NASA Leans on AI to Search for Intelligent Life

The agency's latest exoplanet-hunting satellite will use AI to ID habitable planets.

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Wed, 04/18/2018 - 09:07

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Whether NASA’s newest space telescope — when it eventually gets into orbit — finds intelligent life in the universe is anybody’s guess, despite the hopes, dreams and mathematical probabilities espoused by scientists and star-gazers alike. But TESS, the short name for the Transiting Exoplanet Survey Satellite, will be taking intelligence into orbit with it, in the form of new equipment, navigational computers, cameras and artificial intelligence that can parse the data it collects. If there are signs of intelligent life out there, chances are AI will help find it.

TESS, whose scheduled Monday evening launch aboard a SpaceX Falcon 9 was delayed by a rocket issue, will soon begin a 2-year survey of a wide swath of relatively nearby stars in search of exoplanets — extra-solar planets orbiting in the habitable zones of their stars. It will build on the work of the Kepler space telescope , which discovered more than 2,600 exoplanets in about 440 star systems during an extended decade-long mission. In addition to expanding the search for other forms of life in the great beyond, TESS also underscores how recent advances in technology aid that search.

The space program, which has given birth to many of the technology we use every day, also can be used as a gauge of how far computing has progressed. The early computers used in satellite tracking involved cathode ray tubes and punch cards. The Apollo Guidance Computer aboard the Apollo 11 mission to the moon in 1969 had 64 kilobytes of memory and a clock speed of 0.043 MHz, less computing power than you'd find in a coffee maker at Target.

The IBM System/360 Model 75 mainframes running the mission from the Goddard Space Flight Center cost about $3.5 million each, measured their memory in megabytes, and dazzled with their ability to perform up to 750,000 additions per second. An Apple iPhone 6, by contrast, has a clock speed 32,600 times faster than those Model 75s and can execute instructions 120 million times faster. Even a USB memory stick today has more power that those computers. You get the idea.

Along with providing a handy graph line for Moore's Law, TESS also exemplifies how other technological advancements, among them AI, are feeding the space program.

Reading the Sky

For one thing, AI can help scientists see what TESS is looking at. Like Kepler, TESS will use the "transit" method for identifying planets. Kepler's camera sensors don't exactly take a picture of a planet, but look for the dimming effect caused by a planet passing in front of its star.

That process can be complicated by other factors, such as the presence of other planets, the fact that the dimming effect can be very slight, and other vagaries that contribute to false positives. As a result, the teams behind Kepler and TESS must analyze a lot of data, which is where AI comes in.

In December, NASA announced Kepler had discovered another exoplanet — Kepler 90i — using, for the first time, a deep learning neural network. As NASA explained at the time, the evidence was in the data Kepler collected, but it took an AI program to find what human scientists had missed.

That kind of analysis could make TESS data more valuable in its wide search of the skies. Kepler, which is expected to run out of fuel and finally quit in a few months, has a pretty narrow field of vision, and looked at stars as far as 3,000 light years away. TESS will look closer to home, but with a much broader view, with its four cameras scanning an area 400 times larger than Kepler did, while focusing on stars and planets within 200 light years.

In all, it's expected to get a look at more than 200,000 stars and find about 1,600 planets, among them several dozen about the size of the Earth, and several hundred larger planets up to twice the size of Earth. TESS' discoveries will then be examined in greater detail by the James Webb Space Telescope, successor to the wildly successful Hubble, scheduled for launch in 2020. Webb is expected to look for "bio signatures," such as the presence of oxygen, on the planets TESS identifies.

Smart Satellites and Rovers

AI can also help with satellite operations and navigation, including the exploration of Mars, or maybe someday, exoplanets discovered by Kepler or TESS. AI could allow a Mars Rover, for example, to operate for weeks or months when out of contact with Earth. This will be first tested with the new Mars 2020 Rover , giving it capabilities beyond any previous interplanetary vehicle. Scientists at NASA's Jet Propulsion Laboratory have also used AI software to automate operations of the Earth Observing-1 satellite, allowing it to react to events such as recent volcanic eruptions by immediately taking pictures of the event, long before scientists on the ground even knew what happened.

After the delay of its initial liftoff, TESS was rescheduled for an April 18 launch. When it does go up, it will settle into its orbit sometime in June and begin scanning the cosmos. Regardless of whether it finds any extraterrestrials, the search for life will be a little more intelligent.

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