

# AINT351 - Revision

## Three types of learning

*Imagine a machine experiences a sequence of sensory inputs  $x_1, x_2, \dots, x_n$*

### Supervised learning:

- The machine is also given  $y_1, y_2, \dots, y_n$  and its goal is to learn and reproduce them from the inputs
- Learning by examples, input and output is given so it knows how to reproduce the output from the input

### Unsupervised learning:

- The machine should build a representation of  $x$  that can be used for decision making, prediction
- There is no desired output, you are given inputs and after some iterations you start to categorise data based on some criteria

### Reinforcement learning:

- The machine can generate actions  $a_1, a_2, \dots, a_n$  that affects its environment and receives a reward or punishment based on them. Its goal is to learn actions that maximise long term reward
- Learning based on rewards for actions so that it learns to maximise long term reward

## Goals of supervised learning

### Classify input data:

- In this case the desired outputs  $y_1, y_2, \dots, y_n$  are discrete class labels and the goal is to **classify** new output correctly from the new input
- have an image of a digit and want to know what digit it is based on previous examples of that digit

## Goals of unsupervised learning

### Regression

- In this case the desired outputs  $y_1, y_2, \dots, y_n$  are continuous values and the goal is to **predict** new output correctly from new input
- Have the data from babies and can try to predict its weight given its height

We wish to find useful representations of data. This can involve

- Finding clusters
- Dimensionality reduction

- Finding the hidden cause of the surface phenomena
- Modelling the data probability density