

# CONTENTS

<b>APPROVAL PAGE</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> .....	xi
<b>LIST OF FIGURES</b> .....	xii
<b>CHAPTER 1 INTRODUCTION</b> .....	1
<b>1.1 Rationale</b> .....	1
<b>1.2 Theoretical Framework</b> .....	3
<b>1.3 Conceptual Framework/Paradigm</b> .....	3
<b>1.4 Statement of the Problem</b> .....	4
<b>1.5 Objective and Hypothesis</b> .....	5
1.5.1.Objectives .....	5
1.5.2.Hypothesis.....	5
<b>1.5 Assumption</b> .....	5
<b>1.6 Scope and Delimitation</b> .....	6
1.6.1. Principal Variables .....	6
1.6.2. Locale .....	6
1.6.3. Timeframe.....	6
1.6.4. Justification.....	6
1.6.5. Limitation .....	6
<b>1.7. Significance of the Study</b> .....	7
<b>CHAPTER 2 REVIEW OF LITERATURE AND STUDIES</b> .....	8

<b>2.1</b>	<b>Related Studies</b> .....	<b>8</b>
2.1.1.	Implementation of Deep Learning in Drug Side Effect .....	8
2.1.2.	Optimization for Drug Side Effects with Metaheuristic .....	9
2.1.3.	SMILES-based Descriptor for Drug Representation .....	9
2.1.4.	Deep Learning with Optimization for Drug Side Effect .....	11
2.1.5.	SMILES-based Descriptor using Deep Learning and Tuned by Metaheuristic Algorithm .....	11
2.1.6.	SMILES2Vec-based Descriptor for Drug Representation .....	12
<b>2.2</b>	<b>Side Effects and Interaction between Drug-Target</b> .....	<b>13</b>
<b>2.3</b>	<b>Blood and Lymphatic System</b> .....	<b>14</b>
<b>2.4</b>	<b>SMILES</b> .....	<b>14</b>
<b>2.5</b>	<b>LSTM</b> .....	<b>15</b>
<b>2.6</b>	<b>NiaPy</b> .....	<b>17</b>
<b>2.7</b>	<b>Monarch Butterfly Optimization (MBO) Algorithm</b> .....	<b>17</b>
<b>CHAPTER 3</b>	<b>RESEARCH METHODOLOGY</b> .....	<b>21</b>
<b>3.1</b>	<b>Dataset Overview</b> .....	<b>21</b>
<b>3.2</b>	<b>SMILES2Vec</b> .....	<b>21</b>
<b>3.3</b>	<b>LSTM Model Development</b> .....	<b>22</b>
<b>3.4</b>	<b>Model Optimization by MBO</b> .....	<b>23</b>
<b>3.5</b>	<b>Evaluation</b> .....	<b>24</b>
<b>CHAPTER 4</b>	<b>PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA</b> .....	<b>26</b>
<b>4.1</b>	<b>Presentation of Data</b> .....	<b>26</b>
4.1.1	Presentation Data in Tabular View .....	26
4.1.2	Presentation Data in Textual View.....	26
4.1.3	Presentation Data in Graphical View .....	27
<b>4.2</b>	<b>Implementation</b> .....	<b>28</b>
4.2.1	SMILES2Vec .....	28
4.2.2	Optimization Process using Monarch Butterfly Optimization (MBO) ..	30
<b>4.3</b>	<b>Result and Discussion</b> .....	<b>32</b>
4.3.1	Without tuning Scheme Performance .....	32
4.3.2.	With tuning Scheme Performance.....	38

4.3.3. Without vs Without Tuning Scheme Comparison .....	46
<b>CHAPTER 5 CONCLUSION AND RECOMMENDATIONS .....</b>	<b>50</b>
<b>5.1 Conclusions.....</b>	<b>50</b>
<b>5.2 Recommendations .....</b>	<b>50</b>
<b>BIBLIOGRAPHY.....</b>	<b>51</b>
<b>APPENDICES.....</b>	<b>55</b>
<b>APPENDIX A MISCELLANEOUS.....</b>	<b>55</b>
A.1 Dataset SIDER and Program Resource.....	55
<b>APPENDIX B Curriculum Vitae .....</b>	<b>56</b>