

TABLE OF CONTENTS

ABSTRACT.....	ii
APPROVAL PAGE.....	iii
ORIGINALITY STATEMENT	iv
ENDORSEMENT PAGE	v
PLAGIARISM DECLARATION FORM	vi
ACKNOWLEDGEMENT	vii
TABLE OF CONTENTS.....	viii
LIST OF FIGURES	xi
LIST OF TABLES	xii
LIST OF ALGORITHMS	xiii
CHAPTER I INTRODUCTION	1
I.1 Overview of Research Object.....	1
I.2 Research Background.....	2
I.3 Research Problem.....	5
I.4 Research Objectives	6
I.5 Research Benefits	7
1.5.1 Theoretical Benefits.....	7
1.5.2 Practical Benefits.....	7
I.6 Research Scope and Assumptions	8
1.6.1 Research Scope.....	8
1.6.2 Research Assumptions.....	8
I.7 Thesis Structure	9
CHAPTER II STUDY LITERATURE.....	12
II.1 Convolutional Neural Networks Architecture Model.....	12
II.1.1 Basics of CNN Architecture	12

II.1.2 CNN Architecture with Images as Input.....	13
II.1.3 VGG16 CNN Architecture Model.....	14
II.2 Encoding Time Series Data into 2D Images.....	16
II.3 Dimensionality Reduction using PAA.....	18
II.4 Related Studies and Research Gap.....	20
II.6 Conceptual Framework.....	24
CHAPTER III RESEARCH METHODOLOGY	26
III.1 Research Steps	26
III.2 Model Development and Evaluation Strategy.....	31
III.2.1 Overview of Architecture Design.....	31
III.2.2 Overview of VGG16 Architecture	32
III.2.3 Model Training and Testing Configuration.....	34
III.2.4 Performance Evaluation Metric.....	35
CHAPTER IV DATA EXPLORATION AND ANALYSIS	37
IV.1 Data Sources and Context Description.....	37
IV.2 Data Pre-processing.....	38
IV.2.1 Data Cleaning and Normalization	38
IV.2.2 Data Classification and Label Construction.....	39
IV.2.3 Sliding Window Configuration	40
IV.3 Data Processing	41
IV.3.1 Dimension Reduction using Piecewise Aggregate Approximation for CNN Input.....	42
IV.3.2 Encoding MTS as 2D Images.....	43
IV.3.3 Image Contatenation as RGB Channels	44
IV.3.3 ConvNet Training for Predictions	46
CHAPTER V EXPERIMENTAL RESULTS AND DISCUSSION	47

V.1 Experiment 1: Comparison of Encoding Methods	47
V.2 Experiment 2: Comparative Evaluation of CNN Architectures for Classification Accuracy	52
CHAPTER VI CONCLUSION	54
REFERENCES	60