python. Finally, in your Capstone Project you will be working with k-means clustering — an implementation of unsupervised machine learning. These tasks will be challenging, so feel free to ask your mentor for help if you get stuck, and do any research you feel necessary to solidify your understanding of the concepts we cover.

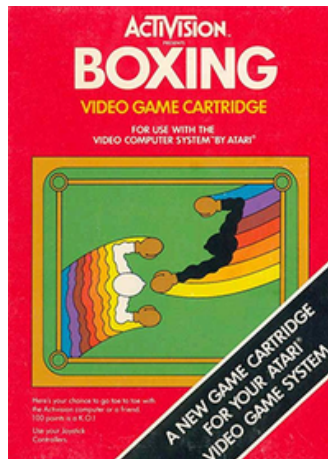


A note from our coding mentor

Serge

Sorry to interrupt, but did you know that Google [DeepMind](#), a London based subsidiary, has trained an AI gamer to play 49 different video games from an Atari 2600, beating a professional human player's top score in 23 of them. Yes, you read that right!

The software isn't told the rules of the game – instead, it uses an algorithm called a deep neural network to examine the state of the game and figure out which actions produce the highest total score.



One of the most impressive, and probably the eeriest example is that, in the boxing game, the software learned how to pin its opponent on the ropes (which is something only seasoned players of the game knew how to do), and release a barrage of punches until its opponent was knocked out! Extremely ruthless, right?

Compulsory Task

Answer the following questions:

- What are the differences between supervised and unsupervised machine learning? Explain what you think semi-supervised machine learning is.
 - Write a paragraph on Machine Learning. Try to use your own words (about 8 sentences)
 - Write a paragraph on Supervised Learning. Try to use your own words (about 5 sentences). Also, list at least 4 models in Supervised Learning.
 - Write a paragraph on Unsupervised Learning. Try to use your own words (about 5 sentences). Also, list at least 2 models in Unsupervised Learning.
 - Write a paragraph on 1 interesting trend in Artificial Intelligence that interests you. E.g. self-driving cars, music production, voice recognition, handwritten signature verification, computational biology, etc.

Completed the task(s)?

Ask an expert to review your work!

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References:

Hackeling, G. (2014). *Mastering Machine Learning with scikit-learn* (1st ed., pp. 7-19). Birmingham: Packt Publishing.

Jackson, D. (2020). The Netflix Prize: How a \$1 Million Contest Changed Binge-Watching Forever. Retrieved 17 March 2020, from <https://www.thrillist.com/entertainment/nation/the-netflix-prize>