**DATA SCIENCE MINI PROJECT**

**STOCK MARKET PREDICTION**

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**(Machine Learning and Recurrent neural network)**

Stock market prediction is **the act of trying to determine the future value of a company stock or other financial instrument traded on an exchange**. The successful prediction of a stock's future price could yield significant profit.

**Candlestick** is used for stock market prediction. Watching everyday data, we can know whether prices rise or fall.

Open -> start at which stocks began to sell

Close -> end at which it stops (outer limit)

If close > open => profit, else it is a loss!

High ->highest price of the stock in whole day

Low -> lowest price of the stock in whole day

Volume rise -> stock price fluctuation depends on selling and buying

Machine Learning algorithm called Recurrent Neural Network (RNN), it's a common Deep Learning technique used for continuous data pattern recognition. Recurrent Neural Network consider how data changes over time, it's typically used for time-series data (stock prices, sensor readings, etc). Recurrent Neural Network can also be used for video analysis.  
  
Dataset consisting of stock prices for Google Inc, used to train a model and predict future stock prices.

**RNN Gradient Problem (Expanding or Vanishing)**  
  
The gradient is used to update the weights in an RNN by looking back a certain number of user defined steps. The lower the gradient, the harder it is to update the weights (vanishing gradient) of nodes further back in time. Especially because previous layers are used as inputs for future layers. This means old neurons are training much slower that more current neurons. It's like a domino effect.

# Expanding Gradient Solutions

### 1. Truncated Back-propagation

Stop back-propagation after a certain point (not an optimal because not updating all the weights). Better than doing nothing which can produce an irrelevant network.

### 2. Penalties

The gradient can be penalized and artificially reduced.

### 3. Gradient Clipping

A maximum limit for the gradient which stops it from rising more.

# Vanishing Gradient Solutions

### 1. Weight Initialization

You can be smart about how you initialize weights to minimize the vanishing gradient problem.

### 2. Echo State Network

Designed to solve vanishing gradient problem. It's a recurrent neural network with a sparsely connected hidden layer (with typically 1% connectivity). The connectivity and weights of hidden neurons are fixed and randomly assigned.

### 3. Long Short-Term Memory Networks (LSTM)

Most popular RNN structure to tackle this problem.

Training Dataset

<https://github.com/AMoazeni/Machine-Learning-Stock-Market-Prediction/blob/master/Data/Google_Stock_Price_Train.csv>

Testing Dataset

<https://github.com/AMoazeni/Machine-Learning-Stock-Market-Prediction/blob/master/Data/Google_Stock_Price_Test.csv>