Astronomers may have stumbled upon four exoplanets when surveying distant red dwarf stars using only low-frequency radio waves.

An international team of researchers led by the University of Leiden, the Netherlands, observed 19 M-type stars - ranging from 13 to 156 light-years away - using the Low Frequency Array (LOFAR), the world's largest ground-based radio telescope that can detect frequencies less than 200MHz. M-type stars are known for being small, cool, and dim. Although they aren't as visible as other stars like the Sun, they can be studied using radio waves.

They commonly undergo intense magnetic activity that power stellar flares and bursts of radio light. These outbursts were identified with the help of deep learning, Benjamin Pope, a co-author of the study and an astrophysics lecturer at the University of Queensland, Australia, told *El Reg*.

A convolutional neural network was trained to find flares ejected by such stars. But four of the 19 samples the network found left scientists puzzled; as they still emitted radio waves despite being magnetically inactive and dormant with no bright flares.

"While plasma emission can generate the low-frequency emission from the most chromospherically active stars of our sample, the origin of the radio emission from the most quiescent sources is yet to be ascertained," the team said in a paper published in *Nature Astronomy* on Monday (here's the free arXiv pre-print).

Instead, the authors reckon the electromagnetic radiation is not coming from the stars themselves but from exoplanets orbiting them. "We've discovered signals from 19 distant red dwarf stars, four of which are best explained by the existence of planets orbiting them," said Pope.

Planets, like Earth, can have their own magnetic fields. When these interact with charged particles from the host star's solar wind, it can lead to a surge of radio emissions. A similar effect occurs on our own planet at the north and south poles during aurora events.

"Our own Earth has aurorae, commonly recognized here as the northern and southern lights, that also emit powerful radio waves – this is from the interaction of the planet's magnetic field with the solar wind," Pope said.

The scenario around the four red dwarf stars, however, is more like the interaction between Jupiter and its moon Io. "Our model for this radio emission from our stars is a scaled-up version of Jupiter and Io, with a planet enveloped in the magnetic field

of a star, feeding material into vast currents that similarly power bright aurorae...in the case of aurorae from Jupiter, they’re much stronger as its volcanic moon Io is blasting material out into space, filling Jupiter’s environment with particles that drive unusually powerful aurorae,” he added.