ECE Seminar
Non-Parametric Bayesian Approaches for Acoustic Modeling in Speech Recognition

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Abstract:

Balancing unique acoustic or linguistic characteristics, such as a speaker's identity and accent, with general behaviors that describe aggregate behavior, is one of the great challenges in applying nonparametric Bayesian approaches to human language technology applications. The goal of Bayesian analysis is to reduce the uncertainty about unobserved variables by combining prior knowledge with observations. A fundamental limitation of any statistical model, including Bayesian approaches, is the inability of the model to learn new structures. Nonparametric Bayesian methods are a popular alternative because we do not fix the complexity a priori (e.g. the number of mixture components in a mixture model) and instead place a prior over the complexity. This prior usually biases the system towards sparse or low complexity solutions. Models can adapt to new data encountered during the training process without distorting the modalities learned on the previously seen data - a key issue in generalization. In this talk we discuss our recent work in applying these techniques to the speech recognition problem and demonstrate that we can achieve improved performance and reduced complexity. For example, on speaker adaptation and speech segmentation tasks, we have achieved a 10% relative reduction in error rates at comparable levels of complexity.

Biography:

Joseph Picone received his Ph.D. in Electrical Engineering in 1983 from the Illinois Institute of Technology. He is currently a professor in the Department of Electrical and Computer Engineering at Temple University. His primary research interests are machine learning approaches to acoustic modeling in speech recognition. His research group is known for producing many innovative open source materials for signal processing including a public domain speech recognition system (see www.isip.piconepress.com). He has also spent significant portions of his career in academia, research and the government, giving him a very balanced perspective on management of R&D. Dr. Picone is a Senior Member of the IEEE and has been active in several professional societies related to human language technology. He has authored numerous papers on the subject and holds several patents in this field.