**Continuous Speech Recognition  
Using Linear Dynamic Models1**

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*Abstract*— Hidden Markov models (HMMs) rely on an assumption that speech features are temporally uncorrelated. HMMs typically assume a diagonal covariance matrix where correlations between feature vectors for adjacent frames are ignored. A Linear Dynamic Model (LDM) is a Markovian state-space model that also relies on hidden state modeling, but explicitly models the evolution of these hidden states using an autoregressive process. An LDM is capable of modeling higher order statistics and can exploit frame to frame correlations of features in an efficient and parsimonious manner. In this paper, we present a hybrid LDM/HMM decoder architecture that postprocesses segmentations derived from the first pass of an HMM-based recognition. This smoothed trajectory model is complementary to existing HMM systems. An Expectation-Maximization (EM) approach for parameter estimation is presented. We demonstrate a 13% relative WER reduction on the Aurora-4 clean evaluation set, and a 13% relative WER reduction on the babble noise condition.

*Keywords*— Linear dynamic models, nonlinear statistical modeling, speech recognition, acoustic modeling

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