

# CONTENTS

<b>APPROVAL PAGE</b>	
<b>SELF DECLARATION AGAINST PLAGIARISM</b>	
<b>ABSTRACT</b>	<b>i</b>
<b>PREFACE</b>	<b>ii</b>
<b>CONTENTS</b>	<b>iii</b>
<b>LIST OF FIGURES</b>	<b>v</b>
<b>LIST OF TABLES</b>	<b>vi</b>
<b>I INTRODUCTION</b>	<b>1</b>
1.1 Background . . . . .	1
1.2 Problem Identification and Objective . . . . .	2
1.3 Related Research . . . . .	4
1.4 Scope of Work . . . . .	5
1.5 Methodology . . . . .	6
1.6 Research Timeline . . . . .	6
1.7 Structure of The Thesis . . . . .	7
<b>II BASIC CONCEPTS</b>	<b>9</b>
2.1 Internet of Things . . . . .	9
2.2 Intrusion Detection System (IDS) . . . . .	10
2.3 Machine Learning (ML) . . . . .	11
2.3.1 Extreme Gradient Boosting . . . . .	13
2.3.2 Categorical Boosting . . . . .	14
2.4 Feature Reduction . . . . .	15
2.4.1 Principal Component Analysis . . . . .	16
2.5 CICIoT2023 Dataset . . . . .	17
<b>III SYSTEM MODEL AND RESEARCH DESIGN</b>	<b>20</b>
3.1 Preliminary Research . . . . .	20

3.2	System Model . . . . .	22
3.3	Simulation Scenario . . . . .	24
3.3.1	Data Preprocessing Scenario . . . . .	25
3.3.2	Double Layer Evaluation . . . . .	27
3.3.3	Simulation Output . . . . .	29
3.4	Emulation Scenario . . . . .	30
<b>IV</b>	<b>RESULT &amp; ANALYSIS</b>	<b>34</b>
4.1	Exploratory Data Analysis (EDA) Dataset . . . . .	34
4.2	Cumulative Percentage Variance . . . . .	39
4.3	Performance Measurement . . . . .	41
4.4	Computation Time . . . . .	46
4.5	Performance Measurement on Emulation Scenario . . . . .	49
<b>V</b>	<b>CONCLUSIONS AND FUTURE WORKS</b>	<b>52</b>
5.1	Conclusions . . . . .	52
5.2	Future Works . . . . .	53
	<b>REFERENCES</b>	<b>54</b>
	<b>Appendices</b>	