

Dear Sir or Madam,

We invite you to the 18th seminar of the monthly series of meetings conducted jointly by **QFRG** (Quantitative Finance Research Group) and **DSLAb** (Data Science Lab). The meeting will be devoted to the application of recurrent neural networks in algo trading.

This time Jakub Michańków, Paweł Sakowski and Robert Ślepaczuk will present the results of their study "LSTM in Algorithmic Investment Strategies on BTC and S&P500 Index". The Authors use LSTM networks to forecast the value of the BTC and S&P500 index, using data from 2013 to the end of 2020, with 1d, 1h, and 15 min frequencies. They introduce an innovative loss function, which improves the usefulness of the forecasting ability of the LSTM model in algorithmic investment strategies. They also apply combinations of LSTM models, optimized on in-sample period and tested on out-of-sample period, using a rolling window approach.

QFRG <http://qfrg.wne.uw.edu.pl/> is a place where research is conducted and experiences are exchanged between people engaged in examining occurrences in the world of investment from the perspective of both theory and practice, on the verge of science and business.

The activity of **DSLAb** <http://dslab.wne.uw.edu.pl/> is focused mainly on academic projects devoted to deepening the knowledge of DSLAb team, sharing it with other people interested in Data Science issues, and preparing scientific and didactic publications.

The meeting will take place on March 21st, 2022 (Monday) at 5:00 pm online on Google Meet platform. The meeting will be conducted in English. The presentation is scheduled for about 45 minutes, and after that, we invite you to a discussion.

Link to the meeting: meet.google.com/gnr-gfbh-fxc

Please log in at the latest at 4:50 PM. The presentation will start at 5:00 PM.

Joining a meeting implies **consent to the recording**. Please **turn off cameras and microphones** during the presentation and send the questions to the speaker in the chat.

Presentation abstract:

We use LSTM networks to forecast the value of the BTC and S&P500 index, using data from 2013 to the end of 2020, with the following frequencies: daily, 1 h, and 15 min data. We introduce our innovative loss function, which improves the usefulness of the forecasting ability of the LSTM model in algorithmic investment strategies. Based on the forecasts from the LSTM model we generate buy and sell investment signals, employ them in algorithmic investment strategies and create equity lines for our investment. For this purpose we use various combinations of LSTM models, optimized on in-sample period and tested on out-of-sample period, using a rolling window approach. We pay special attention to data preprocessing in the input layer, to avoid overfitting in the estimation and optimization process, and assure correct selection of hyperparameters at the beginning of our tests. The next stage is devoted to the conjunction of signals from various frequencies into one ensemble model, and the selection of best combinations for the out-of-sample period, through optimization of the given criterion in a similar way as in the portfolio analysis. Finally, we perform a sensitivity analysis of the main parameters and hyperparameters of the model.

The **next meeting** is planned for the middle of January 2022.

Sincerely,

Paweł Sakowski