

Developing a framework to apply baseline-dependent averaging to superstation beam-forming for the next generation of telescopes: the upcoming SKA and ngVLA

The current generation of radio-interferometers, including MeerKAT and LOFAR, are putting an unprecedented emphasis on both higher resolutions and sensitivities than previous instruments. This results in the exploration of a new parameter space, equivalent to wide-field VLBI.

With this breaking ground on unprecedented parameter spaces comes the development of new techniques, including the coherent sum of interferometer elements into a single “super-station” for the purposes of array calibration and imaging. This method is powerful, but comes with drawbacks, including a loss of signal coherence. The aim of this project is to develop and extend current mathematical frameworks to characterise, and ideally correct, these drawbacks. Such a skill set will be very valuable for the future development of radio telescope facilities, including future upgrades to the SKA and the upcoming ngVLA, as well as in industry.

This project will be very suitable for mathematically or technically minded students (e.g. computer science and/or applied mathematics backgrounds) who are interested in working in the field of radio-astronomy and techniques. The student will extend the existing baseline-dependent weighting schemes used in radio-interferometry to the super-station beamforming; this will result in a publication in an A-rank scientific journal.

Special requirements: A good mathematical understanding will be very valuable. Familiarity with python coding and linux environment is a must. Access to a laptop is required.

- Research Area: Astronomy
- Project Level: Masters

This Project Is Offered At The Following Node(s):

- UCT
- NWU

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