



The University of Chicago

Department of Statistics

Seminar

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“Multiple Alignment of Continuous Time Series”

Monday, October 18, 2004 at 4:00 PM
133 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

Say you repeat an experiment several times, each time measuring a single scalar quantity over time, resulting in several "traces" or "curves". Typically the curves will exhibit systematic variability (e.g. time warping, amplitude shifting) as well as noise. How can we automatically align all of the curves, accounting for as much of the systematic variability as possible?

I will present the Continuous Profile Model (CPM), a generative probabilistic model (similar to a Hidden Markov Model), in which each observed time series is a non-uniformly subsampled version of a single latent trace, to which local rescaling and additive noise are applied. Given a set of observed traces, the model parameters can be fit in an unsupervised way by maximum likelihood using the EM algorithm. After fitting, the estimated latent trace represents a canonical, high resolution fusion of all the replicates. As well, an alignment in time and amplitude of each observation to this trace can be found by inference in the model. We apply the CPM to successfully align speech signals from multiple speakers and sets of Liquid Chromatography-Mass Spectrometry proteomic data.

Joint work with Jennifer Listgarten and Radford Neal.