

**COMPARISONS BETWEEN NEWTON AND
QUASI-NEWTON METHOD IN SOLVING UNCONSTRAINED
OPTIMIZATION PROBLEMS**

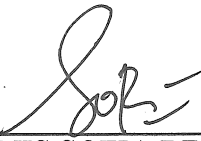
**NAZNIN FAIQA BINTI KHIRUL FOZI
HANIS SOFLA BINTI MOHD RODI**

**Thesis Submitted in Fulfillment of the Requirement for
Bachelor of Science (Hons.) Computational Mathematics in the
Faculty of Computer and Mathematical Sciences
Universiti Teknologi Mara**

July 2019

DECLARATION BY CANDIDATE

We certify that this report and the project to which it refers is the product of our own work and that any idea or quotation from the work of other people, published or otherwise are fully acknowledged in accordance with the standard referring practices of the discipline.



HANIS SOFIA BINTI MOHD RODI

2016299256

11 JULY 2019



NAZNIN FAIQA BINTI KHIRUL FOZI

2016299226

11 JULY 2019

ABSTRACT

Newton and Quasi-Newton methods are widely used in solving unconstrained optimization problems. The solution to optimization problems are known as local optimum solutions and global minimum solutions. For Newton method, if the initial points are far from the solution points, it may fail to converge. As an alternative, two Quasi-Newton methods which are Davidon-Fletcher-Powell (DFP) and Broyden-Fletcher-Goldfarb-Shanno (BFGS) methods were developed to overcome this problem. In this research, a comparison was made between Newton and Quasi-Newton method to determine the best method in solving unconstrained optimization problems. These methods were tested using six test functions with different initial points and their performance were compared based on the number of iterations, CPU time, and accuracy. This research also discussed about the convergence rate, global convergence and local convergence of the three methods. From numerical results, it has been shown that BFGS method is better compared to the other methods.

TABLE OF CONTENT

	Page
DECLARATION BY THE SUPERVISOR	i
DECLARATION BY THE CANDIDATE	ii
ABSTRACT	iii
ACKNOWLEDGEMENT	iv
LIST OF FIGURE	ix
LIST OF TABLE	x
LIST OF ALGORITHM	xi
LIST OF ABBREVIATION AND SYMBOL	xii
CHAPTER ONE: INTRODUCTION OF THE RESEARCH	
1.1 Introduction	1
1.2 Background of the Study	1
1.3 Problem Statement	4
1.4 Objectives	6
1.5 Significance of the Project	6
1.6 Scope of the Project	6
1.7 Project Benefit	7
1.8 Definition of Terms and Concepts	8
1.9 Organization of the Project	9
CHAPTER TWO: METHODOLOGY AND LITERATURE REVIEW	
2.1 Introduction	11

2.2	Research Step	11
2.3	Literature Review	15
2.4	Fundamental Concepts for Unconstrained Optimization Problem	18
2.4.1	Newton's Method	19
2.4.2	David-Fletcher-Powell (DFP) Method	20
2.4.3	Broyden-Fletcher-Goldfarb-Shanno (BFGS) Method	22
2.5	Conclusion	24

CHAPTER THREE: IMPLEMENTATION

3.1	Introduction	25
3.2	Implementation of Numerical Methods	25
3.2.1	Implementation of Newton Method	26
3.2.2	Implementation of Quasi-Newton Method	35
3.3	Calculation of Error	48
3.4	Conclusion	49

CHAPTER FOUR: NUMERICAL RESULTS AND DISCUSSION

4.1	Introduction	50
4.2	Sample of Test Functions	50
4.2.1	Problem 1: Three Hump Camel Function	51
4.2.2	Problem 2: Six Hump Camel Function	52
4.2.3	Problem 3: Himmelblau Function	53
4.2.4	Problem 4: White and Holst Function	54
4.2.5	Problem 5: Nonscomp Function	54
4.2.6	Problem 6: Leon Function	55