Confirmation and Characterization of the Exoplanet Candidate TOI-5770.01 Using Ground-Based Observations

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A planet is an object that moves through space in a fixed path, orbiting a star or remnants of a star. An exoplanet is a planet outside our solar system. The TESS space telescope has identified numerous candidate systems, each potentially hosting an exoplanet. In this project, I focused on one such system: TOI-5770.01. The goal was to confirm the presence of the exoplanet and characterize its properties using the transit method. TESS also uses the transit method, which detects the dip in a star's brightness as a planet passes in front of it. However, our ground-based observations provided higher spatial resolution, improved signal-to-noise ratio (SNR), and a higher cadence of observations, allowing for more detailed analysis. Based on the predicted transit time, we conducted manual observations using the Large Array Survey Telescope (LAST) in southern Israel, capturing 438 images of the host star. I analyzed the star's brightness in each image to detect and measure the transit signal. From the observed light curve, I derived the planet's orbital parameters and estimated its radius. We then collaborated with Dr. Dave Latham and his team in the United States, who performed 16 spectroscopic observations using the TRES spectrograph. These observations revealed a periodic shift in the star's radial velocity, providing further evidence for the presence of an exoplanet. Based on the radial velocity data, I could also estimate the planet's mass. The host star is part of a binary system. The discovered exoplanet is estimated to have R= 1.12 R_jupiter, M = 1.65M_jupiter, Period- 1.453 days, and an equilibrium temperature of approximately 1,450 K.

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