Dr. Jeffrey C. Smith
Data Scientist
SETI Institute
NASA Ames Research Center
M/S 269-3
Moffett Field, CA 94035-0001
https://www.seti.org/our-scientists/jeffrey-smith

office: 650-604-0556
cell: 650-804-9644

Exploring Beyond Earth's Atmosphere with Human-Machine Teams

NASA's highly successful Kepler Mission has revolutionized our understanding of the Galaxy. We now know that planets, even Earth-size planets in the habitable zone, are common. With the end of the Kepler Mission we now look to the future with the Transiting Exoplanet Survey Satellite (TESS) which will discover thousands of exoplanets in orbit around the brightest stars in the sky. In a two-year survey, TESS will perform an all-sky search of more than 200,000 stars for temporary drops in brightness caused by planetary transits. With Kepler and TESS, humanity is finally at the verge of studying the masses, sizes, densities, orbits, and atmospheres of a large cohort of small planets, including a sample of rocky worlds in the habitable zones of their host stars which may prove to host life.

The massive data sets generated by Kepler and TESS must be meticulously combed for the weakest planetary signals every month. While a daunting and error-prone task for humans, this is an exciting opportunity for the breakthroughs recently seen in machine learning. Specifically, traditional methods for identifying planet transits require extensive data processing pipelines followed by extensive human vetting. This manual process risks loss of information due to the data processing and to inconsistency and biases due to individual human vetters. The latest advancements in machine learning will allow an objective classifier to minimize the losses of information and greatly lessen the burden on the human vetters, in addition to providing assessment of quality and score to each planet candidate, freeing the humans to concentrate on border cases and other more interesting investigations.