

TABLE OF CONTENTS

ABSTRACT.....	i
PLAGIARISM STATEMENT.....	ii
TABLE OF CONTENTS.....	iii
TABLE LIST.....	v
FIGURE LIST.....	vi
CHAPTER I.....	1
1.1. Background.....	1
1.2. Research Problem.....	2
1.3. Problem Limitations.....	3
1.4. Research Objective.....	3
1.5. Benefits of Research.....	4
1.6. Research Methodology.....	4
1.7. Writing Scheme.....	5
CHAPTER II.....	6
CHAPTER III.....	15
3.1 Virtual Reality.....	15
3.2 Body Tracking.....	15
3.3 Pose Estimation.....	15
3.3.2 HRNet.....	16
3.4 Data Preprocessing.....	17
3.5 Mean Per Joint Positional Error.....	18
3.6 Inference Time (Latency).....	18
CHAPTER IV.....	20
4.1 General Description of Research.....	20
4.2 Problem Analysis.....	21
4.3 Data Acquisition.....	22
4.3.1 COCO-Whole Body Dataset.....	22
4.4 Algorithm Design for Model Training and Testing.....	23
4.4.1 Algorithm overview.....	23
4.4.2 Pose Estimation.....	24
4.4.2.1 Data Preprocessing.....	25
4.4.2.2 Data Undersampling.....	26
4.4.2.2 Pose ResNet.....	27
4.4.2.3 HRNet.....	27
4.4.3 Hyperparameter Tuning.....	27
4.5 Implementation.....	27
4.6 Strategy Analysis and Model Evaluation.....	28
4.6.1 Model Testing and Evaluation Metrics.....	28

4.6.1.1. Mean Per Joint Position Error (MPJPE).....	28
4.6.1.3. Inference Time (Latency).....	28
4.6.2 Result Analysis and Model Performance Comparison.....	29
4.7 Report Writing.....	30
CHAPTER V.....	31
5.1 Research Environment.....	31
5.2 Importing Libraries.....	31
5.3 Dataset Undersampling.....	32
5.4 Data Preprocessing.....	34
5.5 Model Development and Fine-Tuning.....	35
5.5.1 Pose ResNet.....	35
5.5.1.1 Model Architecture.....	35
5.5.1.2 Preloading Pretrained Weight.....	39
5.5.1.3 Fine-Tuning.....	40
5.5.2 HRNet.....	45
5.5.2.1 Model Architecture.....	45
5.5.2.2 Preloading Pretrained Weights.....	52
5.5.2.3 Fine-Tuning.....	53
5.6 Model Evaluation.....	55
5.6.1 Accuracy Metrics.....	55
5.6.2 Efficiency Metrics.....	57
CHAPTER VI.....	60
6.1 Data Pre-Processing Result.....	60
6.2 Hyperparameter Model dan Callbacks.....	61
6.3 Model Training.....	62
6.3.1 Pose Resnet Model Training with VR-Headset-Fitted Dataset.....	63
6.3.2 HRNet Model Training with VR-Headset-Fitted Dataset.....	64
6.4 Model Evaluation.....	65
6.4.1 Model Evaluation on Augmented Data Using Pretrained Weights.....	65
6.4.2 Model Evaluation on Augmented Data After Fine Tuning.....	67
CHAPTER VII.....	70
7.1 Conclusion.....	70
7.2 Future Works.....	71
REFERENCES.....	72