

UNIVERSITI TEKNOLOGI MARA

**INVESTIGATION OF ARTIFICIAL
NEURAL NETWORK PERFORMANCE AS
THE CLASSIFIER OF THE MUSCLE
CONTRACTION PATTERN ON
ELECTROMYOGRAPHY SIGNAL DURING
STEPPING ACTIVITY (P39S23)**

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ABSTRACT

Exercise and repetitive movement fatigue are crucial to healthcare and rehabilitation. Muscle fatigue is a frustrating problem that happens after exercise. To improve the quality of rehabilitation and healthcare, precise evaluations and focused interventions are needed. Potential sites for force production can now be assessed using non-invasive stimulation approaches which is surface Electromyography (sEMG). Electromyography (EMG) is an essential technique used to measure muscle activity during various tasks. Despite its popularity, previous studies have yet to determine which EMG features are critical in classifying muscle contraction patterns across different physical activities and obtaining optimal performance. Therefore, this study aims to classify muscle contraction patterns during stepping exercises from sEMG and investigate the performance of Artificial Neural Networks as a classifier of this contraction pattern. 60 participants voluntarily participated in this exercise and their EMG signal was recorded. This study has been approved by the University of Birmingham Research Ethics Committee (ERN_14-0493). The raw EMG signal undergoes filtering, rectification, and linear enveloping. Then, each signal from each participant was segmented into a relax signal and a contract signal. Time domain and frequency domain features were then retrieved from every relax and contract signal and fed into the ANN model. For validation purposes, ANN model performance has been compared with other machine learning models which are support vector machines and Decision Tree. The results indicate that ANN outperformed the other machine learning models with 96.5% accuracy performance in classifying the muscle contraction patterns from the sEMG signal. The findings from this research could contribute valuable insights to inform more effective and personalized rehabilitation services in identifying muscle contractions autonomously, thereby improving the overall mobility and quality of life for individuals facing muscle fatigue and financial problems. This study could help in strengthening the healthcare services mentioned in Ekonomi Madani's 17-Big Bolds.

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TABLE OF CONTENTS

	Page
SUPERVISOR’S APPROVAL	i
AUTHOR’S DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	vii
LIST OF FIGURES	viii
CHAPTER ONE: INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	2
1.3 Research Questions	3
1.4 Research Objectives	3
1.5 Significance and Benefit of Study	3
1.6 Scope and Limitation of Study	4
1.7 Definitions of Terms	5
CHAPTER TWO: LITERATURE REVIEW	7
2.1 Introduction	7
2.2 Lower Limb rehabilitation	8

2.3	The Need for Classifying Muscle Contraction Using Biometrics	9
2.4	The biometrics	10
2.5	Electromyography Biosignal	11
2.6	Muscles Involved in Stepping Activity Using Stepper	12
2.7	Electromyography (EMG) Signal Analysis	14
2.7.1	Features Extraction of EMG Signals	18
2.8	Artificial Neural Network (ANN) analysis	19
2.9	Summary	21
CHAPTER THREE: RESEARCH METHODOLOGY		23
3.1	Electromyography Data Acquisition	24
3.2	Feature Extraction	25
3.2.1	The Electromyography Pre-processing	25
3.2.2	Time Domain Analysis	26
3.2.3	Frequency Domain Analysis	28
3.3	Artificial Neural Network (ANN) Model Development	29
3.4	Model Performance Comparison	30
3.5	Summary	31
CHAPTER FOUR: RESULTS AND DISCUSSIONS		33
4.1	Preprocessing	33
4.2	Muscle Response during Stepping Activity	36
4.3	Classification results performance using ANN	39
4.4	Model Performance Comparison	44
4.5	Summary	46
CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS		48
REFERENCES		50
APPENDICES		55