Spring Colloquium

February 27, 3:30-4:30pm
Seitz 313

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Forecasting in Big Data Environments: an Adaptable and Automated Shrinkage Estimation of Neural Networks (AAShNet)

This paper considers improved forecasting in possibly nonlinear dynamic set- tings, with high-dimension predictors (big data environments). To overcome the curse of dimensionality and manage data and model complexity, we exam- ine shrinkage estimation of a back-propagation algorithm of a neural net with skip-layer connections. We expressly include both linear and nonlinear compo- nents. This is a high-dimensional learning approach including both sparsity L1 and smoothness L2 penalties, allowing high-dimensionality and nonlinearity to be accommodated in one step. This approach selects significant predictors as well as the topology of the neural network. We estimate optimal values of shrinkage hyperparameters by incorporating a gradient-based optimization technique resulting in robust predictions with improved reproducibility. The latter has been an issue in some approaches. This is statistically interpretable and unravels some network structure, commonly left to a black box. An additional advantage is that the nonlinear part tends to get pruned if the un- derlying process is linear. In an application to forecasting equity returns, the proposed approach captures nonlinear dynamics between equities to enhance forecast performance. It offers an appreciable improvement over current uni- variate and multivariate models by RMSE and actual portfolio performance.