AI Hunt For Extraterrestrial Intelligence Finds 8 Promising Signals

Machine intelligence is helping astronomers analyse vast datasets from radio telescopes — and finding previously unseen signals of interest.

The Physics arXiv Blog
By The Physics arXiv Blog
Mar 8, 2023

(Credit:John M. Chase/Shutterstock)

One of the great scientific projects of our time is the Search for Extraterrestrial Intelligence or SETI — the hunt for evidence of technologically advanced civilizations elsewhere in the galaxy. The current manifestation of this endeavor is the Breakthrough Listen Initiative, which uses radio telescopes to look for signals that cannot have a terrestrial origin.

The big challenge in this effort is combing through massive data sets — hundreds of hours of data at multiple frequencies. Researchers have found tens of millions of false positives in these datasets and so would dearly love a quicker way to filter out the weeds.

Machine SETI

Now Peter Xiangyuan Ma at the University of Toronto in Canada, and colleagues, have trained a machine learning algorithm to do the job instead. And in putting the machine through its paces, the team say it helped identify 8 signals of interest that deserve further follow up.

One feature of a signal from a distant star is that it should only be observable when a radio telescope is pointed directly at it. Point the telescope away and the signal should disappear. By contrast, most terrestrial interference leaks into the observations regardless of the telescope pointing direction.

So astronomers have developed a technique called “position switching” where, during an observation, the radio telescope scans a specific part of the sky for a few seconds, then looks away, then continues its scan, then looks away and so on.

These cadences produce distinctive patterns of data. Any signal from a distant star appear only in the “on-source” scans, while the terrestrial interference should appear in all the scans. This makes these false positives relatively easy to spot.

The trick that Xiangyuan Ma and co have perfected is to teach a machine learning system to spot these distinctive patterns in the cadences.

They used their algorithm to analyze 480 hours of observations of 820 stars taken by the Robert C. Byrd Green Bank Telescope in West Virginia. This came in the form of over 1000 cadences generating some 115 million windows of data to analyze.

In this haystack, the algorithm found almost 3 million distinctive patterns, which further filtering reduced to just 20,515. “Upon a visual inspection, we identify 8 promising signals of interest,” say the team.

Solar Analogue

These signals correspond to five stars that sit between 30 and 90 light years from Earth. One of them is a sun-like star called HIP 62207. The team reobserved these stars but did not see the same signals again. “This shows that no matter what the true nature of these signals are, they are not persistent in time,” they say.

That’s interesting work that pushes the boundaries of what is possible with SETI. “This work represents the most comprehensive ML-based technosignature search to date, and improves on previous work by finding signals of interest not detected before,” say Xiangyuan Ma and co.

These kinds of automated analyses should make future studies more manageable and improve capabilities for discovering other civilizations.

For the moment, the team come to no conclusion about the origin of the signals of interest. But they clearly deserve more attention. “We encourage further re-observations of these targets,” they say.

*Ref: A Deep-Learning Search For Technosignatures Of 820 Nearby Stars : **arxiv.org/abs/2301.12670***