

Title: The Performance of MUSIC-Based DOA In White Noise With Missing Data.

Speaker: Raj Tejas Suryaprakash

Abstract:

Multiple Signal Classification (MUSIC) is a widely used algorithm for estimating the direction of arrival (DOA) of signals impinging on a sensor array. We analyze the performance of MUSIC-like algorithms in the large array setting, where we have relatively few signal-plus-white-noise snapshots, and where only a random, sample-independent fraction of the data is observed. Using random matrix theory, we obtain a closed-form, minimal stochastic representation for the DOA estimation error, that captures how the performance depends on the number of sensors, number of snapshots, Signal-to-Noise ratio (SNR) and the probability of observing an entry of the data matrix. This minimal representation facilitates accurate computation of the DOA mean squared error (MSE) and other desired statistics. Our analysis brings into sharp focus the presence of a phase transition that separates a regime where MUSIC-based algorithms accurately localize a source, from a regime where the source is present but the algorithms fail. The critical phase transition threshold depends on the number of sensors, the number of samples and the probability of observing an entry of the data matrix in a simple manner that we make explicit. We validate our asymptotic theoretical predictions with simulations.