▸ our Solar System. During his first year studying Applied Physics at Northern Arizona University, Pearson was asked by his professor to apply what he'd learnt to his current research. "I was already studying the characterisation of exoplanet atmospheres," he says, "so it was only natural to make the jump to exoplanet detection." Pearson developed a deep net capable of scanning through data to detect exoplanets. It tries to learn what the potentially planet-signifying dips in star brightnesses should look like based on previous examples.

Teaching on test

One of the big advantages of deep nets is that they can be trained to identify very subtle features in large sets of data.

RobERt (Robotic Exoplanet Recognition) is a deep net created by Dr Ingo Waldmann and his team at University College London. Using over 85,000 simulated light curves from five classes of exoplanets, they 'taught' RobERt to recognise the presence of particular molecules and gases in exoplanets' atmospheres.

After the teaching was completed, RobERt was able to identify molecules such as water, carbon dioxide, ammonia and titanium oxide in light curves from real exoplanets with 99.7 per cent accuracy. It would take traditional atmospheric modelling approaches days to pick out this information from the masses of data collected by exoplanet observations. RobERt can do it much faster.

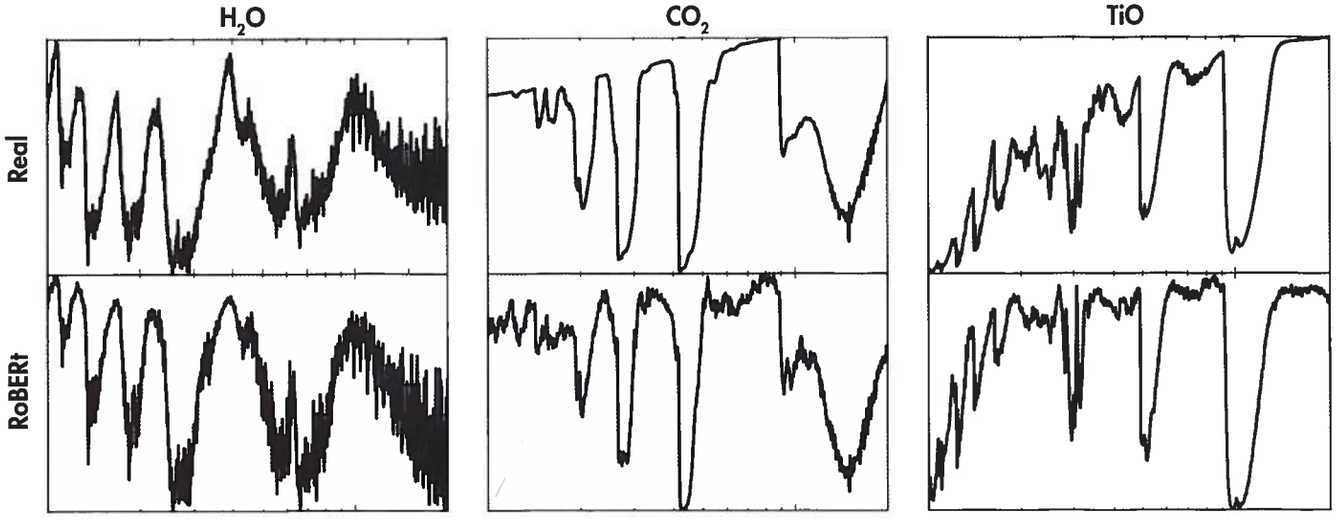
But to check RobERt had really 'learnt' how such compounds affect the light coming from exoplanets, Waldmann's team reversed

▲ Kepler will generate so much data that AI systems will be needed to analyse it in a practical amount of time

▲ Dr Ingo Waldmann stands next to the computer equipment that makes up the RobERt deep net, which has been trained to recognise exoplanet atmospheres

ESO, NASA AMES/JPL-CALTECH/T PYLE, INGO WALDMANN X 2, ISTOCK, NASA/JPL-CALTECH X 2, ESA/CC BY-SA 3.0 IGO, ESA/D.DUCROS/2013

"One of the big advantages of deep nets is that they can be trained to identify very subtle features in large sets of data"



▲ Graphs showing how water (H_2O), carbon dioxide (CO_2) and titanium oxide (TiO) appear when detected in an exoplanet's atmosphere (Real) and in RoBERt's predictions. The similarity shows that RoBERT has the capability to identify these compounds independently