**University of Leicester**

**Future 50 PhD Scholarship**

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| **Project Reference** | SPACE Casewell |

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**Section 2 – *Project Information***

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| **Project Title** | Planet hunting in the near-infrared with the Next Generation Planet Survey | |
| **Project Highlights:** | 1. | Calibration of the new near-infrared camera for NGTS using laboratories at the University of Leicester. |
| 2. | Development and exploitation of artificial intelligence techniques to search for planets in NGTS data |
| 3. | Using data from the new camera and NGTS an understanding of how young stars in Orion interact with their surroundings will be developed. |
| **Project Summary** | | |
| The Next Generation Transit Survey (NGTS: Wheatley et al., 2018, MNRAS, 475, 4476) is an STFC-supported facility consisting of 12 20cm mirror telescopes fitted with wide field optical CCDs optimised for operation in the 520-890 nm wavelength range. NGTS conducts wide field exoplanet surveys, and targeted observations of single transit events from NASA’s TESS mission, star clusters and bright stars. NGTS has been hugely successful with over 30 exoplanets discovered to date and data used to confirm many others, as well as supplementary science including stellar flares, cataclysmic variables and stellar clusters.  We have recently secured funding to purchase a near-IR camera to increase the capability of NGTS – with it we will be able to detect planets around cooler host stars, and obtain simultaneous photometry at 2 wavelengths. We anticipate these observations will be of open star clusters, in particular those that are ~10 million years old or younger, such as the well-known Orion region. These star forming regions are full of newly formed stars, many of which are themselves suspected to be forming planets and hosting protoplanetary discs. These stars are often very dynamic, accreting gas and dust from their environment and showing flares and outbursting behaviour. Understanding these young stars and how they interact with their environment is crucially important for understanding how planets form.  We are already monitoring the well-known 1-10 Million-year-old Orion Nebula Cluster and its vicinity for around 200 days with NGTS, and have extracted lightcurves for over 2000 stars in the optical. We will add to these observations with the new infrared camera. The Orion Nebula Cluster has also been observed by JWST early in its mission, and our data, monitoring many stars with a long baseline in the optical and infrared will add insights into these deep, snapshot observations.  This interdisciplinary PhD project will combine calibrating and characterising the detector within the camera with on sky observations taken at the NGTS facility in Chile. This project will exploit artificial intelligence (AI) techniques for large-scale image recognition to search the new near-IR lightcurves and combine them with optical lightcurves obtained with NGTS to automatically discover new planets around faint, cool stars. | | |