Master Research Seminar Summer Term 2018

The main topic of this research seminar is going to be machine learning (ML) in finance. In general, we define ML as a set of methods that can automatically detect patterns in data, and then use the uncovered patterns to predict future data, or to perform other kinds of decision making under uncertainty. The seminar is geared towards understanding and discovering innovations based on a probabilistic approach to ML that can be applied to any problem involving uncertainty. This approach is closely related to the field of statistics, while it differs in terms of emphasis and terminology.

Your are going to work with a variety of probabilistic models, suitable for a wide variety of tasks such as: What is the best prediction about the future given some past data? What is the best model to explain some data? What measurement should be performed next?

The goal of the seminar is not to develop or replicate applications of ML algorithms or ad hoc techniques but instead to present a unified view of the field through the lens of probabilistic modeling and inference. Working as a team of 2 you are going to select a research paper from a leading journal that is related to ML in finance and try to obtain a clear comprehension and explain it in your own words. Given that, you will need to critically analyze and discuss the paper.

Possible topics:

- Bayesian statistics

  - Bayesian decision theory

  - Hierarchical Bayes

  - Bayesian model selection

- Markov and hidden Markov models

- Adaptive basis function models

  - Neural networks

  - Classification and regression trees

- - Boosting

  - Ensemle learning

- State space models

  - Kalman filtering/smoothing in econometric forecasting

- Clustering

  - Measuring (dis)similarity

  - Hierarchical

  - Spectral

  - Dirichlet process

- Latent variable models for discrete data

  - Latent Dirichlet allocation

- Deep learning

  - Deep Neural Networks

A list with research papers to choose from will be published on Moodle in the beginning of the summer term. The seminar can be conducted either in german or in english.

Literature:

Murphy, Kevin P. *Machine learning: a probabilistic perspective*. MIT press, 2012.