

**EVALUATION OF OPTIMAL MLP STRUCTURE FOR HEART DISEASE
DIAGNOSIS**

**This is presented in partial fulfillment for the award of the
Bachelor of Engineering (Hons.) Electrical
UNIVERSITI TEKNOLOGI MARA (UiTM)**



**SALBIAH BINTI AB HAMID
FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM,
SELANGOR, MALAYSIA**

ACKNOWLEDGEMENTS

First and foremost, I would like to state my greatest gratitude to ALLAH S.W.T that gives me opportunity and strength to be able to complete my final year project and thesis.

I would like to express my sincere gratitude and thanks to my supervisor Miss Nani Fadzlina Naim and my co-supervisor Mr Ihsan bin Mohd Yassin for their guidance, support and encouragement throughout the completion of this project. Their valuable suggestions have been greatly appreciated.

I wish to thank the panels of this thesis, Madam Hasnida Saad for her suggestion and recommendation for my thesis's topic and Madam Mas Izyani for her courage to make my thesis completed with particular specifications.

I would also like to thank my colleagues for their help in teaching me how to use MATLAB.

My deepest thanks go to my understanding parents and family.

ABSTRACT

This thesis presents the investigation on the performance of Artificial Neural Network (ANN) with Multilayer Perceptron (MLP) using Levenberg-Marquardt (LM) Algorithm in heart disease diagnosis. ANN aims to transform the inputs into the meaningful output. ANN is biological inspired and it has dynamic characteristic which is learning. ANN is able to learn through experience and adaptation. It learns the types of input based on their weights and properties. MLP consist of interconnected input layer, hidden layer and output layer. The weight of each value in hidden layers will be considered during the learning process. LM algorithm is used to minimize the error during training and testing process. A transfer function simulation model is developed by using the MATLAB software. This ANN model is developed to facilitate heart disease diagnosis.

TABLE OF CONTENTS

CONTENTS	PAGES
TITLE	i
APPROVAL	ii
DECLARATION	iii
ACKNOWLEDGEMENTS	iv
ABSTRACT	v
TABLE OF CONTENTS	vi
LIST OF FIGURES	ix
LIST OF TABLES	x
LIST OF SYMBOLS AND ABBREVIATIONS	xi
CHAPTER 1: INTRODUCTION	1
1.1 Problem statement	1
1.2 Objective	2
1.3 Scope of Work	2
1.4 Thesis Outline	3
CHAPTER 2: LITERATURE REVIEWS	4
CHAPTER 3: METHODOLOGY	9
3.1 Artificial Neural Network	9
3.1.1 Mc-Culloch-Pitt model	10
3.1.2 Biological Neuron	11
3.1.3 Medical Application of ANN	13
3.2 Multilayer Perceptron	14
3.3 Weight	17
3.4 Activation Function	18
3.5 Training MLP Network	20

3.6 Early stopping	20
3.7 Learning Paradigms	21
3.8 Learning Algorithm	23
3.8.1 Levenberg-Marquardt	24
3.8.2 Gradient Descent	26
3.8.3 Gauss-Newton	26
3.8.4 Backpropagation	27
3.9 Mean Squared Error	28
3.9.1 Accuracy	29
3.9.2 Convergence	29
3.9.3 Random Number Generation	29
3.10 Heart Disease	31
3.10.1 Dataset	35
3.10.2 Attributes	36
3.10.3 Sample of Data	37
3.10.4 Sample Size	39
3.11 Software	39
CHAPTER 4: RESULT AND DISSCUSSION	42
4.1.1 Training accuracy	42
4.1.2 Testing Accuracy	43
4.1.3 Average Iterations	44
4.1.4 Mean Squared Error	45
CHAPTER 5: CONCLUSION	46
5.1 Conclusion	46
5.2 Evaluation	47
CHAPTER 6: FUTURE IMPROVEMENTS	48