DEEP LEARNING FRAMEWORK FOR FINANCIAL TIME SERIES PREDICTION USING TECHNICAL INDICATORS AND PRICE DATA

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DECLARATION

I declare that this is my own work and this thesis/dissertation[2] does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate has carried out research for the Master's Dissertation under my supervision.

Name of the Supervisor: Dr. Amal Shehan Perera

Signature of the Supervisor: Date:

ABSTRACT

Financial Time Series prediction is a challenging task due to its dependency in many socio-economic factors. It depends on both quantitative and qualitative factors in a Financial Market. Quantitative factors can be mathematically modeled but qualitative factors are harder to model. Market behavior depends on both micro-economic as well as macro-economic behavior which includes quantitative and qualitative factors on both of them. Therefore modeling and predicting a financial time series has become a challenging task in Big Data Analytics world.

Deep Neural Networks can be identified as a main tool in Big Data Analytics which could solve the above challenge. Long Short Term Memory Units and Gated Recurrent Units in deep neural networks can accommodate memory cells which can store an accumulated memory. This helped to accurately capture the dependencies of the current data point by previous data points. Financial Time Series heavily depends on their predecessors and these concepts managed to capture such relationships.

This research use a combination of LSTM and GRU Units to accurately predict the Index Close Price of Tadawul All Share Index (TASI) and Stock Close Price of five highly tradable stocks in Tadawul Stock Exchange. Open, High, Low and Close Prices as well as Standard Technical Indicators of Stocks and Indices are primarily used to create the model. Principal Component Analysis is used to reduce the dimensionality. OHLC and Technical Indicator Values are fed to the network based on four different topologies creating four Evaluator Models.

DEDICATION

This work is dedicated to my parents who have always loved me unconditionally and whose good examples have taught me to work hard for the things that I aspire to achieve.

This thesis work is also dedicated to my beloved wife who has been a constant source of support and encouragement throughout my life. I am truly blessed for having you in my life.

At the same time I would like to dedicate this thesis for my dear colleagues who have been a constant source helping hand during this post graduate journey. You guys are the best.

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LSTM	Long Short Term Memory
GRU	Gated Recurrent Unit
MAPE	Mean Absolute Percentage Error
TASI	Tadawul All Share Index
OHLC	Open High Low Close