

**TABLE OF CONTENTS**

	<b>Pages</b>
ACKNOWLEDGEMENTS .....	ii
TABLE OF CONTENTS .....	iii
LIST OF FIGURES .....	iv
LIST OF TABLES .....	v
ABSTRACT.....	vi
CHAPTER I INTRODUCTION .....	7
1.1    Background of the Problem .....	7
Research Question.....	8
Limitation of Research.....	9
1.2    Objective .....	9
1.3    Benefits of Research .....	9
CHAPTER II LITERATURE REVIEW.....	10
CHAPTER III THEORETICAL BASE.....	14
3.1    Machine Learning .....	14
3.2    Deep Learning.....	15
3.3    Natural Language Processing.....	18
3.3.1    Language Modelling .....	18
3.3.2    Encoder-Decoder Model .....	19
3.4    BERT .....	19
3.4.1    Attention.....	20
3.4.2    Transformers .....	21
3.4.3    Model Pre-training .....	24
3.4.4    Model Fine-Tuning .....	25
3.4.5    Feature Extraction .....	27
CHAPTER IV RESEARCH METHODOLOGY .....	28
4.1    Literature Study.....	28
4.2    Tools of Research.....	28
4.3    Data for research .....	28
4.4    Work Procedure for IndoBERT .....	30
4.5    Work Procedure for Summarization .....	32
4.6    Work Procedure for Sentiment Analysis.....	35



4.7	Work Procedure Part-of-Speech Tagger .....	36
CHAPTER V EXPERIMENTAL RESULT.....		37
5.1	Experimental IndoBERT.....	37
5.2	Experimental Summarization.....	38
5.3	Experimental Sentiment Analysis .....	41
CHAPTER VI .....		44
REFERENCES.....		46



## LIST OF FIGURES

Figure 3.1 Neural network example with two hidden layers .....	16
Figure 3.2 Neuron output .....	16
Figure 3.3 Linear Function.....	17
Figure 3.4 Sigmoid and Tanh Function .....	17
Figure 3. 5 ReLU .....	18
Figure 3.6 Transformer Architecture (Taken from (Vaswani et al., 2017)) .....	22
Figure 3.7 Multihead-headed scaled dot-product self-attention (Taken from (Vaswani et al., 2017)) .....	24
Figure 3.8 Input Example (Taken from (Devlin et al., 2019) .....	25
Figure 3.9 Downstream tasks fine-tuning using BERT (Taken from (Devlin et al., 2019) .....	26
Figure 4. 1 Distribution of first dataset classes .....	29
Figure 4. 2 Distribution of second dataset classes .....	29
Figure 4. 3 Architecture of Summarization tasks.....	30
Figure 4. 4 Encoding Multiple Sentences .....	33
Figure 4. 5 Sentiment Analysis Architecture .....	35
Figure 4. 6 POS Tagger Architecture.....	36



## **LIST OF TABLES**

Table 2. 1 Literature Review.....	12
Table 5. 1 Result of Summarization .....	41
Table 5. 2 Result of Sentiment Analysis.....	42
Table 5. 3 Result of Sentiment Analysis .....	43