

ARIMA vs LSTM on NASDAQ stock exchange data

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Project goal

The goal of the project was to compare two completely different models: statistical one (ARIMA) and deep learning one (LSTM) on a chosen set of NASDAQ data. Models were used to predict daily and monthly average prices of chosen companies listed on NASDAQ. Only one feature for both models was used – historical price value. MAPE (Mean Absolute Percentage Error) was used to assess and compare the models.

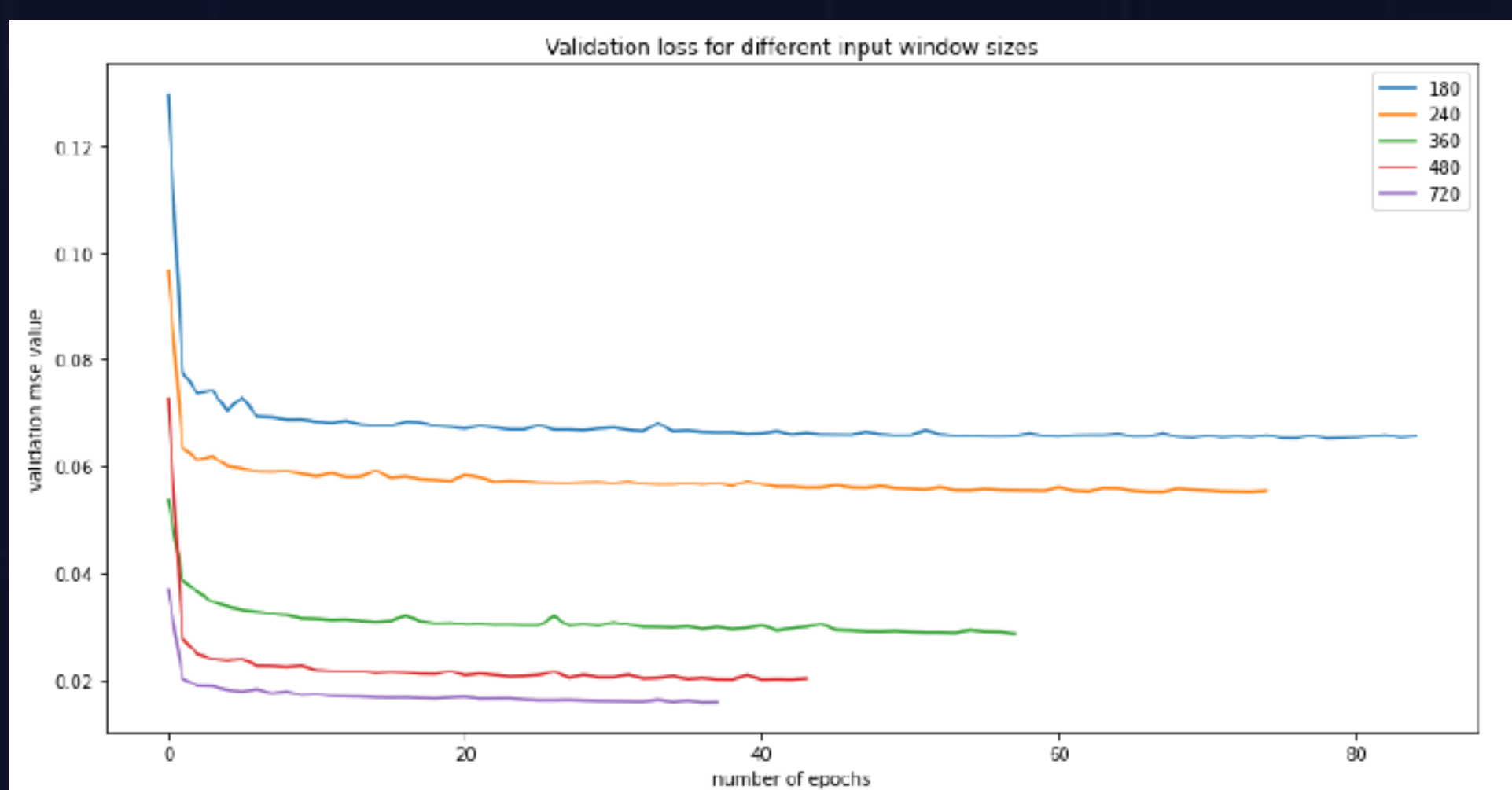
Input data

Selected 90 companies listed on NASDAQ stock exchange, from 9 most popular sectors (10 companies from each sector). Historical stock prices of a chosen companies, along with timestamps were chosen. Training the model covered stock prices from various sectors in order to avoid overfitting. Chosen sectors were: IT, automotive, financial, logistics & transport, clothing, food, energy, healthcare, and entertainment & media. Data was log-transformed before fitting the models.

Id	Timestamp	Stock Price
1	2008-01-02	105.24647
2	2008-01-03	104.91873
3	2008-01-04	101.84878

Conclusions

Learning plots showed that LSTM is not learning (after the 5th epoch). The reason of this behaviour is that not enough features were taken into account (just one feature was used – price). In LSTM, all of the desired prediction period values are predicted at once. That is why LSTM produced worse results – it consists of a more complicated architecture which needs more features for effective training. Otherwise, the LSTM model is in its basic state and is not using its full potential.



Results

ARIMA model performs better than LSTM model in predicting more than one time period in terms of using just one feature – historical price values, using selected hyperparameters. The longer the data period, the better ARIMA performs, and the worse LSTM performs.

time window	ARIMA (MAPE)	LSTM (MAPE)
1 day	1,64	<u>1,46</u>
30 days	<u>1,64</u>	5,52
1 month	<u>4,28</u>	6,90
3 months	<u>5,93</u>	10,53
9 months	<u>7,55</u>	16,05

