

Solutions

Chapter 22: Project: Adventures in data diving

Task D: Data and artificial intelligence, page 145

- 1 20Q uses artificial intelligence in the form of a neural network, similar to a human brain. In 1988 on its first go it was given only one object – a cat. Every time someone played the game by thinking of another object it added that to its knowledge base. Now after 90 million games it knows more than 10 000 objects.

For 20Q, playing is the same as learning, as it develops connections whenever it receives answers to questions. It is able to reinforce these connections by playing games over and over with different people, gradually learning which answers are correct and which aren't.

As the questions are answered they are given 'weightings' and each answer gives a pattern that keeps narrowing down possibilities. Anyone who tries to 'poison' the system by purposely giving wrong answers or who answers stupidly is thus overpowered by the many more people who answered truthfully. The program uses its data to ask questions to clear up the confusion, eventually arriving at an answer. For example, if someone said that a fish was mineral (the first question) then later it will ask something like 'does it swim?' and then switch to realising that it is animal not mineral.

The online version of 20Q guesses correctly about 80% of the time, and if you allow 25 questions, it claims a 98% success rate. With over 60 million games played online, its neural net continues to learn. The inventor has said that it is still learning, but it is not increasing its success rate. What happens is that it is learning to play more kinds of people, people who don't speak English easily, or who have never played 20 questions, or who come from different cultures and to understand more difficult kinds of things.

Unlike other AI products, it does not slow down the bigger it gets.

- 2 The inventor of 20Q believes that a system like his could eventually be used by hospitals to question patients efficiently before seeing a doctor. If an AI system is able to collect or use very huge databases, a bit like 20Q does, then it could become efficient at predicting. Driverless cars can only be made safe by responding to the thousands of 'unpredictable' things that can happen on a road and which human drivers must respond to. Intelligent assistants on smartphones, such as Siri, already anticipate users' needs. User commands such as 'Send my mother a message to meet here next Wednesday morning and add it as an event in my calendar' can now be accurately interpreted and automatically result in a message sent to the correct person and adds their name and time entered as an event in the calendar.

Task E: Pattern recognition, pages 145–6

- 1 Neural networks allow computers to appear as if they are learning. Instead of giving a computer a list of instructions as in a regular program, the computer is only given inputs and some simple rules. Each artificial neuron acts like the neurons in our brain. They accept many inputs but deliver only one output called a node.

The neurons are linked and each link is given a weight. When a node is given a value it ‘fires’ its data to all other nodes it’s connected to. These connected nodes often have a rule that says they only fire when input is above a certain value.

When a neural network is presented with a pattern it first makes a random ‘guess’ as to what it might be. It is told the actual object and then calculates how far its answer (output) was from the actual one and makes an adjustment to its input weights.

Visit this site for more information:

https://www.doc.ic.ac.uk/~nd/surprise_96/journal/vol4/cs11/report.html

- 2 The following are all actual examples.

Table 22.3

1	Recognition on car number plates for law enforcement
2	Customer research, credit evaluation of customers for loans
3	Facial recognition
4	Identifying content of photographs
5	Medical modelling of cardiovascular system Electronic noses used in surgery (yes! an actual application!)