

**UNIVERSITI TEKNOLOGI MARA**

**Predicting Heart Disease Using Ant  
Colony Optimization**

**Siti Aisyah Bt Ismail**

**Report submitted in fulfillment of the requirements  
for Bachelor of Science (Hons.) Management  
Mathematics Faculty of Computer and  
Mathematical Science**

**July 2020**

## **STUDENT'S DECLARATION**

I certify that this report and the research to which it refers are the product of my own work and that any ideas or quotation from the work of other people, published or otherwise are fully acknowledged in accordance with the standard referring practices of the discipline.



.....

**SITI AISYAH BT ISMAIL**

**2017976033**

**5 AUGUST, 2020**

## ABSTRACT

The death rate due to heart disease has caused alarming concern among health experts in Malaysia as it increases year-on-year. They have to make more effort to detect heart disease, but it is not an easy task. Thus, this study used the Ant Colony Optimization algorithm with data mining called Ant-Miner to predict heart disease because it is said that Ant-Miner's rule list is simpler than other rule induction algorithms. The aim of this study is to develop a classification model for predicting heart disease. The data set is discretised by converting the numeric attributes to the nominal attributes by using WEKA as a tool. After that, the dataset was run in the Gui Ant-Miner to find the rules and percentage of accuracy in predicting heart disease. The results of Ant-Miner's accuracy are later compared to J48 for better classification. The dataset was run using a different number of ants from 100 to 400 to observe changes in accuracy, number of rules and number of conditions. In addition, rules and condition number were also observed when the value of the minimum case per rule was changed. The cross-validation number was set to  $k=10$  times throughout the test due to low bias and variance, while other parameters are set with fixed value, such as maximum uncovered cases equal to 10, convergence rules equal to 10, and iteration numbers equal to 100. In conclusion, it was found that the accuracy of Ant-Miner was 78.85% while the accuracy of J48 was 73.93%, indicating that Ant-Miner had better accuracy compared to J48.

**Keywords:** Ant Colony Optimization, classification, Ant-Miner, WEKA.

# TABLE OF CONTENT

<b>CONTENTS</b>	<b>PAGE</b>
<b>SUPERVISOR'S APPROVAL</b>	<b>ii</b>
<b>STUDENT'S DECLARATION</b>	<b>iii</b>
<b>ACKNOWLEDGEMENT</b>	<b>iv</b>
<b>ABSTRACT</b>	<b>v</b>
<b>TABLE OF CONTENT</b>	<b>vi</b>
<b>LIST OF FIGURES</b>	<b>viii</b>
<b>LIST OF TABLES</b>	<b>ix</b>
<b>CHAPTER ONE: INTRODUCTION</b>	
1.1    Background of the Study	1
1.2    Problem Statement	2
1.3    Objective of the Study	2
1.4    Scope of the Study	2
1.5    Significance of the Study	3
1.6    Summary	3
<b>CHAPTER TWO: LITERATURE REVIEW</b>	
2.1    Heart Disease Prediction	4
2.2    Ant Colony Optimization	6
2.3    Ant Colony Optimization for Rule Induction	8
2.4    Summary	10
<b>CHAPTER THREE: RESEARCH METHODOLOGY</b>	

3.1	Data Pre-Processing	11
3.2	Model Development	13
3.3	Model Validation	19
3.4	Summary	19
 <b>CHAPTER FOUR: RESULT AND DISCUSSION</b>		
4.1	Results of Classification using Ant-Miner	20
4.2	Results of Classification using J48	22
 <b>CHAPTER FIVE: CONCLUSION AND RECOMMENDATION</b>		
5.1	Conclusion	24
5.2	Recommendations	25
 <b>REFERENCES</b>		26
 <b>APPENDICES</b>		29
APPENDIX A: 5-FOLD CROSS-VALIDATION		29
APPENDIX B: ANT-MINER RESULT OF HIGHEST ACCURACY		30
APPENDIX C: J48 RESULTS		35