2025 EECMS Summer Internship Application Form

Main Supervisor	Dr Mahbuba Afrin
Other supervisors (if applicable)	
Project Title	Uncertainty-Aware Robotic Task Allocation in Agricultural Cyber-Physical Systems
Student location(s) for the project	Online or Curtin University Bentley Campus
Duration of project	Eight weeks
Project Description	Robots are indispensable in precision agriculture, automating critical tasks such as planting, monitoring, and harvesting, which boosts efficiency and productivity while minimizing resource wastage and environmental impact. Equipped with advanced sensors and data analytics, these robotic systems provide real-time insights into crop health and soil conditions, enabling precise and informed decision-making. However, the agricultural environment is challenged with uncertainties like weather variations, sensor inaccuracies, and unexpected obstacles. Uncertainty-aware task allocation is crucial for ensuring that robotic operations remain robust and reliable despite these challenges. By integrating uncertainty models into task allocation strategies, robots can dynamically adapt to changing conditions, optimize resource usage, and mitigate risks, thereby significantly enhancing the overall effectiveness and sustainability of precision agriculture. Therefore, the primary goal of this project is to develop and implement uncertainty-aware task allocation strategies for robotic systems in agricultural cyber-physical systems (CPS). The primary goal of this project is to develop and implement uncertainty-aware task allocation strategies for robotic systems in agricultural cyber-physical systems (CPS). Throughout this eight-week project one research intern will work on the following activities: **Week 1-2: Literature Review and Problem Definition** • Review existing research on uncertainty modelling and task allocation in robotics and agricultural CPS. • Identify key sources of uncertainty in agricultural CPS. **Week 3-4: Methodology Development** • Develop probabilistic and robust optimization models for task allocation under uncertainty using machine learning. • Design a dynamic task allocation algorithm adaptable to real-time changes. • Select software tools for implementation, especially python based. **Week 5: Data Collection and Simulation Setup** • Gather or use existing datasets to model uncertainties. • Set up machine learning based simulation environments to test uncertainty aware task allocation strategies.

	Week 6: Model Implementation and Testing • Implement task allocation strategies using selected tools. • Conduct simulations to evaluate performance under various uncertainties. • Analyze results to identify patterns and impacts. **Week 7-8: Documentation and Presentation** • Document methodology, implementation, and findings. • Prepare a comprehensive report and presentation. • Submit report and present findings to project supervisors. **Required Skills** • Proficiency in programming languages such as Python, MATLAB. • Ability to preprocess, analyze, and interpret data. • Strong analytical skills to identify and address project challenges. • Proficiency in documenting methodologies, processes, and findings.