Project title	Name(s) of Supervisors	Supervisors email address	Project description	Skill requirement
Decoding Human Brain Signals	*Zhiyong Wang*	zhiyong.wang@sydney.edu.au	The human brain plays an eccentric role of a human life, from wellbeing and heath to intelligence. With technological advances, various types of brain signals have been widely used for disease diagnosis and treatment, as well as understanding brain itself. This project aims to investigate advanced deep learning techniques for decoding brain signals, such as understanding what a subject has perceived or experienced. The outcomes of this project could assist doctors and medical researchers in disease diagnosis and treatment and discoveries in neuroscience.	Deep Learning, Strong Programming Skills (Python)
Domain Randomization for Reinforcement Learning in Bimanual Manipulation	*Fabio Ramos, Sasha Rubin*	fabio.ramos@sydney.edu.au, sasha.rubin@sydney.edu.au	This project will develop novel reinforcement learning techniques for high-dimensional robotics problems such as dual-arm manipulation for assembly tasks. We will leverage parallel simulators such as Nvidia's Isaac Sim to train policies in simulation before deploying in the real world. Applications include humanoids, industrial assembly, and food preparation.	Potential candidates should be familiar with the basics of machine learning and statistical inference, and competent programmers in python.
Federated Koopman Learning for Enhanced Multivariate Time Series Forecasting	*Nguyen Tran*	nguyen.tran@sydney.edu.au	Multivariate Time Series (MVTS) forecasting has become increasingly relevant in our data-driven society, dealing with complex interactions among multiple variables. Traditional forecasting methods such as ARIMA are often inadequate due to their requirement for data stationarity, which is rarely present in real-world MVTS data. This limitation has prompted a shift towards more robust machine learning models like Informer and Autoformer, known for their ability to handle long data sequences efficiently. Despite these advancements, deploying such models on edge networks raises significant challenges, particularly in terms of privacy and computational efficiency. This proposal introduces a novel approach called Federated Koopman Learning (FedKoop), designed to enhance the privacy and efficiency of MVTS forecasting in distributed computing environments. By integrating Koopman operator theory with Federated Learning (FL), our framework, FedKoop, offers a groundbreaking solution to handle non-stationarity in MVTS data through the innovative use of Optimal Mode Decomposition (OMD). This approach distinctly separates non-stationary and stationary components, optimizing data analysis across distributed networks.	Python
Classification of rice grain types using deep learning	*Hazem El-Alfy*	hazem.elalfy@sydney.edu.au	Many countries, namely in South-East Asia, export rice as a significant part of their national income. It is essential to develop a good reputation for continued exportation. So far, rice quality has been manually inspected for the most part to eliminate broken and lower-grade grains. However, with mass production, the cost of this manual inspection becomes virtually prohibitive. Therefore, we suggest automating this process using state-of-the-art machine learning and image processing techniques. While significant work was done in the area of classifying grain types and varieties, grain quality classification is still open to improvement. If time permits, we may also develop our own dataset, which will be used as a standard for the classification of Vietnamese rice quality.	Knowledge of machine learning, deep learning, Python coding, Keras or PyTorch libraries
Investigating Federated Consensus in Stellar	*Qiang Tang*	qiang.tang@sydney.edu.au	We will understand how the consensus protocols work in the real world Stellar network, and analyze its actual security (and all assumptions).	Basic logic and computer science foundation, with blockchain or cryptography background would be a big plus