

## Table of Contents

<b>Subject</b>	<b>Page</b>
Dedication .....	i
Acknowledgement .....	ii
Table of Contents .....	iii
List of Tables .....	v
List of Figures .....	vi
Abbreviations .....	vii
Abstract .....	viii
المستخلص.....	ix
 <b>Chapter one: Introduction.....</b>	 1
1.1 Over View.....	1
1.2 Statement of the problem .....	2
1.3 Research Objective .....	3
1.4 Previous study .....	3
1.5 Thesis Layout .....	5
 <b>Chapter Two: Speech Recognition .....</b>	 6
2.1 Introduction .....	6
2.2 Speech and Voice Recognition .....	6
2.3 Speech Recognition Levels .....	8
2.4 Basic Concepts of Recognition Techniques.....	10
2.5 Automatic Speech Recognition .....	12
2.6 Linear Predictive Code for Speech Recognition .....	13
2.7 Recognition Approaches .....	19
 <b>Chapter Three: Artificial Neural Networks .....</b>	 23
3.1 Introduction .....	23
3.2 The Biological Neuron .....	24
3.3 The Artificial Neuron .....	25
3.4 Artificial Neural Networks .....	29

3.4.1 Basic Components of an Artificial Neural Network .....	31
3.4.2 Neural Network Topologies .....	34
3.4.3 Artificial Neural Network Learning .....	39
3.5 Neural Network Paradigms .....	42
3.5.1 Back Propagation Network .....	42
3.5.2 Kohonen Feature Maps .....	47
3.5.3 Probabilistic Neural Networks .....	50
3.5.4 General Regression Neural Network .....	51
3.5.5 The Functional-Link Network .....	52
<b>Chapter Four: Methodology used .....</b>	<b>54</b>
4.1 Test Data .....	54
4.2 Hardware and Software .....	54
4.3 Procedure .....	55
4.3.1 Learning Pattern Generation .....	55
4.3.2 Building and Learning the Network .....	56
4.4 Assessment of the Performance of the GRNN Model .....	58
<b>Chapter five: Result and Analysis .....</b>	<b>59</b>
5.1 GRNN Training Sessions Output Result .....	59
5.2 Testing and Assessment .....	61
<b>Chapter Six: Conclusion and Recommendations .....</b>	<b>65</b>
6.1 Conclusion .....	65
6.2 Recommendations .....	65
References .....	66
Appendix A: Example of the Test Data	
Appendix B: GRNN and BPN Session Output result	

## List of Tables

<b>Table</b>		<b>Page</b>
5.1.1	Sample of GRNN Training Session Results .....	60
5.1.2	Sample of BPN Training Session Results .....	61
5.2.1	Sample of GRNN Test Session Output Results .....	63
5.2.2	Sample of BPN Test Session Output Results .....	64

## List of Figures

<b>Figure</b>	<b>Page</b>
2.1 Automatic Speech Recognition and Speech Understanding .....	13
2.2 Basic Block of Linear Predictive Code Process.....	14
2.3 A block Diagram of the LPPC.....	18
2.4 Acoustic –Phonetic Approach .....	19
2.5 Pattern Recognition Approach.....	20
3.1 Basic Feature of a Biological Neuron .....	25
3.2 A Simple Artificial Neuron .....	26
3.3 An MCP Neuron .....	27
3.4 The Perceptron Model.....	27
3.5 The Adaline Model .....	29
3.6 Simple Artificial Neural Network .....	30
3.7 Basic Components of an Artificial Neuron .....	31
3.8 Transfer Function .....	33
3.9 A typical Feed-forward Artificial Neural Network.....	35
3.10 Signal-Layer Perceptron.....	36
3.11 Multi-Layer Perceptron.....	38
3.12 Basic Feedback Artificial Neural Network .....	39
3.13 The Structure of Supervised Learning System .....	40
3.14 Back Propagation Networks .....	43
3.15 The Structure of the Elman Networks .....	46
3.16 The Architecture of the Jordan Networks .....	47
3.17 Kohonen Self-organizing Feature Map .....	49
3.18 A typical PNN Architecture .....	51
3.19 The Input Layer of the FLN .....	53
5.1 GRNN Training Specifications .....	59
5.2 Test Session Specifications .....	60

## Abbreviations

Adaline	The Adaptive Linear Element
AI	Artificial Intelligence
ANNs	Artificial Neural Networks
ASR	Automatic Speech Recognition
BPN	Back Propagation Network
DC	Direct Current
DTW	Dynamic Time Warping
FLN	Functional-Link Network
GAL	General Adaptive Learning
GRNN	General Regression Neural Network
HMMs	Hidden Markov Models
LMS	Least Mean Square
LPC	Linear Predictive Coding
LPCC	Linear Prediction Cepstral Coefficient
LVQ	Learning Vector Quantization
MADALINE	Multiple Adaptive Linear Element
MCP	McCulloch and Pitts Model
NNs	Neural Networks
PNN	Probabilistic Neural Network
SR	Speech Recognition
VQ	Vector Quantization