

# CONTENTS

|  |      |
|--|------|
| <b>APPROVAL</b>                            | ii   |
| <b>SELF DECLARATION AGAINST PLAGIARISM</b> | iii  |
| <b>ABSTRACT</b>                            | iv   |
| <b>ABSTRAK</b>                             | v    |
| <b>DEDICATION</b>                          | vi   |
| <b>ACKNOWLEDGMENTS</b>                     | vii  |
| <b>CONTENTS</b>                            | viii |
| <b>LIST OF TABLES</b>                      | x    |
| <b>LIST OF FIGURES</b>                     | xi   |
| <b>1 INTRODUCTION</b>                      | 1    |
| 1.1 Background . . . . .                   | 1    |
| 1.2 Problem Identification . . . . .       | 2    |
| 1.3 Objective and Hypotheses . . . . .     | 3    |
| 1.4 Scope and Delimitation . . . . .       | 4    |
| <b>2 REVIEW OF LITERATURE AND STUDIES</b>  | 5    |
| 2.1 Related Literatures . . . . .          | 5    |
| 2.2 Related Studies . . . . .              | 7    |
| 2.2.1 Dumbbell Topology . . . . .          | 7    |
| 2.2.2 Round-Trip Time . . . . .            | 8    |
| 2.2.3 Model Baseline . . . . .             | 8    |
| 2.2.4 Activation Function . . . . .        | 11   |
| 2.2.5 Evaluation Performance . . . . .     | 13   |
| 2.2.6 Model Comparison . . . . .           | 15   |
| <b>3 RESEARCH METHODOLOGY</b>              | 17   |
| 3.1 Research Design . . . . .              | 17   |
| 3.1.1 Data Collection . . . . .            | 17   |
| 3.1.2 Dataset Splitting . . . . .          | 18   |
| 3.1.3 Estimated RTT . . . . .              | 18   |
| 3.1.4 Evaluation Performance . . . . .     | 18   |

|          |  |           |
|----------|--|-----------|
| 3.2      | System Implementation . . . . .  | 19        |
| 3.3      | Experiment Scenario . . . . .  | 19        |
| 3.3.1    | RELM Baseline . . . . .  | 19        |
| 3.3.2    | Improving Regularized Extreme Learning Machine . . . . .                             | 21        |
| 3.4      | Comparison Several Model Machine Learning . . . . .                                  | 22        |
| 3.5      | Experiment Regression Problems . . . . .   | 22        |
| <b>4</b> | <b>PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA</b>                             | <b>24</b> |
| 4.1      | Presentation of Data . . . . .   | 24        |
| 4.1.1    | RELM using Grid Search for Hidden Layer(Tanh, Sigmoid and ReLU Activation) . . . . . | 24        |
| 4.1.2    | RELM changes the constant C by trial and error . . . . .                             | 26        |
| 4.1.3    | Cross Validation for RELM model . . . . .  | 28        |
| 4.1.4    | Improving RELM (Find the best C constants using brute force) . . .                   | 29        |
| 4.1.5    | Improving RELM (Find the best C constants using proposed function)                   | 30        |
| 4.2      | Analysis of the experiment result . . . . .  | 31        |
| <b>5</b> | <b>CONCLUSION</b>  | <b>34</b> |
|          | <b>BIBLIOGRAPHY</b>  | <b>35</b> |
|          | <b>Appendices</b>  | <b>39</b> |
|          | <b>A MISCELLANEOUS</b>   | <b>41</b> |