Introduction to Machine Learning and Network Analytics in Finance Minitrack

Peter Sarlin
Silo.AI
RiskLab at Arcada and Hanken School of Economics
peter@silo.ai

József Mezei
Åbo Akademi University
Avaintec Oy, Helsinki
jmezei@abo.fi

Recent years have seen a rapid evolution of methodologies in artificial intelligence and machine learning, and as a result, increasingly widespread use of these techniques in different domains. One of the most important application areas is finance, offering challenging problems for researchers and practitioners. In the early stages of the use of machine learning in finance, traditional quantitative data, e.g. historical time series, has been the main focus of analysis to develop various prediction models and to shed new light of stock markets, economic behaviour etc. More recently, following general trends in machine learning, contributions utilizing unstructured, specifically textual, data have started to appear and the number of these applications increases steadily. Previously untouched data sources, such as news articles, company announcements or even social media comments, can be utilized to improve or complement traditional financial data analytics tools. The selected contributions included in the minitrack offer novel contributions in applying machine learning tools, with the main focus on utilizing textual data. The contributions not only develop new predictive models, improving for example traditional neural network approaches, but rigorously test them on large real-life datasets illustrating the relevance of machine learning tools in finance.

The minitrack appeared in the program of the conference in 2016 for the first time, and since then there has been a set of submissions of high quality papers each year. This year, from five submissions, finally two articles have been selected to be presented in the minitrack during the conference.

The first article "*You are What You Say: The Influence of Company Tweets on Its Stock Performance*" is authored by Babajide Osatuyi (The Pennsylvania State University) and Behrooz Yoosefi (The Pennsylvania State University). The paper utilizes traditional sentiment analysis to investigate the relationship between stock performance and data from a social media platform (Twitter). The model utilizes both traffic-related (i.e. volume) and motivational metrics. The second group of metrics includes binary polarity measure and also more complex emotional constructs. The variables are integrated in a hierarchical regression model to predict stock performance (adjusted closing price). The empirical analysis focuses on the company Amazon using data from a one year period, and the main finding shows that the presence of positive emotions in tweets is the strongest predictor.

The second article "*A Tensor-based eLSTM model to predict stock price using financial news*" by Jinghua Tan, Jun Wang, Denisa Rinprasertmeechai, Rong Xing and Qing Li (Southwestern University of Finance and Economics, Chengdu) proposes a new Long Short-term Memory (LSTM) network model to predict stock prices. As the main novelty of the contribution, the authors develop a tensor-based event-LSTM model to combine fundamental financial data and sentiment data in the form of financial news. An important challenge in this process pertains to the fact that while numerical data from the stock market can be sampled with fixed time intervals, this is rarely the case with news data. The developed model allows for the representation of different data sources using tensors and can aid in determining the relationship of different predictors and stock movements. The model is tested using financial data from 95 companies listed in the China Securities Index and 12,170 news articles related to those companies. The experiments show that the proposal outperforms traditional approaches in terms of directional accuracy.