ICRAR & ICRAR-Pawsey Summer Studentships 2018-2019
Project Proposal

Project Details	
Project Title	**Optimizing galaxy formation and evolution models**
Primary Supervisor	Rodrigo Tobar
Primary Supervisor Availability	All the time
Contact Details	rtobar@icrar.org
Additional Supervisors & Contact Details	Claudia Lagos claudia.lagos@uwa.edu.au
Additional Resources Required	None
Pawsey Centre Hardware Use	Yes
Software Required	Linux or MacOS Python 2 and/or 3
Student Location for project	ICRAR-UWA
Project Description	Semi-Analytical Models (SAMs) are tools that allow us to study how galaxies form and evolve in a simulated Universe. Because they implement a big number of physical processes, with various degrees of freedom, they allow astronomers to explore how this formation and evolution of galaxies varies as different parameters change. This big number of parameters also means that finding the "optimal" set of parameters that produces the "best looking" SAM outputs is impossible (because the parameter space is too big). A common technique in these cases is to use heuristics (e.g., MCMC, PSO, genetic algorithms, etc.) to explore the parameter space more efficiently and find local optima. During this project, a tool will be developed to execute such heuristics over ***shark***, a new SAM developed at ICRAR. This tool needs to run ***shark***, read its outputs, assess how "good" they look, calculate a new set of parameters (using some heuristic) that will improve the results, and run again. The tool will be written in Python, so some basic python coding skills are necessary. It also needs to correctly integrate itself with HPC centers, like Pawsey and our local *pleiades* cluster, but previous HPC knowledge is not required.
Student Attributes	
Academic Background	Basic Computer Science / Software Engineering background Comfortable with basic mathematics
Computing Skills	Familiarity with Linux or MacOS and command-line usage Moderate Python (2 and/or 3) knowledge, numpy is a plus
Training Requirement	Basic HPC training will be provided
Project Timeline	
Week 1	Getting familiar with the shark ecosystem
Week 2	Automatic evaluation of shark outputs
Week 3	Automatic evaluation of shark outputs
Week 4	Integrate output evaluation into heuristics
Week 5	Integrate output evaluation into heuristics

Week 6	Getting familiar with HPC clusters
Week 7	Integrating heuristics with HPC clusters
Week 8	Integrating heuristics with HPC clusters
Week 9	Bug fixing and final touches
Week 10	Final Presentation and Reporting