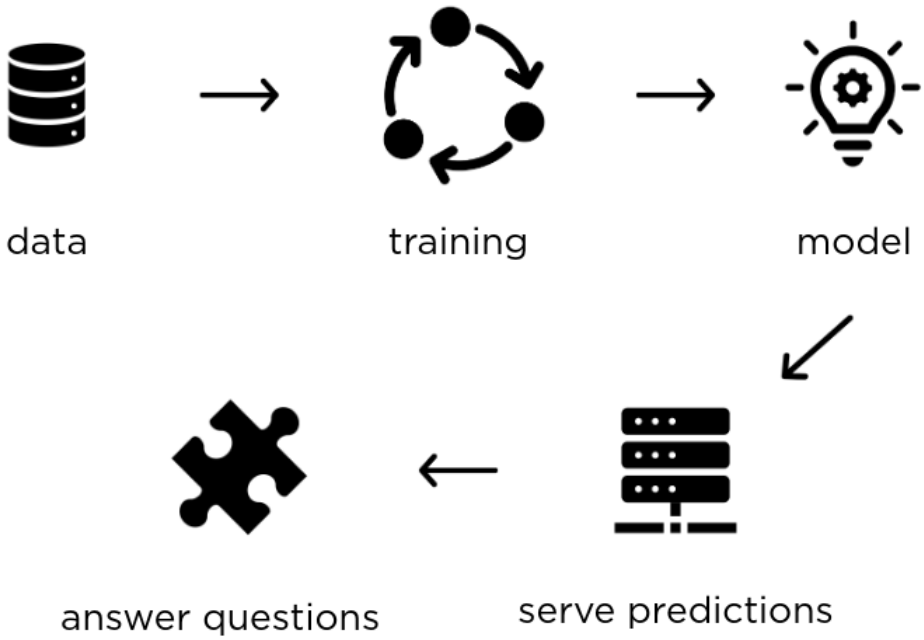
# Introduction to Machine Learning

## 1 Machine Learning Lifecycle


- To determine how to differentiate between things using our model rather than using human judgement and manual rules
- We can extrapolate the ideas to other problem domains as well, where the same principles apply

## 2 What is machine learning?

**Definition: Machine Learning**

A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P if its performance at tasks in T, as measured by P, improves with experience E.

Machine learning is the study of algorithms that:

- Improve their performance P
- At some task T
- With experience E

A well defined learning task is given by `P,T,E`

# 3 Supervised Learning

To learn the mapping (the rules) between a set of inputs and outputs

Labelled data is provided of past input and output pairs during the learning process to train the model how it should behave

# 4 Unsupervised learning

To learn the hidden pattern (the rules) from a set of inputs (no output)

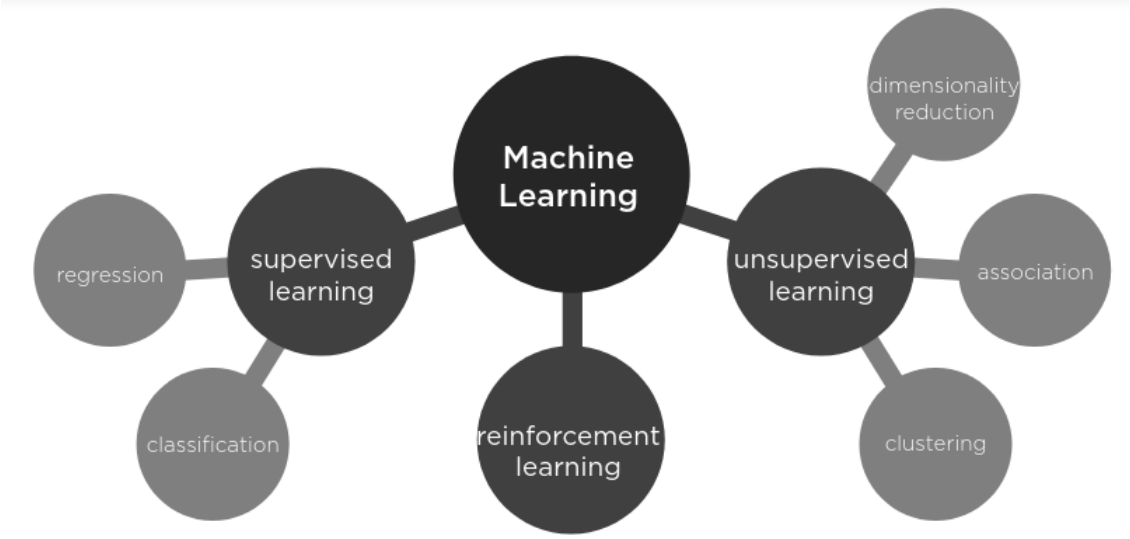
Unlabelled data is provided of past input during the learning process to train the model how it should behave

# 5 Reinforcement learning

Occasional positive and negative feedback is used to reinforce behaviours

- Good behaviours are rewarded with a treat and become more common
- Bad behaviours are punished and become less common

A reinforcement learning algorithm just aims to maximise its rewards by playing the game over and over again




# 6 Key terms

**Label** - The variable that we are predicting typically represented by the variable y
**Features** are input variables that describe our data typically represented by the variables $x_1, x_2, x_3, ..., x_n$
**Example** - A particular instance of data, x