

The University of Queensland - IIT Delhi Academy of Research Joint PhD Project

Project title	Beamforming and localization using extremely large antenna arrays
Project code	UQIDAR 00200
Project description	<p>Antenna arrays are capable of changing their radiation patterns with time and frequency. This is achieved using signal processing algorithms that control the array and can be used to achieve a focused beam towards a particular point in space through a superposition of beams of the individual antenna elements. In the context of 5G and beyond 5G communication systems, large number (100's) of distributed base station (BS) antenna could be used to jointly serve many distributed users. The goal of localization or positioning is to estimate the user location. In wireless networks localization is achieved by first collecting measurements such as signal strength, time of arrival (ToA), angle of arrival (AoA) and using signal processing techniques to estimate the location. The need for localization with improved accuracy arises in numerous location-based services such as navigation, search and advertising, gaming, and infotainment. In future communication systems, the availability of large number of antenna at BS and larger bandwidths would open new dimensions and opportunities for user device localization. The use of antenna arrays would allow angle of arrival/departure estimation in addition to three dimensional spatial location estimation. The use of fully digital arrays would enable advanced signal processing algorithms for localization. In this project, we will develop beamforming and localization techniques suitable for extremely large antenna arrays. We will also address challenges such as the need for synchronization among BSs and with the user devices and the impact of antenna position/orientation misalignment on the localization accuracy using large arrays.</p>
Project outcomes	<ul style="list-style-type: none"> - Beamforming techniques and beam optimization algorithms for distributed large antenna arrays - Localization algorithms using distributed large antenna arrays - Beamforming algorithms that can enable improved localization for simultaneous beamforming and localization - Analyse the impact of antenna position/orientation misalignment on the localization accuracy using large arrays
Advisory team	<p>UQ Principal Supervisor Dr Chamith Wijenayake Information Technology and Electrical Engineering c.wijenayake@uq.edu.au http://researchers.uq.edu.au/researcher/25435</p> <p>IITD Principal Supervisor Assistant Professor Seshan Srirangarajan Electrical Engineering 0 seshan@ee.iitd.ac.in http://web.iitd.ac.in/~seshan/</p>
Type of student	Applications are open to: I or q students who meet eligibility criteria .
Discipline background of student	Ideally, this project requires students with a background in: Electrical and Communication Engineering Computer Engineering Signal Processing

Ideal candidate

Essential Capabilities: Strong mathematical background, strong background in signals and systems, probability theory and stochastic processes.

Desirable Capabilities: Background in signal processing and optimization.

Expected qualifications (Courses/Degrees etc.): Bachelors or Masters in Electrical and Communication Engineering or allied areas

Application
process

Apply online by the due date: <https://www.uqidar.org/students/how-to-apply/>