Report

Part1

In part 1 I used a fully connected neural network with variable input layer node size (L=1,2,3..10) and with a 20 nodes in the hidden layer and an output layer.

Since it is a regression instead of accuracy my metric was root_mean_squared_error . I calculated the rmse by the function

```
def root_mean_squared_error_layer(y_true, y_pred):
    rms = sqrt(mean_squared_error(np.array(y_true,dtype=np.float), np.array(y_pred,dtype=np.float)))
    return rms
```

Part2

In part 2 the model was a RNN with 2 types. One a stateful and other a stateless model.

```
def create_rnn_model(stateful,length):
    ##### YOUR MODEL GOES HERE #####
    model = Sequential()
    model.add(SimpleRNN(20, return_sequences=False, stateful=stateful, batch_input_shape=(1, length, 1)))
    adam = optimizers.Adam(lr=0.001)
    model.add(Dense(1))
    model.compile(loss='mean_absolute_error', optimizer=adam, metrics=[root_mean_squared_error])
    return model
```

Part3

In part 3 the model was a LSTM with 2 types. One a stateful and other a stateless model.

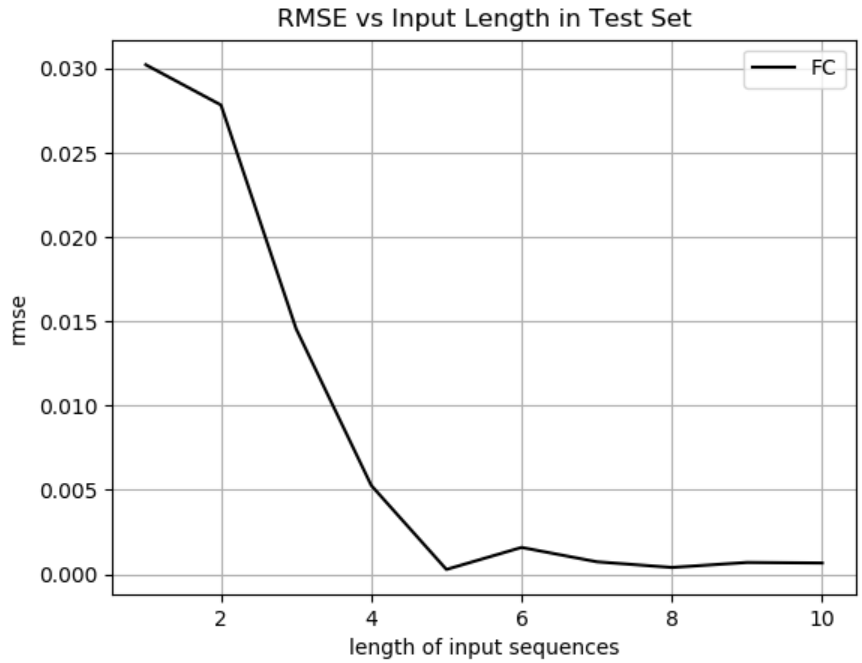
```
def create_lstm_model(stateful,length):
    ##### YOUR MODEL GOES HERE #####
    model = Sequential()
    model.add(LSTM(20, return_sequences=False, stateful=stateful, batch_input_shape=(1, length, 1)))
    adam = optimizers.Adam(lr=0.001)
    model.add(Dense(1))
    model.compile(loss='mean_squared_error', optimizer=adam, metrics=[root_mean_squared_error])
    return model
```

Part4

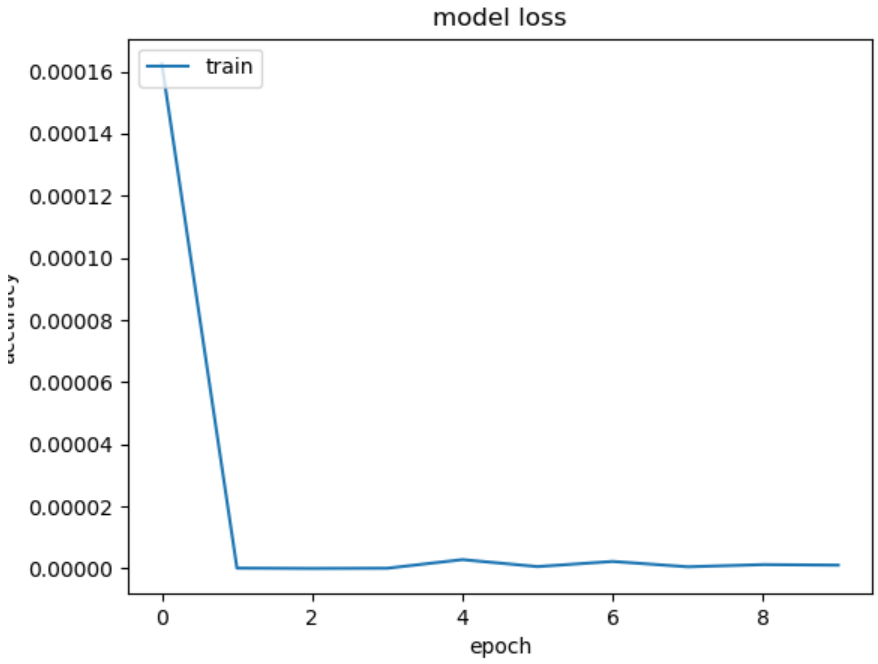
In part 4 we compare the models I created with trained weight and predict and compare the 4 of them. It seems among the 4 the LST Models perform the best out of all which is expected.

Appendix

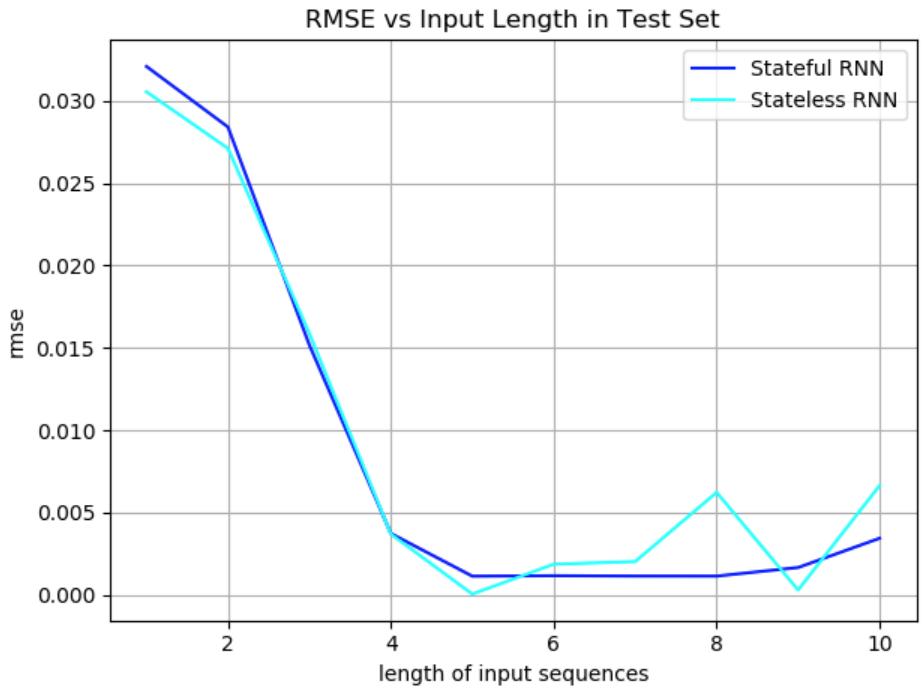
Part1 RMSE



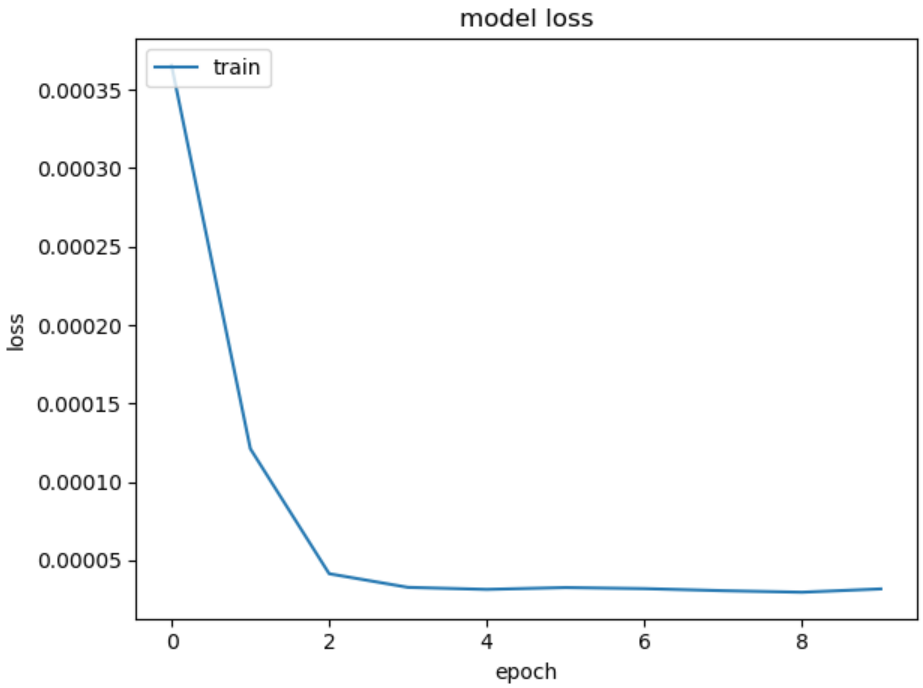
Part1 Loss (this is for L=10 the rest images can be found under the folder)



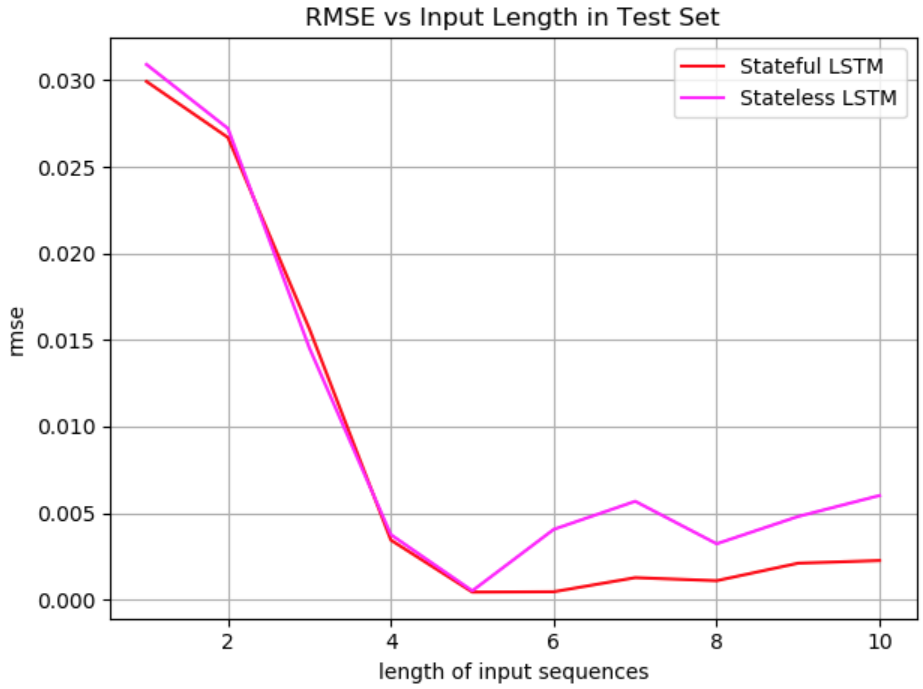
Part2 RMSE



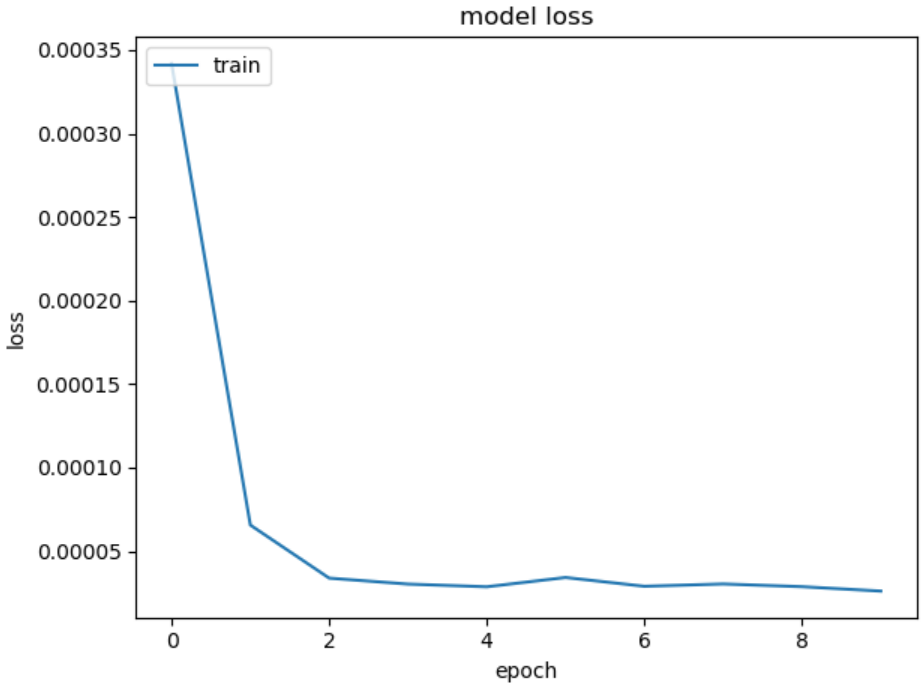
Part2 Loss (this is for L=10 the rest images can be found under the folder)


model loss
train
0.00035
0.00030
0.00025
0.00020
0.00015
0.00010
0.00005
loss
0
2
4
6
8
epoch

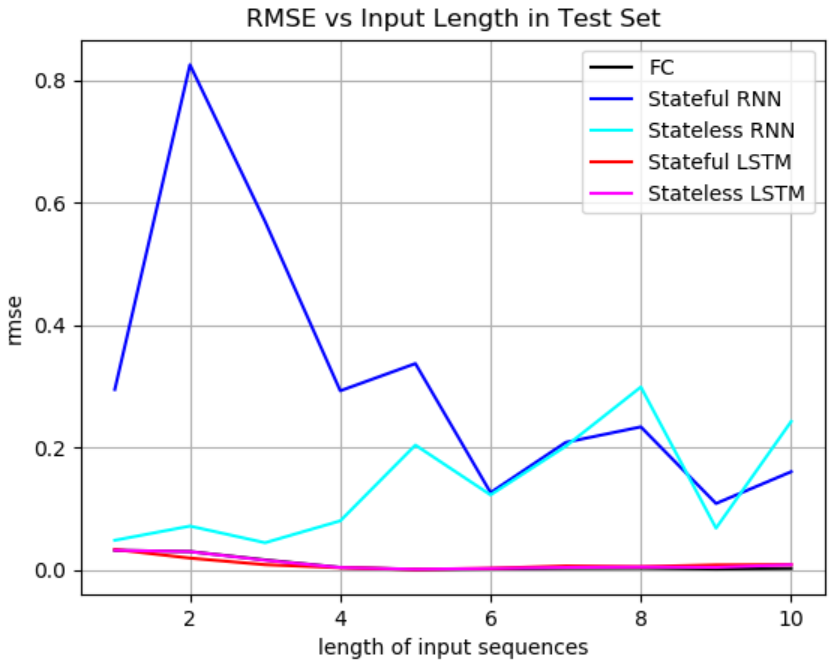
Part3 RMSE


RMSE vs Input Length in Test Set
Stateful LSTM
Stateless LSTM
0.030
0.025
0.020
0.015
0.010
0.005
0.000
rmse
2
4
6
8
10
length of input sequences

Part3 Loss (this is for L=10 the rest images can be found under the folder)



Part 4


RMSE vs Input Length in Test Set
FC
Stateful RNN
Stateless RNN
Stateful LSTM
Stateless LSTM
rmse
0.0
0.2
0.4
0.6
0.8
2
4
6
8
10
length of input sequences