

# 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  | _____                      |

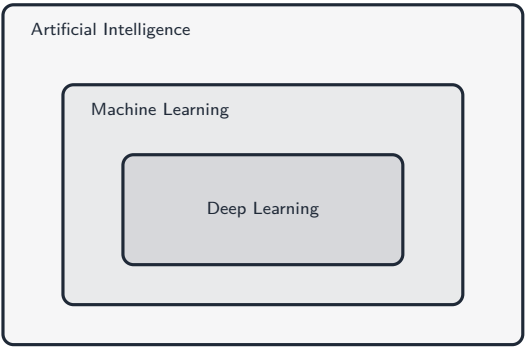
## Recall

**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.

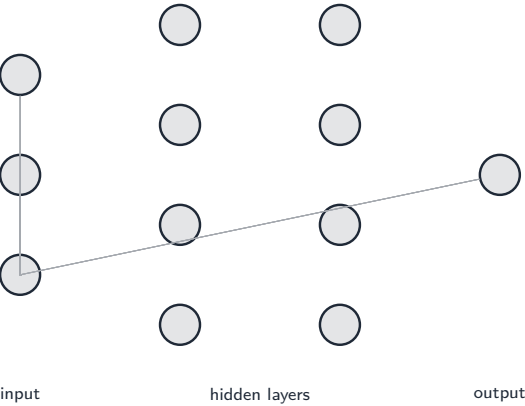
### ■ 1 AI, ML and deep learning



- **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

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Try these in order.

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

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

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

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

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

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**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]

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

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