Michael Fairbank, University of Essex, UK.

Date: September 28

„Tensorflow and Deep Learning“

The course introduces Tensorflow as a programming language from scratch and shows how to use it to build simple neural networks and perform backpropagation. Students are encouraged to program along with the tutor. The basic underlying workings of TensorFlow and neural networks are taught without resorting to higher-level black box packages, so that students can gain a fundamental understanding of how deep learning works. The course also gives an introductory overview of popular deep learning models, including convolutional neural networks and recurrent neural networks. The course alternates programming exercises with taught theory throughout the day.

Working language: Python

Hannes Mueller, Institute for Economic Analysis, Barcelona School of Economics, Barcelona.

Date: September 29

„Forecasting with Millions of News Articles as Data: The Methodology Behind Conflictforecast.org“

Content:

- Discussion of the background to the project Conflictforecast.org
- Introduce the text mining unsupervised LDA using some news data
- Introduce a discussion of supervised learning using random forests

The application would then be:

- Estimation of an LDA
- Introduction to rolling forecasting using machine learning

Working language: Python

Christian Brownlees, Universitat Pompeu Fabra, Barcelona.

Date: September 30

„High-Dimensional **Macroeconometric** Time Series Models: Big Data and Machine Learning“

The course provides an introduction to the state-of-the-art econometric and statistical techniques used for the analysis of large panels of economic and financial time series.

The course begins by reviewing the properties of the classic linear regression model in a large dimensional environment. It then introduces some of the most popular methodologies used to carry out estimation in such a setting, namely regularized estimation techniques such as Ridge, LASSO and Elastic-net. The course then focuses on showing how this methodology can be used for forecasting economic and financial time series using large panels. These techniques are applied to carry out forecasting using the FRED-MD dataset.

The second topic of the course is covariance matrix estimation in large dimensions. It is shown that the performance of the classic sample covariance estimator is poor when the dimensionality of the covariance is large. This motivates a large literature that proposes to regularize the sample covariance using a number of different strategies. In particular, the course focuses on the class of shrinkage estimators proposed by Ledoit and Wolf. These methods are illustrated with an application to asset allocation.

The third and final topic of the course is the estimation of large dimensional network models. It is shown how the estimation of these models can be cast as either a large covariance or a large Vector Autoregression estimation problem subject to appropriate sparsity constraints. These network techniques are then applied to estimate the CDS credit risk network of the European financial system as well to estimate the Granger volatility risk network of the US financial system.

Working language: Python