SOURCE CODE

The dataset used in this notebook is Tesla stock history from 2014 to 2017. You can find the .csv file in the project folder.

```
import numpy as np
import tensorflow as tf
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.preprocessing import StandardScaler
%matplotlib inline
```

Step 0. Loading dataset

```
tesla_stocks = pd.read_csv('tesla_stocks.csv')
tesla_stocks.head()
```

	Date	Open	High	Low	Close	Volume
0	2-Aug-17	318.94	327.12	311.22	325.89	13091462
1	1-Aug-17	323.00	324.45	316.13	319.57	8303102
2	31-Jul-17	335.50	341.49	321.04	323.47	8535136
3	28-Jul-17	336.89	339.60	332.51	335.07	4880414
4	27-Jul-17	346.00	347.50	326.29	334.46	8302405

```
data_to_use = tesla_stocks['Close'].values
print('Total number of days in the dataset: {}'.format(len(data_to_use)))
```

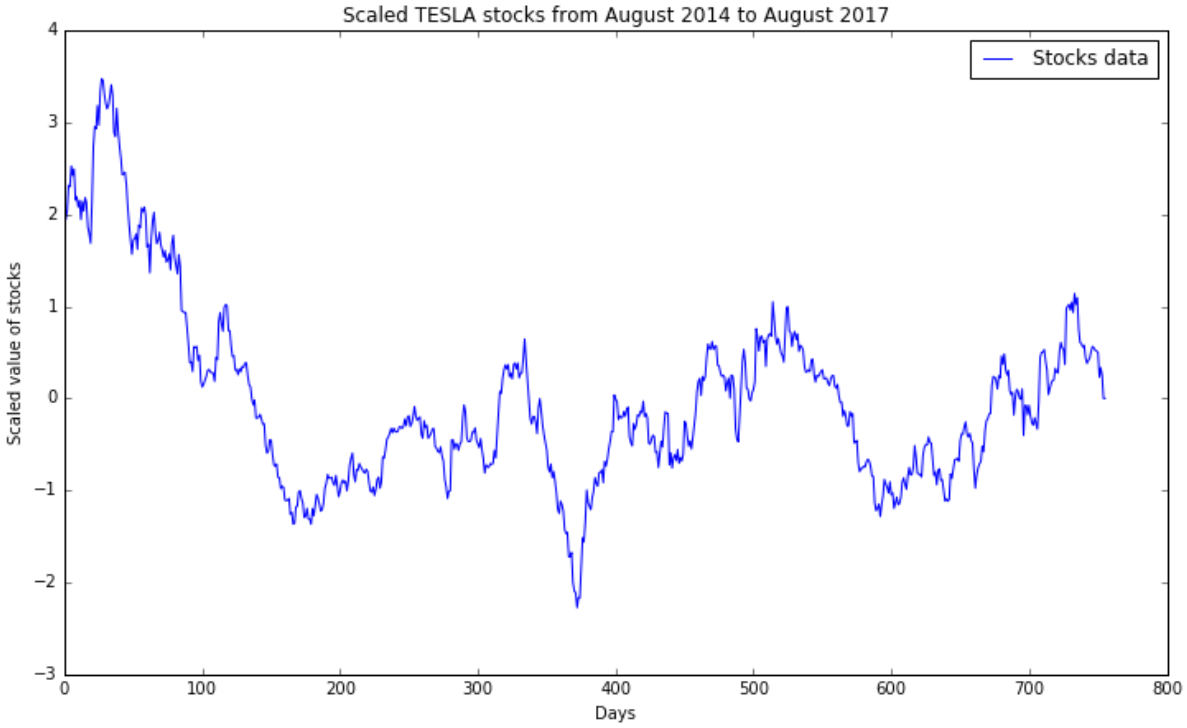
Total number of days in the dataset: 756

Step 1. Data preprocessing

Step 1.1 Scaling data

```
scaler = StandardScaler()
scaled_dataset = scaler.fit_transform(data_to_use.reshape(-1, 1))
plt.figure(figsize=(12,7), frameon=False, facecolor='brown', edgecolor='blue')
```

```
plt.title('Scaled TESLA stocks from August 2014 to August 2017')
plt.xlabel('Days')
plt.ylabel('Scaled value of stocks')
plt.plot(scaled_dataset, label='Stocks data')
plt.legend()
plt.show()
```




```
def window_data(data, window_size):
    X = []
    y = []

    i = 0
    while (i + window_size) <= len(data) - 1:
        X.append(data[i:i+window_size])
        y.append(data[i+window_size])

        i += 1
    assert len(X) ==  len(y)
    return X, y
```

Step 1.2 Windowing the dataset

```
X, y = window_data(scaled_dataset, 7)
```

Step 1.3 Creating Training and Testing sets

```
X_train  = np.array(X[:700])
y_train = np.array(y[:700])

X_test = np.array(X[700:])
y_test = np.array(y[700:])

print("X_train size: {}".format(X_train.shape))
print("y_train size: {}".format(y_train.shape))
print("X_test size: {}".format(X_test.shape))
print("y_test size: {}".format(y_test.shape))
```

```
X_train size: (700, 7, 1)
y_train size: (700, 1)
X_test size: (49, 7, 1)
y_test size: (49, 1)
```

Let's create the RNN

```
epochs = 200
batch_size = 7
def LSTM_cell(hidden_layer_size, batch_size,number_of_layers, dropout=True, dropout_rate=0.8):

    layer = tf.contrib.rnn.BasicLSTMCell(hidden_layer_size)

    if dropout:
        layer = tf.contrib.rnn.DropoutWrapper(layer, output_keep_prob=dropout_rate)

    cell = tf.contrib.rnn.MultiRNNCell([layer]*number_of_layers)

    init_state = cell.zero_state(batch_size, tf.float32)
```

```
    return cell, init_state
def output_layer(lstm_output, in_size, out_size):

    x = lstm_output[:, -1, :]
    print(x)
    weights = tf.Variable(tf.truncated_normal([in_size, out_size], stddev=0.05),
name='output_layer_weights')
    bias = tf.Variable(tf.zeros([out_size]), name='output_layer_bias')

    output = tf.matmul(x, weights) + bias
    return output
def opt_loss(logits, targets, learning_rate, grad_clip_margin):

    losses = []
    for i in range(targets.get_shape()[0]):
        losses.append([(tf.pow(logits[i] - targets[i], 2))])

    loss = tf.reduce_sum(losses)/(2*batch_size)

    #Cliping the gradient loss
    gradients = tf.gradients(loss, tf.trainable_variables())
    clipper_, _ = tf.clip_by_global_norm(gradients, grad_clip_margin)
    optimizer = tf.train.AdamOptimizer(learning_rate)
    train_optimizer = optimizer.apply_gradients(zip(gradients, tf.trainable_variables()))
    return loss, train_optimizer
class StockPredictionRNN(object):

    def __init__(self, learning_rate=0.001, batch_size=7, hidden_layer_size=512,
number_of_layers=1,
                 dropout=True, dropout_rate=0.8, number_of_classes=1, gradient_clip_margin=4,
window_size=7):
```

```
        self.inputs = tf.placeholder(tf.float32, [batch_size, window_size, 1], name='input_data')
        self.targets = tf.placeholder(tf.float32, [batch_size, 1], name='targets')

        cell, init_state = LSTM_cell(hidden_layer_size, batch_size, number_of_layers, dropout,
dropout_rate)

        outputs, states = tf.nn.dynamic_rnn(cell, self.inputs, initial_state=init_state)

        self.logits = output_layer(outputs, hidden_layer_size, number_of_classes)

        self.loss, self.opt = opt_loss(self.logits, self.targets, learning_rate, gradient_clip_margin)
tf.reset_default_graph()
model = StockPredictionRNN()
Tensor("strided_slice:0", shape=(7, 512), dtype=float32)
Time to train the network
session =  tf.Session()
session.run(tf.global_variables_initializer())
for i in range(epochs):
    traind_scores = []
    ii = 0
    epoch_loss = []
    while(ii + batch_size) <= len(X_train):
        X_batch = X_train[ii:ii+batch_size]
        y_batch = y_train[ii:ii+batch_size]

        o, c, _ = session.run([model.logits, model.loss, model.opt], feed_dict={model.inputs:X_batch,
model.targets:y_batch})

        epoch_loss.append(c)
        traind_scores.append(o)
        ii += batch_size
    if (i % 30) == 0:
```

```
        print('Epoch {}/{}'.format(i, epochs), ' Current loss: {}'.format(np.mean(epoch_loss)))
```

```
Epoch 0/200  Current loss: 0.1219751164317131
Epoch 30/200  Current loss: 0.013420963659882545
Epoch 60/200  Current loss: 0.01436462439596653
Epoch 90/200  Current loss: 0.012508750893175602
Epoch 120/200  Current loss: 0.012003767304122448
Epoch 150/200  Current loss: 0.012045850977301598
Epoch 180/200  Current loss: 0.011652822606265545
```

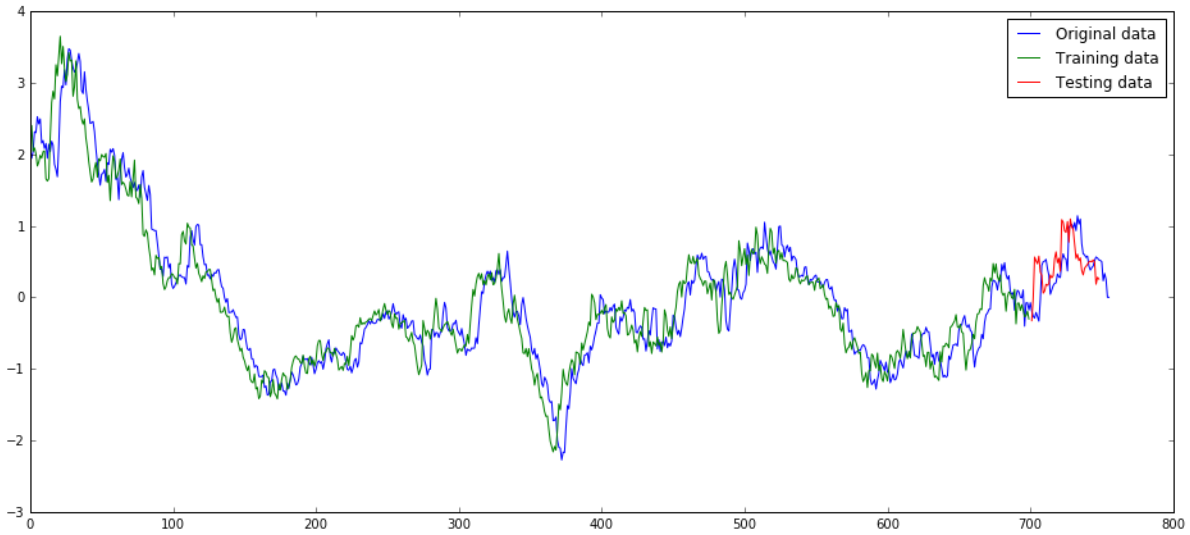
```
sup =[]
for i in range(len(traind_scores)):
    for j in range(len(traind_scores[i])):
        sup.append(traind_scores[i][j])
tests = []
i = 0
while i+batch_size <= len(X_test):

    o = session.run([model.logits], feed_dict={model.inputs:X_test[i:i+batch_size]})
    i += batch_size
    tests.append(o)
tests_new = []
for i in range(len(tests)):
    for j in range(len(tests[i][0])):
        tests_new.append(tests[i][0][j])
test_results = []
for i in range(749):
    if i >= 701:
        test_results.append(tests_new[i-701])
    else:
        test_results.append(None)
```

Plotting predictions from the network

```
plt.figure(figsize=(16, 7))
```

```
plt.plot(scaled_dataset, label='Original data')
plt.plot(sup, label='Training data')
plt.plot(test_results, label='Testing data')
plt.legend()
plt.show()
```




```
session.close()
```