

MACQUARIE UNIVERSITY
STATISTICS DEPARTMENT SEMINAR

Speaker: Professor Barry Quinn, Department of Statistics, Macquarie University

Date: Tuesday 22 May 2018, Time 1-2pm

Venue: Room 264, 14 Sir Christopher Ondaatje Ave

Title: Estimation of Fundamental Frequency

Abstract:

A periodic function may be represented as an infinite sum of sinusoids, the Fourier series, with frequencies all integer multiples of a “fundamental” frequency. This is well-understood by musicians, and scientists and engineers working in acoustics and speech. Regularly-sampled audio data may thus be represented as (finite) sums of sinusoids with unknown fundamental frequency, amplitudes and phases, in additive noise. In many applications, the noise cannot be regarded as “white”, i.e. cannot be modelled as realisations of i.i.d. random variables, and cannot be assumed to be Gaussian. Most algorithms assume both whiteness and Gaussianity. After reviewing some statistical theory for the (regression) estimator of frequency, and for the estimation of the fundamental frequency, I shall show how to estimate simultaneously the fundamental frequency, amplitudes and phases, and the spectral density of the noise process. Neither whiteness nor Gaussianity is assumed, and the procedure may be automated, so that both the number of sinusoids and the number of noise parameters are estimated as well. Automation is important, as the applications are to online, real-time processing.

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