

Testing for Local Stationarity in Acoustic Signals: Parametric and Nonparametric approaches

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3:30-4:30 pm

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4-178 EECS Bldg.

ABSTRACT: This talk treats nonstationarity detection in the context of speech and audio time series, with broad application to stochastic processes exhibiting locally stationary behavior. Many such processes, in particular information-carrying natural sound signals, exhibit a degree of controlled nonstationarity that varies slowly over time. The talk first describes the basic concepts of these systems and their analysis via local Fourier methods. Parametric approaches appropriate for speech are then introduced by way of time-varying autoregressions, along with nonparametric approaches based on time-localized power spectral density estimates, along with an efficient offline bootstrap procedure based on the Wold representation. The talk includes asymptotic results as well as practical examples and applications in speech forensics and audio waveform segmentation.

BIOGRAPHY: Daniel Rudoy is with the Statistics and Information Sciences Laboratory at Harvard University, where his doctoral dissertation work is focused on statistical signal processing and time-frequency analysis with application to robust speech processing. He received BSE and MSE degrees in computer science, and a BA in mathematics, from the University of Pennsylvania in 2002, and subsequently worked for three years at MIT Lincoln Laboratory, designing efficient approximate inference algorithms for large-scale graphical models. Since 2005 he has held consecutive US National Science Foundation and National Defense Science & Engineering graduate fellowships, and in 2008 he was awarded a distinction in teaching for his contributions to engineering statistics at Harvard. His other research interests include time series analysis, statistics on graphs, and Monte Carlo methods for applications in electrical engineering and computer science.