

```
In [1]: %config InlineBackend.figure_format = 'retina'
```

Individual predictor training - Horizon: 40 datapoints

This Jupyter notebook is the second out of three notebooks that are used to train the individual predictors to benchmark the system performance. In total, 15 individual predictors will be trained on stock and index data. For the benchmarking process, predictors from the predictors1.py and predictors2.py are trained. Each predictor will be served with an input batch that is used to determine the forecast estimation. The input size will be set at 20 data points (20 trading days). Furthermore, 3 forecasting horizons are considered: 5, 30 and 40 datapoints into the future.

```
In [2]: %run ../tools/dataloader.py
%run ../tools/predictors1.py
%run ../tools/predictors111.py
```

Dataset

The third dataset used is the S&P 500 (^GSPC). Prices are in USD and listed on SNP. The data is extracted via the Yahoo Finance API accessed via the pandas data reader function. The adjusting closing price was used to train the following predictors.

Link to website: <https://uk.finance.yahoo.com/quote/%SEGSPC/history?p=%SEGSPC>

```
In [12]: data = DataLoader("^GSPC", '2010-01-01', '2018-01-01')
prices = data.get_adjclose()
```

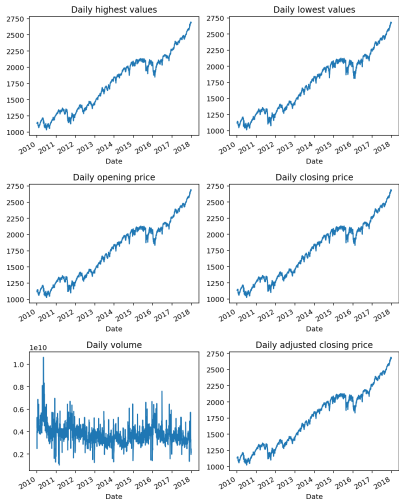
```
In [13]: print(data)
```

Total count of rows: 2813
Ticker: ^GSPC
Start: 2010-01-01
End: 2018-01-01

```
In [14]: data.statistics()
```

	High	Low	Open	Close	Volume	Adj Close
count	2013.000000	2013.000000	2013.000000	2013.000000	2.013000e+03	2013.000000
mean	1753.468063	1736.600179	1745.309675	1745.880929	3.749912e+09	1745.880929
std	438.586053	439.145837	438.868087	438.888644	8.493332e+08	438.888644
min	1032.949951	1010.909973	1027.650024	1022.580017	1.025000e+09	1022.580017
25%	1334.400024	1320.709961	1328.660034	1328.260010	3.241030e+09	1328.260010
50%	1810.880005	1800.770020	1806.329956	1805.810059	3.632350e+09	1805.810059
75%	2095.610107	2078.459961	2087.629883	2088.000000	4.134680e+09	2088.000000
max	2694.969971	2685.919922	2692.709961	2690.159912	1.061781e+10	2690.159912

```
In [15]: data.plotting_grid()
```



```
In [16]: predictor11 = BasicUnivariatePredictor(20, 40, prices)
predictor11.create_lstm()
predictor11.model_blueprint()
```

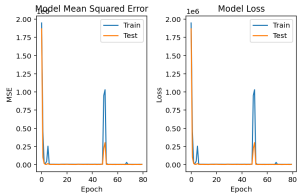
Model: "sequential_1"

Layer (type)	Output Shape	Param #
lstn_3 (LSTM)	(None, 20, 40)	6720
lstn_4 (LSTM)	(None, 20, 50)	18200
lstn_5 (LSTM)	(None, 50)	28200
dense_1 (Dense)	(None, 40)	2840
Total params: 47,160		
Trainable params: 47,160		
Non-trainable params: 0		

```
In [17]: predictor11.fit_model(80, 0)
```

```
Out[17]: <tensorflow.python.keras.callbacks.History at 0x1e2cbd9d640>
```

```
In [18]: predictor11.show_performance()
```



```
In [19]: predictor11.save_model()
```

WARNING:tensorflow:From C:\Users\Max\Anaconda3\envs\sys\lib\site-packages\tensorflow\python\training\ttracking\ttracking.py:111: Model.state_updates (from tensorflow.python.keras.engine.t raining) is deprecated and will be removed in a future version.
Instructions for updating:
This property should not be used in TensorFlow 2.0, as updates are applied automatically.
WARNING:tensorflow:From C:\Users\Max\Anaconda3\envs\sys\lib\site-packages\tensorflow\python\training\ttracking\ttracking.py:111: Layer.updates (from tensorflow.python.keras.engine.base_la yer) is deprecated and will be removed in a future version.
Instructions for updating:
This property should not be used in TensorFlow 2.0, as updates are applied automatically.
INFO:tensorflow:Assets written to: C:\Users\Max\Documents\GitHubPrivate\arguing-predictors\notebooks\assets

```
In [20]: predictor12 = BasicUnivariatePredictor(20, 40, prices)
predictor12.create_mlp()
predictor12.model_blueprint()
```

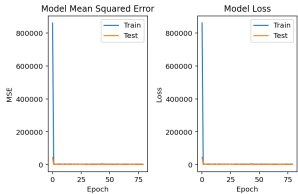
Model: "sequential_2"

Layer (type)	Output Shape	Param #
dense_2 (Dense)	(None, 50)	1850
dense_3 (Dense)	(None, 25)	1275
dense_4 (Dense)	(None, 25)	650
dense_5 (Dense)	(None, 40)	1840
Total params: 4,015		
Trainable params: 4,015		
Non-trainable params: 0		

```
In [21]: predictor12.fit_model(80, 0)
```

```
Out[21]: <tensorflow.python.keras.callbacks.History at 0x1e2d2a4bac0>
```

```
In [22]: predictor12.show_performance()
```



```
In [23]: predictor12.save_model()
```

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```
In [24]: predictor13 = BasicUnivariatePredictor(20, 40, prices)
predictor13.create_cnn()
predictor13.model_blueprint()
```

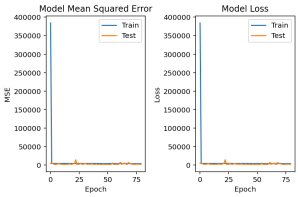
Model: "sequential_3"

Layer (type)	Output Shape	Param #
conv1d (Conv1D)	(None, 19, 64)	192
conv1d_1 (Conv1D)	(None, 18, 32)	4128
max_pooling1d (MaxPooling1D)	(None, 9, 32)	0
flatten (Flatten)	(None, 288)	0
dense_6 (Dense)	(None, 50)	14450
dense_7 (Dense)	(None, 40)	2840
Total params: 20,810		
Trainable params: 20,810		
Non-trainable params: 0		

```
In [25]: predictor13.fit_model(80, 0)
```

```
Out[25]: <tensorflow.python.keras.callbacks.History at 0x1e2d1547490>
```

```
In [26]: predictor13.show_performance()
```



```
In [27]: predictor13.save_model()

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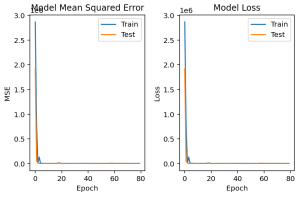
In [28]: predictor14 = BasicUnivariatePredictor(20, 40, prices)
predictor14.create_bilstm()
predictor14.model_blueprint()

Model: "sequential_4"
Layer (type)                Output Shape              Param #
-----
bidirectional (Bidirectional) (None, 20, 100)         20800
lstm_7 (LSTM)                (None, 50)                30200
dense_8 (Dense)              (None, 40)                 2040
-----
Total params: 53,040
Trainable params: 53,040
Non-trainable params: 0

In [29]: predictor14.fit_model(80, 0)

Out[29]: <tensorflow.python.keras.callbacks.History at 0x1e2d772c9d0>

In [30]: predictor14.show_performance()
```



```
In [31]: predictor14.save_model()

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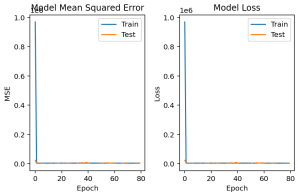
In [32]: predictor15 = HybridUnivariatePredictor(2, 20, 40, prices)
predictor15.create_cnnlstm()
predictor15.model_blueprint()

Model: "sequential_5"
Layer (type)                Output Shape              Param #
-----
time_distributed (TimeDistr) (None, None, 9, 64)      192
time_distributed_1 (TimeDistr) (None, None, 8, 32)     4128
time_distributed_2 (TimeDistr) (None, None, 4, 32)           0
time_distributed_3 (TimeDistr) (None, None, 128)             0
lstm_8 (LSTM)                (None, None, 50)        35800
lstm_9 (LSTM)                (None, 25)              7600
dense_9 (Dense)              (None, 40)               1040
-----
Total params: 48,760
Trainable params: 48,760
Non-trainable params: 0

In [33]: predictor15.fit_model(80, 0)

Out[33]: <tensorflow.python.keras.callbacks.History at 0x1e2da5ac9d0>

In [34]: predictor15.show_performance()
```



```
In [35]: predictor15.save_model()

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```