

ICRAR & ICRAR-Pawsey Summer Studentships 2016 - 2017 Project Proposal

Project Details	
Project Title	Innovative signal domain processing to improve data flow for SKA
Primary Supervisor	Maria Rioja
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Additional Supervisors & Contact Details	Richard Dodson Andreas Wicenec
Additional Resources Required	Matlab licence
Student Location for project	UWA
Project Description	<p>We are in one of the most exciting periods for Radio Astronomy. The Square Kilometre Array (SKA) is the focus of intensive preparatory investigation. SKA will provide two orders of magnitude increase in sensitivity, which will provide a massive increase in the possible scientific projects. Nevertheless to take advantage of these possibilities we need a similar increase in methodological developments. In the Data Intensive Astronomy group in ICRAR we are exploring new methodologies and approaches in High Performance Computing to reduce the massive computing power otherwise required.</p> <p>We are using data from pathfinder facilities, such as the Murchison Widefield Array, to explore pre-conditioning of the data to massively improve the processing for data calibration and imaging. Areas the project will explore include:</p> <ul style="list-style-type: none"> • Reduction of noise in the signals. Noise contributions to the signals are spread in frequency (white noise) whereas the sky signal is limited in bandwidth. Correct filtering of the data will improve the signal to noise. This simple approach has not been applied before and will bring about instantaneous improvements. The numerical investigations will be in <i>Matlab</i> (or similar, if preferred) with simulated data. • Once filters and methodologies have been developed we will export these into the standard astronomical computing environment, <i>casapy</i>. Once the filters are implemented we will apply this to SKA Pathfinders, such as the Murchison Widefield Array (MWA), to provide the initial demonstrations of the benefits of these approaches. <p>It is expected that this project will be developed into a PhD</p>

	position. So the project is particularly suitable for those considering continuing with astronomy.
Student Attributes	
Academic Background	Strong mathematical and computing skills. Interested in PhD position in future.
Computing Skills	Expertise with <i>Matlab</i> or similar
Training Requirement	Will learn fundamentals of Radio Astronomy and how to interact with data, using a combination of <i>casapy</i> and <i>python</i> (or similar)
Project Timeline	
Week 1	Setup and orientation
Week 2	Exploration of simulated data and design of filters (matlab)
Week 3	Demonstration of filters on simulated data, reducing noise
Week 4	Demonstration of filters on real data, reducing noise and contribution from other sources.
Week 5	Finalisation of filter design
Week 6	Implementation of filter design in <i>python</i> & <i>casapy</i>
Week 7	Confirmation of previous results in new environment
Week 8	Demonstration of filters on real data with imaging
Week 9	Filtering real data to reduce field of view
Week 10	Preparation of results & conclusions
	Final Presentation