

UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

**PREDICTION OF RAINFALL BY USING
NEAREST NEIGHBORHOOD APPROACH**

P18S18

**MUHAMMAD SHOFWATULLAH BIN MOHAMED RADZWAN
MOHAMAD NAZRAN BIN AB GHANI
MUHAMAD AMIRUL AIMAN BIN CHE AB DULLAH**

**Bachelor of Science (Hons.) Mathematics
Faculty of Computer and Mathematical Sciences**

DECEMBER 2018

ACKNOWLEDGEMENTS

IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

As a matter of first importance, we might want to express our gratitude toward Allah for giving us the strength to go through all the difficulties to complete this project. We would also like to express our gratitude to our supervisor, Sir Luqman Bin Sapini for his help and motivation throughout this research project and for his efforts in overseeing the entire progress of our project. He gave us a clear sense of direction and outline from starting until the end of our research project.

The most important thankful to our group members, without the persistence among the group members, this final year project would not have been completed punctually. During the development of this research project, we faced various difficulties during the data collection, analyze and as well as interpretation processes. However, we managed to pull through all hardships with the guidance and motivation from the people around us. Therefore, we take this opportunity to express our gratitude towards them.

Besides, we are thankful to our respective MSP's lecturer, Dr Mat Salim and Sir Mohd Azdi Maasar, Mathematical Modelling's lecturer, Dr Khairul Anwar Rasmani and our examiner for Final Year Project, Dr Nor Azni Shahari for the basic exposure which they provide us when we undertake this research project. Finally, we would like to thank everyone who had helped us directly and indirectly way in finishing this final year project.

Table of Contents

ACKNOWLEDGEMENTS	i
LIST OF TABLES	iii
LIST OF FIGURES	iii
ABSTRACT	iv
CHAPTER 1 INTRODUCTION	1
1.1 PROBLEM STATEMENT	2
1.2 OBJECTIVE	2
1.3 SCOPE OF STUDY	3
1.4 LIMITATION OF STUDY	3
1.5 SIGNIFICANCE OF STUDY AND RESEARCH BENEFITS	3
1.6 DEFINITION OF TERM	4
CHAPTER 2 BACKGROUND THEORY AND LITERATURE REVIEW	5
2.1 BACKGROUND THEORY	5
2.2 PREDICTION MODELS	5
2.3 ERROR MEASURE	8
2.4 HANDLING MISSING DATA	10
2.5 SUMMARY	10
CHAPTER 3 METHODOLOGY AND IMPLEMENTATION	11
3.1 FLOWCHART OF METHODOLOGY	11
11	
3.2 DATA COLLECTION	12
3.3 MANAGING ZERO AND NON-VALUE DATA	12
3.4 THE PREDICTION MODELS	12
3.4.1 ZERO-TH-ORDER APPROXIMATION METHOD (ZOAM)	13
3.4.2 K-NEAREST NEIGHBORS APPROXIMATION METHOD (KNNAM)	14
3.4.3 WEIGHTED DISTANCE APPROXIMATION METHOD (WDAM)	14
3.5 MEASURE PERFORMANCE AND SELECT THE BETTER THE MODEL	15
CHAPTER 4 RESULTS AND DISCUSSION	18
4.1 PREDICTION OF RAINFALL FOR THE SHORT TERM	18
4.2 PREDICTION OF RAINFALL FOR LONG TERM	19
4.3 COMPARING PERFORMANCE BETWEEN THE SHORT AND LONG TERM	21
4.4 PERFORMANCE OF KNNAM AND WDAM BY USING DIFFERENT DISTANCE	22
4.5 DISCUSSION	24
CHAPTER 5 CONCLUSION AND RECOMMENDATION	25
5.1 CONCLUSION	25
5.2 RECOMMENDATION	25
REFERENCES	26
APPENDIX A	28
APPENDIX B	29
APPENDIX C	30
APPENDIX D	34

LIST OF TABLES

Table 1: Definition of terms.....	4
Table 2: The value of distance, d	13
Table 3: Predicted values from the three (3) models	15
Table 4: Example of predict and real data	16
Table 5: The value of cc and e for the short-term.....	18
Table 6: The values of the cc and e for the long-term.	19
Table 7: The value of cc and e for the short and long term	21
Table 8: The actual data.....	28
Table 9: The adjusted data	28

LIST OF FIGURES

Figure 1: Flowchart of methodology	11
Figure 2: Performance of KNNAM using different distance (d) for the short-term.....	22
Figure 3: Performance of WDAM using different distance (d) for the short-term.....	23

ABSTRACT

Prediction of rainfall has become a normal phenomenon in the world, usually people will think that predict rainfall is normal and just like predict it without any calculation. However, for some knowledgeable people and researchers, they know that the prediction of rainfall can be used by using the mathematical calculation. Therefore, in our research, we study about one of them, which is the nearest neighborhood approach. Therefore, the aim of this study is to find the suitable model of nearest neighborhood approaches which are zero-order approximation method (ZOAM) and improved ZOAM. The improved ZOAM are k-nearest neighborhood approximation method (KNNAM), and weighted distance approximation method (WDAM). Moreover, to compare the performance of accuracy between the nearest neighborhood approaches by finding the relationship between the real and predicted data by using correlation coefficient, cc and use the average absolute error, e to decide whether the model is better or not. Lastly, to show whether short or long term which one is better as a length of prediction range. Based on this study, the result shows that the most suitable model to predict the rainfall data is WDAM by using 5 distances, and the best duration of prediction is predicting in the short-term by using WDAM with 8 distances. Overall, WDAM is the best model because add-on the element of distance to improve the prediction tool and better than ZOAM and KNNAM.