

**UNIVERSITI TEKNOLOGI MARA**

**CLASSIFICATION OF PARKINSON'S DISEASE (PD) BASED  
ON MULTILAYER PERCEPTRONS (MLPs) NEURAL  
NETWORK AND ANOVA AS A FEATURE EXTRACTION**

**ZAHARI BIN ABU BAKAR  
NUR FARAHIAH BINTI IBRAHIM  
DZUFI ISZURA BINTI ISPAWI  
ASSOC. PROF. DR. NOORITAWATI BINTI MD. TAHIR**

**FACULTY OF ELECTRICAL ENGINEERING**

**DECEMBER 2012**

## DECLARATION

We hereby declare that the thesis is based on our own work except for quotations and citations which have been properly acknowledged.



.....  
**ZAHARI BIN ABU BAKAR**

DATE: 31 DECEMBER 2012



.....  
**NUR FARAHIAH BINTI IBRAHIM**

DATE: 31 DECEMBER 2012



.....  
**DZUFI ISZURA BINTI ISPAWI**

DATE: 31 DECEMBER 2012

.....  
**ASSOC. PROF. DR. NOORITAWATI BINTI MD. TAHIR**

DATE: 31 DECEMBER 2012

## **ABSTRACT**

Parkinson's disease (PD) is the second commonest late life neurodegenerative disease after Alzheimer's disease. It is prevalent throughout the world and predominantly affects patients above 60 years old. It is caused by progressive degeneration of dopamine containing cells (neurons) within the deep structures of the brain called the basal ganglia and substantia nigra. Therefore, accurate prediction of PD need to be done in order to assist medical or bio-informatics practitioners for initial diagnose of PD based on variety of test results. This paper described the analysis conducted based on two training algorithms namely Levenberg-Marquardt (LM) and Scaled Conjugate Gradient (SCG) of Multilayer Perceptrons (MLPs) Neural Network in diagnosing PD with Analysis of Variance (ANOVA) as a feature selection. The dataset information of this project has been taken from the Parkinson Disease Data Set. Results attained confirmed that the LM performed well with accuracy rate of above 90% before and after feature selection whilst SSG attained above 85% subsequent to implementation of ANOVA as feature selection.

# TABLE OF CONTENT

<b>CONTENTS</b>	<b>PAGE</b>
<b>Acknowledgement</b>	<b>i</b>
<b>Abstract</b>	<b>ii</b>
<b>Table Of Content</b>	<b>iii</b>
<b>List Of Figures</b>	<b>vi</b>
<b>List Of Tables</b>	<b>vii</b>
<b>List Of Abbreviations</b>	<b>viii</b>
<b>CHAPTER 1 INTRODUCTION</b>	<b>1</b>
1.1 Introduction	1
1.2 Overview	2
1.3 Problem Statement	2
1.4 Significance	2
1.5 Objectives	3
1.6 Limitations of the Project	3
1.7 Thesis Layout	3
<b>CHAPTER 2 LITERATURE REVIEW</b>	<b>5</b>
2.1 Introduction	5
2.2 Parkinson's Disease (PD)	5
2.3 Machine Learning Algorithms	8
2.4 Software Implementation	9
2.5 Related Works	9
2.5.1 Artificial Neural Network Classifier for the Diagnosis of Parkinson's disease using [99mtc] TRODAT-1 and SPECT	10
2.5.2 Deep-Brain Stimulator and Control of Parkinson's disease	10

# CHAPTER ONE

## INTRODUCTION

### 1.1 Introduction

This chapter describes the overall view about this project, problem statement, significance, objectives, limitation of the project and the thesis layout.

### 1.2 Overview

Parkinson's disease (PD) is caused by progressive degeneration of dopamine containing cells (neurons) within the deep structures of the brain called the basal ganglia and substantianigra. Both motor and non-motor symptoms exist in PD, although the cardinal features and the diagnosis of PD are based purely on the presence of motor symptoms. PD is a condition of the nervous system which causes the muscles to become stiff and the body to shake. According to Dr.Norlinah Mohamed Ibrahim, Head of the Neurology Unit at UniversitiKebangsaan Malaysia Medical Centre (PPUKM), PD symptoms slowly creep up in patients, mostly over age 60, and this is often misinterpreted as a part of normal ageing but PD also affects patients below age 45[1, 2]. It is estimated that more than 15,000 people in Malaysia are suffered from PD, and the number is rising every year.

Symptoms in PD can be divided into motor and non-motor. However, for this project, the data set used is based on the motor symptoms[1]. Typically, motor symptoms include tremor of the hands and/or legs and slowness of movement. Tremor in PD is also known as "pill-rolling" tremor as it has the characteristic appearance of someone rolling a pill in his hands. It usually occurs when the patient is resting and become more pronounced with mental tasks or anxiety. The initial symptoms of PD can be detected among the patient when hand-writing become more progressively smaller (micrographia) and patient may lose dexterity in carrying out daily tasks. Besides, the voice may become low-pitched and monotonous, with excessive drooling of saliva. The other symptoms are the gait may be affected where resulting in strides with lack of arm swing and giving a shuffling appearance when walking.