A-LEVEL COMPUTER SCIENCE • HOLIDAY HOMEWORK 假期作业

18 What AI is – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
Artificial intelligence	人工智能			
machine learning	机器学习			
deep learning	深度学习			
neural networks	神经网络			
hidden layers	隐藏层			

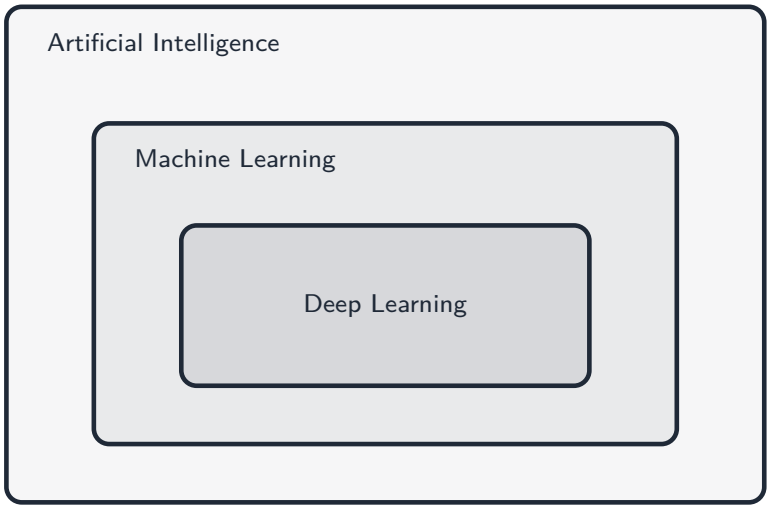
Recall

Artificial intelligence 人工智能 (AI) builds systems that do tasks normally needing human intelligence — seeing, speaking, translating, playing games.

New ideas

Read these first. Each idea has a short worked example. Then do the Practice.

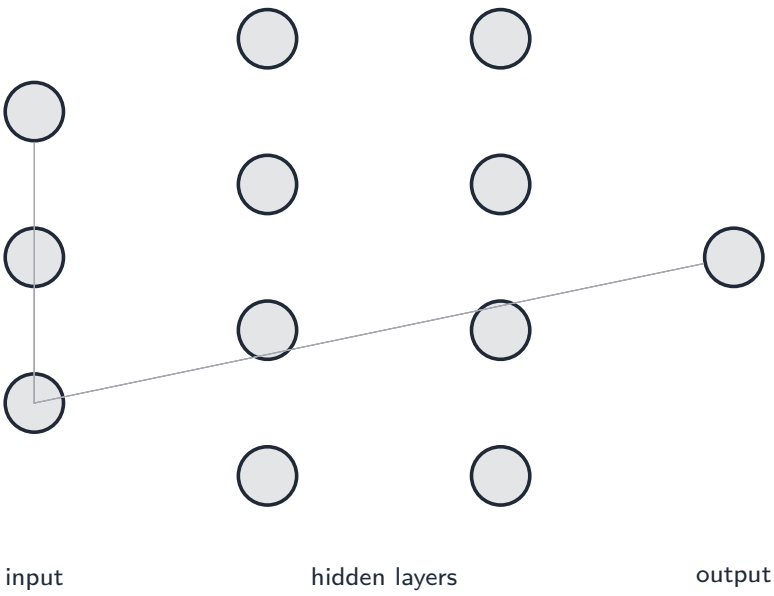
■ 1 AI, ML and deep learning



- **machine learning** 机器学习 learns patterns from data instead of being programmed step by step;
- **deep learning** 深度学习, using **neural networks** 神经网络 with many layers, is part of machine learning.

Worked example. To filter spam, you don't hand-write a rule for every spam word. Instead, machine learning is shown thousands of emails already labelled "spam" or "not spam", and it learns the patterns by itself.

2 A neural network



A neural network has an input layer, one or more **hidden layers** 隐藏层, and an

output layer. With many hidden layers it is a *deep* network.

Worked example. To read a handwritten digit, the pixels enter the input layer, pass through hidden layers that pick out edges and shapes, and the output layer gives the most likely digit, 0–9.

Watch out: machine learning learns from *data* — it is not given explicit rules. And the three terms are *nested*: deep learning is inside machine learning, which is inside AI — they are not three separate things.

Practice

Try these in order.

18.1 What does *AI* build systems to do? [1]

18.2 How does *machine learning* work? [1]

18.3 Is *deep learning* part of machine learning, or the other way round? [1]

18.4 What sits between the input and output layers of a neural network? [1]

18.5 When is a neural network called *deep*? [1]

18.6 A traditional program uses fixed rules; a machine-learning spam filter does not. Explain the key difference in how each decides whether an email is spam. [2]

18.7 Challenge. Explain why machine learning is useful for a task like recognising faces, where writing explicit rules would be very hard. [2]