A Search for Exoplanets in the Open Star Clusters Messier 35 and Koposov 62 Using A Novel Large-Scale Photometric Algorithm for the "Crippled" Kepler Mission

Dholakia, Shashank
Dholakia, Shishir
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To date, over 5000 exoplanet candidates have been discovered orbiting around isolated stars. All of these stars once existed in open star clusters, yet the existence of exoplanets in open clusters has not been well studied. In this project, we search for exoplanets in two open clusters, Messier 35 and Koposov 62. We hypothesized that we would not find exoplanets in clusters because gravitational interactions between stars would eject forming exoplanets. The Kepler Space Telescope was instrumental in the search for exoplanets, but it failed in 2013. The salvage mission, dubbed K2, allowed limited observations to continue. We used images of the clusters and a control group of isolated stars from the K2 mission taken every 30 minutes for 85 days. We developed a novel, K2-optimized photometric computational pipeline to search for exoplanets using the transit method. We discovered four exoplanet candidates in a sample of 620 clustered stars. In an equal sample of isolated stars, no exoplanets were found. Three exoplanets found were hot-Jupiters, and one was a super-Earth. All four exoplanets orbit within 0.1 AU from their host star. We conclude that exoplanets do exist in open clusters. Furthermore, their prevalence may even be higher in open clusters than in other stars. A possible explanation for our results is the gravitational recapture of ejected exoplanets in open clusters. We are looking to analyze four more clusters with future K2 campaigns. Our discovery of exoplanet candidates in open clusters further the understanding of planetary formation around all stars.

Awards Won:
First Award of $5,000
European Organization for Nuclear Research-CERN: Third Award $500