2025 EECMS Summer Internship Application Form

Main Supervisor(s)	Aloke Phatak & Arash Bahramian
Other supervisors (if applicable)	
Project Title	Statistics and data science methods for extracting information from novel astronomical data
Student location(s) for the project	Curtin University Bentley Campus
Duration of project	Eight weeks
Project Description	We propose three possible projects that the student can choose from depending on his/her aptitudes and interests. The projects below would suit a second- or third-year student who has programming skills, a good background in statistics/data science, and a willingness to learn and implement new methods using novel astronomical data. **Project 1: Applying forecasting techniques to astronomical time-series** Stars in our Galaxy exhibit various forms of variability on timescales of minutes to years. A large fraction of these variabilities are stochastic and unpredictable, however underneath that stochasticity, there are trends and patterns caused by effects such as stellar pulsation or eclipses with the star being blocked by planets around it or its stellar companion. In this project, we aim to assess the efficacy of forecasting techniques on time-series of stars as captured by astronomical observatories. Can forecasting methods help us predict the behaviour of stars? **Project 2: Exploring Energetic astronomical events with frequency-domain and spectral analysis** Fast radio bursts (FRBs) are extremely energetic and short pulses of light from exotic astronomical events, lasting fractions of a second. Over the past few years, thanks to the advancement of astronomical observatories in Australia and around the world, we have been able to obtain detailed astronomical time-series on these events. However, the nature of these events, and the physics of how they form is still elusive. In this project, we aim to explore new data collected by astronomical observatories to explore frequency-domain properties of these bursts to understand the nature of these energetic events. **Project 3: in search of black holes in large astronomical datasets with supervised and unsupervised techniques** Over the past decade, astronomers have amassed large datasets of stars and other celestial bodies in our Galaxy. The nature of many of these objects is not yet determined. Theoretical studies speculate that our Galaxy has a large population of black holes hidden among

	stars. In this project, we aim to use supervised and unsupervised classification techniques to identify possible black holes and other types of celestial objects in datasets such as the data gathered by the Gaia Space Telescope, a catalogue of 2 billion celestial objects with 200 features measured for each.