



**UNDERGRADUATE THESIS**

**HANDWRITTEN JAVANESE SCRIPT TEXT  
RECOGNITION USING CNN BILSTM AND  
CONNECTIONIST TEMPORAL CLASSIFICATION**

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2026**

## APPROVAL SHEET

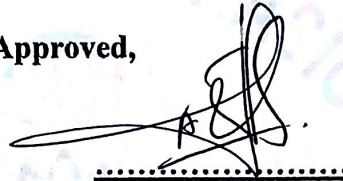
### HANDWRITTEN JAVANESE SCRIPT TEXT RECOGNITION USING CNN BILSTM AND CONNECTIONIST TEMPORAL CLASSIFICATION

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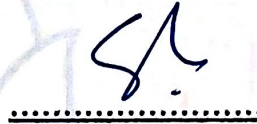
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## ABSTRACT

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Supervisor : 1. Fetty Tri Anggraeny, S.Kom., M.Kom.  
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The Nglegena Javanese script is a traditional writing system with high historical and cultural value, but faces the threat of extinction due to the low literacy skills of the community. Based on previous research, 81.4% of students are unable to read and 79% are unable to write Javanese script. On the other hand, more than 19,000 Javanese script manuscripts stored in various collections have not been adequately inventoried, so an automatic text recognition system is needed that can support digitization and preservation efforts. This study aims to develop an end-to-end handwritten text recognition model for the Nglegena Javanese script based on Convolutional Neural Network (CNN), Bidirectional Long Short-Term Memory (BiLSTM), and Connectionist Temporal Classification (CTC) architecture without requiring explicit character segmentation. The dataset used consists of 1,200 synthetic images resulting from rendering Javanese script fonts, with 1,000 images as training data and 200 images as validation data. In addition, 300 real handwritten images from six participants were used, divided into 100 images as validation data and 200 images as test data. This study systematically explored architectural variations by varying the number of CNN layers from 3 to 7 layers and BiLSTM layers from 1 to 3 layers, using Character Error Rate (CER) and Exact Match (EM) as evaluation metrics. The experimental results showed that the optimal configuration was achieved by the 5-CNN and 2-BiLSTM architectures with a CER value of 0.068 and an EM accuracy of 0.795. Fine architectures (3-4 CNN layers) indicated underfitting due to limited feature capacity, while deeper architectures (6-7 CNN layers and 3 BiLSTM layers) showed performance degradation and instability due to overfitting. The effectiveness of the CNN-BiLSTM-CTC architecture synergy was proven through the model's high generalization ability on varied real handwritten test data. The entire system is then implemented in the form of an API and an interactive website interface to support accessibility of Nglegena Javanese script recognition by other systems and the wider community.

**Keywords:** Nglegena Javanese Script, Handwritten Text Recognition, CNN, BiLSTM, CTC, Character Error Rate, Exact Match.

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The author acknowledges that this thesis is far from perfect. Therefore, the author welcomes constructive criticism and suggestions. Finally, I hope this thesis will

contribute to the advancement of knowledge, particularly in the field of computer science.

Surabaya, May 25<sup>th</sup> 2026



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## TABLE OF CONTENTS

APPROVAL SHEET .....	i
APPROVAL SHEET .....	iii
STATEMENT OF ORIGINALITY .....	v
ABSTRACT .....	vii
ACKNOWLEDGEMENTS .....	ix
TABLE OF CONTENTS .....	xi
LIST OF FIGURES.....	xiii
LIST OF TABLES.....	xv
LIST OF SOURCE CODES .....	xvii
CHAPTER I INTRODUCTION.....	1
1.1 Background .....	1
1.2 Problem Statement .....	3
1.3 Research Objectives .....	4
1.4 Research Contributions .....	4
1.5 Scope and Limitations .....	5
CHAPTER II LITERATURE REVIEW.....	7
2.1 Related Studies .....	7
2.2 Javanese Script .....	11
2.3 Handwritten Text Recognition.....	12
2.4 Artificial Intelligence .....	14
2.5 Machine Learning.....	14
2.6 Deep Learning .....	15
2.7 Convolutional Neural Network .....	16
2.8 LSTM and BiLSTM .....	21
2.9 Connectionist Temporal Classification.....	25
2.10 Model Performance Evaluation .....	26

2.11	Synthetic Data.....	27
CHAPTER III RESEARCH METHODOLOGY.....		31
3.1	Research Workflow .....	31
3.2	Literature Review .....	32
3.3	Dataset Development.....	32
3.4	Data Preprocessing .....	39
3.5	Model Architecture Design.....	45
3.6	Model Training and Testing Scenarios .....	69
3.7	Model Implementation .....	72
CHAPTER IV RESULTS AND DISCUSSION.....		75
4.1	System Implementation .....	75
4.2	Data Preparation .....	75
4.3	Data Augmentation and Preprocessing.....	79
4.4	Model Architecture .....	82
4.5	Decoding Mechanism .....	85
4.6	Model Training .....	87
4.7	Model Evaluation .....	89
4.8	Logging and Visualization.....	92
4.9	Results and Analysis.....	94
4.10	Model Implementation.....	109
CHAPTER V CONCLUSIONS AND RECOMMENDATIONS.....		115
5.1	Conclusions .....	115
5.2	Recommendations .....	116
REFERENCES.....		117
ATTACHMENT .....		121

## LIST OF FIGURES

Figure 2.1 Sequential based HTR system .....	13
Figure 2.2 Convolutional Neural Network Structure.....	17
Figure 2.3 Convolutional operation of CNN.....	18
Figure 2.4 Pooling operation of CNN .....	19
Figure 2.5 LSTM cells connection.....	22
Figure 2.6 Internal structure of LSTM cell .....	22
Figure 2.7 Comparison of LSTM architecture with BiLSTM .....	24
Figure 2.8 Example rendering results with different fonts .....	28
Figure 2.9 Results of adding synthetic attributes .....	29
Figure 2.10 Visual variations in text images.....	30
Figure 3.1 Research flowchart .....	31
Figure 3.2 Handwritten data creation flow .....	33
Figure 3.3 Handwriting image sample .....	34
Figure 3.4 Synthetic data creation flow .....	35
Figure 3.5 Synthetic data image samples.....	38
Figure 3.6 The result of each augmentation transformation .....	44
Figure 3.7 CNN BiLSTM CTC architecture diagram.....	46
Figure 3.8 CNN flowchart.....	47
Figure 3.9 Feature extraction image sample .....	48
Figure 3.10 Image sample pixel values.....	48
Figure 3.11 3×3 sized kernel .....	48
Figure 3.12 Convolution operation .....	49
Figure 3.13 The result of the convolution operation calculation .....	50
Figure 3.14 Batch Normalization calculation results.....	51
Figure 3.15 Results of applying the ReLU activation function .....	52
Figure 3.16 Max Pooling operation .....	52
Figure 3.17 Results of applying Max Pooling .....	53
Figure 3.18 Adaptive Average Pooling operation .....	53
Figure 3.19 Results of applying Adaptive Average Pooling .....	54
Figure 3.20 BiLSTM flowchart.....	57
Figure 3.21 Squeeze & permute operations .....	58
Figure 3.22 Illustration of all possible character alignments .....	64

Figure 3.23 CTC collapse process.....	66
Figure 3.24 CER calculation flow.....	68
Figure 3.25 EM calculation flow.....	68
Figure 3.26 API specification.....	73
Figure 3.27 Website design .....	74
Figure 4.1 Dependencies between code modules.....	75
Figure 4.2 Batch Data Structure Inspection Results from DataLoader.....	79
Figure 4.3 Example of image results after applying augmentation.....	81
Figure 4.4 example of image results after pre-processing .....	82
Figure 4.5 Model architecture inspection.....	85
Figure 4.6 Visualization of the model training process.....	89
Figure 4.7 Training loss of 3-CNN model.....	95
Figure 4.8 Validation metrics of the 3-CNN model .....	95
Figure 4.9 Training loss of 4-CNN model.....	96
Figure 4.10 Validation metrics of the 4-CNN model .....	97
Figure 4.11 Training loss of 5-CNN model.....	97
Figure 4.12 Validation metrics of the 5-CNN model .....	98
Figure 4.13 Training loss of 6-CNN model.....	99
Figure 4.14 Validation metrics of the 6-CNN model .....	99
Figure 4.15 Training loss of 7-CNN model.....	100
Figure 4.16 Validation metrics of the 7-CNN model .....	101
Figure 4.17 Training loss of 1-BiLSTM model.....	103
Figure 4.18 Validation metrics of 1-BiLSTM model .....	103
Figure 4.19 Training loss of 2-BiLSTM model .....	104
Figure 4.20 Validation metrics of 2-BiLSTM model .....	105
Figure 4.21 Training loss of 3-BiLSTM model .....	106
Figure 4.22 Validation metrics of the 3-BiLSTM model .....	107
Figure 4.23 Evaluation of the best model CER distribution .....	109
Figure 4.24 API success response .....	110
Figure 4.25 API error response .....	111
Figure 4.26 Initial view of the website.....	112
Figure 4.27 Inference section view .....	112
Figure 4.28 View after image is inserted.....	113
Figure 4.29 Display of prediction results .....	114

## LIST OF TABLES

Table 2.1 Nglegena Javanese Script Characters.....	12
Table 2.2 Classification of machine learning approaches.....	15
Table 3.1 First participant words and characters data distribution.....	33
Table 3.2 Synthetic data words and characters distribution.....	35
Table 3.3 List of Javanese script fonts.....	36
Table 3.4 Distribution of font usage for text rendering.....	37
Table 3.5 Handwriting image preprocessing stages.....	39
Table 3.6 Synthetic image augmentation stages.....	41
Table 3.7 Synthetic image preprocessing stages.....	45
Table 3.8 CNN configuration.....	54
Table 3.9 Example illustration of initial weights and biases.....	59
Table 3.10 BiLSTM configuration.....	61
Table 3.11 Illustration of the model output probability value.....	63
Table 3.12 CER and EM analysis example.....	66
Table 3.13 Hardware specifications.....	69
Table 3.14 Software specifications.....	69
Table 3.15 Model training dataset.....	70
Table 3.16 Model Hyperparameter.....	70
Table 3.17 Model architecture test scenario.....	71
Table 4.1 CNN layer variation results.....	101
Table 4.2 BiLSTM layer variation results.....	107

## LIST OF SOURCE CODES

Source code 4.1 Vocabulary creation .....	76
Source code 4.2 Dataset class .....	76
Source code 4.3 Data collation.....	78
Source code 4.4 Augmentation pipeline.....	80
Source code 4.5 Preprocessing pipeline.....	81
Source code 4.6 Model class .....	82
Source code 4.7 Decoding function .....	85
Source code 4.8 Training loop function .....	87
Source code 4.9 Validation loop function .....	88
Source code 4.10 Metrics function.....	89
Source code 4.11 Evaluation loop function .....	91
Source code 4.12 Logging and visualization function.....	92