

TABLE OF CONTENT

Pages

<u>TABLE OF CONTENT</u>	i
<u>LIST OF FIGURES</u>	iii
<u>LIST OF TABLES</u>	v
<u>ABSTRACT</u>	vi
<u>ACKNOWLEDGEMENT</u>	vii
<u>CHAPTER I INTRODUCTION</u>	8
<u>1.1 Background of the Problem</u>	8
<u>1.2 Research Problem</u>	12
<u>1.3 Research Limitation</u>	12
<u>1.4 Objective</u>	13
<u>1.5 Benefits of Research</u>	13
<u>CHAPTER II LITERATURE REVIEW</u>	14
<u>CHAPTER III THEORITICAL BASE</u>	20
<u>3.1 Stock</u>	20
<u>3.2 Wavelet Transform</u>	20
<u>3.3 Data Preprocessing</u>	15
<u>3.4 ARIMA Model</u>	16
<u>3.5 Sliding Windows</u>	16
<u>3.6 Deep Learning</u>	17
<u>3.7 Error Evaluation</u>	23
<u>CHAPTER IV RESEARCH METHODOLOGY</u>	24
<u>4.1 Research Setup</u>	24
<u>4.2 System Description</u>	25
<u>CHAPTER V RESEARCH IMPLEMENTATION</u>	38
<u>5.1 Collecting Dataset</u>	38
<u>5.2 Processing Data</u>	38



<u>5.3</u>	<u>Experiment Result</u>	42
<u>CHAPTER VI CONCLUSION</u>		46
<u>6.1</u>	<u>Result</u>	46
<u>6.2</u>	<u>Future Works</u>	46
<u>REFERENCES</u>		47
<u>APPENDIX</u>		48

LIST OF FIGURES

<u>Figure 3.1 Wavelet Transformation</u>	14
<u>Figure 3.2 Wavelet Reconstruction</u>	15
<u>Figure 3.3 Sliding Windows Data</u>	17
<u>Figure 3.4 Deep learning illustration [3]</u>	18
<u>Figure 3.5 Hidden state illustration [25]</u>	20
<u>Figure 3.6 LSTM architecture [26]</u>	20
<u>Figure 4.1 Procedure Steps</u>	25
<u>Figure 4.2 Yahoo! Finance stock data</u>	26
<u>Figure 4.3 Min-Max Normalization Step</u>	28
<u>Figure 4.4 Min-max Data Normalization</u>	28
<u>Figure 4.5 Splitting Dataset</u>	28
<u>Figure 4.7 Sliding Windows Transformation</u>	29
<u>Figure 4.6 Wavelet Transform</u>	30
<u>Figure 4.5 ANN Architecture</u>	31
<u>Figure 4.6 LSTM Architecture</u>	32
<u>Figure 4.7 Attention LSTM Architecture</u>	32
<u>Figure 4.8 Attention LSTM for Approximate Data Architecture</u>	33
<u>Figure 4.9 Attention-LSTM for Detail Data Architecture</u>	33
<u>Figure 4.10 ANN Input and Output Model</u>	34
<u>Figure 4.11 LSTM Input and Output Model</u>	35
<u>Figure 4.12 Attention-LSTM Input and Output Model</u>	35
<u>Figure 4.13 Attention-LSTM Approximate Input and Output Model</u>	36
<u>Figure 4.14 Attention-LSTM Detail Input and Output Model</u>	36
<u>Figure 5.1 Raw Data Plot</u>	39
<u>Figure 5.2 Normalized Data Plot</u>	39
<u>Figure 5.3 Low Frequency Data Stock (CVX)</u>	40
<u>Figure 5.4 High Frequency Data Stock (CVX)</u>	40
<u>Figure 5.5 Low Frequency Data Stock (XOM)</u>	41



<u>Figure 5.6 High Frequency Data Stock (XOM)</u>	<u>41</u>
<u>Figure 5.7 Training Loss Using XOM Data</u>	<u>42</u>

LIST OF TABLES

<u>Table 2.1 Literature Review</u>	9
<u>Table 2.2 Literature Review (Continue)</u>	10
<u>Table 2.3 Literature Review (Continue)</u>	11
<u>Table 4.1 Sample data</u>	25
<u>Table 4.2 Predictions Example</u>	37
<u>Table 5.1 Stock Data and Code</u>	38
<u>Table 5.2 All Models Training Results</u>	43
<u>Table 5.3 All Models Prediction Result</u>	44
<u>Table 5.4 Comparison of ARIMA and Attention-LSTM Result</u>	45