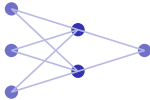


Artificial Intelligence

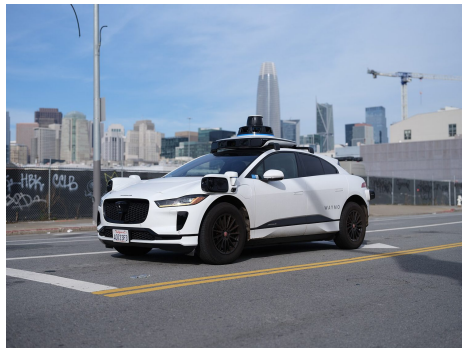
A-Level Computer Science ■ Topic 18

A-Level Computer Science



What we will cover

- 1 What AI is
- 2 Graphs in AI
- 3 Neural networks
- 4 ML, DL, RL
- 5 Training & regression
- 6 Recap



What AI is

Artificial intelligence 人工智能 is software that performs tasks needing human-like reasoning: perception, decisions, language.

Machine learning 机器学习 is a subset of AI that learns patterns from **data** rather than being explicitly programmed; **deep learning** 深度学习 is a subset of that.

Artificial Intelligence (AI)

machines do tasks that
normally need human intelligence

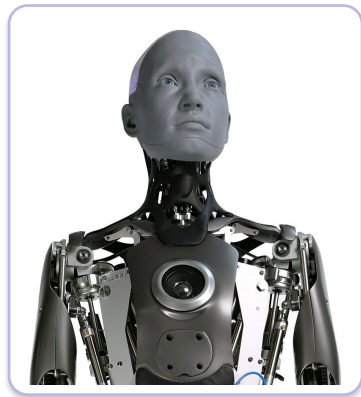
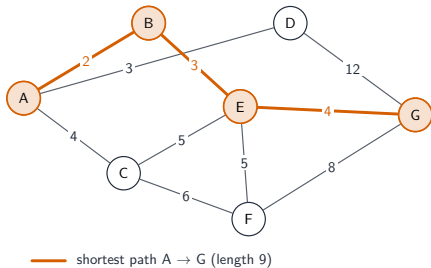
Machine Learning (ML)

systems learn patterns
from data, not by fixed rules

Deep Learning (DL)

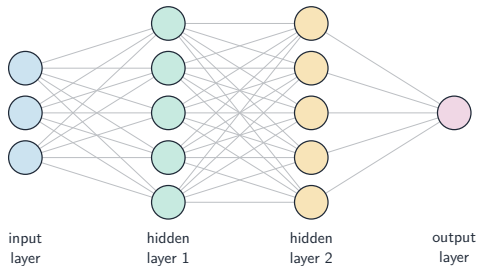
many-layer
neural networks

Graphs in AI



humanoid robot

Artificial neural networks

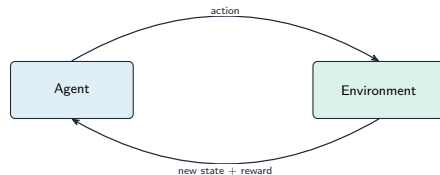


industrial robot arm

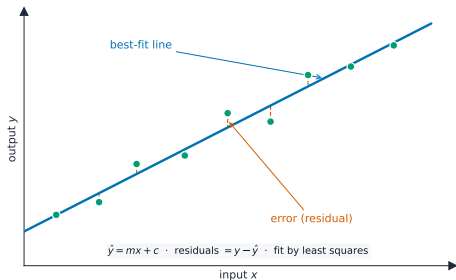
ML, DL and reinforcement learning

- **supervised**: learn from **labelled** examples
- **unsupervised**: find structure in **unlabelled** data (clustering)
- **reinforcement** 强化学习: learn from **reward** by trial and error

Training a network adjusts weights by **backpropagation** 反向传播 + **gradient descent** 梯度下降 to reduce the error.



Regression



Regression 回归 fits a line (or curve) to data to **predict** a continuous value:

$$\hat{y} = mx + c$$

Training minimises the total squared error between predictions and the real values.

Classification predicts a **category**;
regression predicts a **number**.

Topic 18 – key takeaways

1 AI/ML/DL

nested subsets; ML learns from data

2 Search

A* over a graph, guided by a heuristic

3 Networks

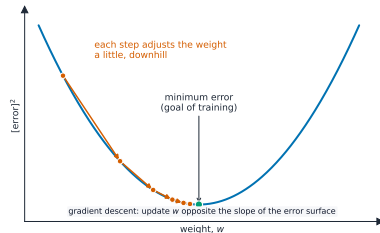
weighted neurons; learn the weights

4 Training

backprop + gradient descent; regression

Check yourself

- 1 Is deep learning a subset of ML or vice versa?
- 2 What does a heuristic do in a search?
- 3 What does a neural network learn?
- 4 Classification or regression predicts a number?



Answers

1. subset of ML

2. guides toward the goal

3. the weights

4. regression