PhD Scholarship Opportunity

The Food Security Program within the USQ Computational Engineering and Science Research Centre, led by Professor Thanh Tran-Cong, is currently offering an APA Scholarships to support the PhD project described below.

Scholarships carry a tax-free stipend of $30,000 pa for a period of 3 years plus $5,000 for conference attendance.

**PhD Project: Artificial intelligence framework for real-time, site-specific irrigation of field crops**

**Supervisors:** Dr T. Nguyen-Ky  
Dr A. McCarthy

**Advisors:** Prof T. Tran-Cong  
Prof S. Raine  
A/Prof C. Baillie

Spatial and temporal variability of crop factors can have a significant influence on agriculture production by reducing yield and quality of produce (Raine et al., 2007). Soil properties including fertility, physical properties, and chemical properties, are spatially variable within fields. Also variable are crop characteristics such as crop density, height, stress, biophysical properties, structure, type and genetics (Zhang et al., 2002). The management practices may contribute to the variability of the field by impacting on the level of nutrients, compaction and acidity of the soil. Meteorological conditions (e.g. rainfall, temperature and sunlight) can affect the crop yield (A. McCarthy, 2010).

This research will study the input of spatially variable soil and plant parameters of field crops, implement control strategies to optimise irrigation application, and provide simulation or control signal outputs. The control strategies utilise industry crop production models. Control strategies can utilise a model for forecasting crop response to different inputs (e.g. irrigation and fertiliser). An accurate crop model is required to ensure that the infield response is aligned with the predicted response and that the crop management can be optimised. This can be achieved by calibrating and refining the input parameters of the model according to the infield measurements.

The crop model for each crop type must be specifically programmed into the framework and updated for new crop varieties. However, industry models may not be updated with the development of the new varieties, and may not consider all the soil-plant-water relations. A game theory and artificial intelligence-based approach to crop modelling would provide an inbuilt self-learning capability to irrigation optimisation and real-time adaptive control. This approach would enable the same framework to adapt, using real-time sensor feedback of weather and soil moisture and plant growth parameters, to a range of agricultural crops.

Please direct enquiries regarding this PhD project to thanh.tran-cong@usq.edu.au

For more details on this scholarship and how to apply please visit: http://www.usq.edu.au/scholarships/usq/australian-postgraduate-award