

Nepali Handwritten Text Recognition



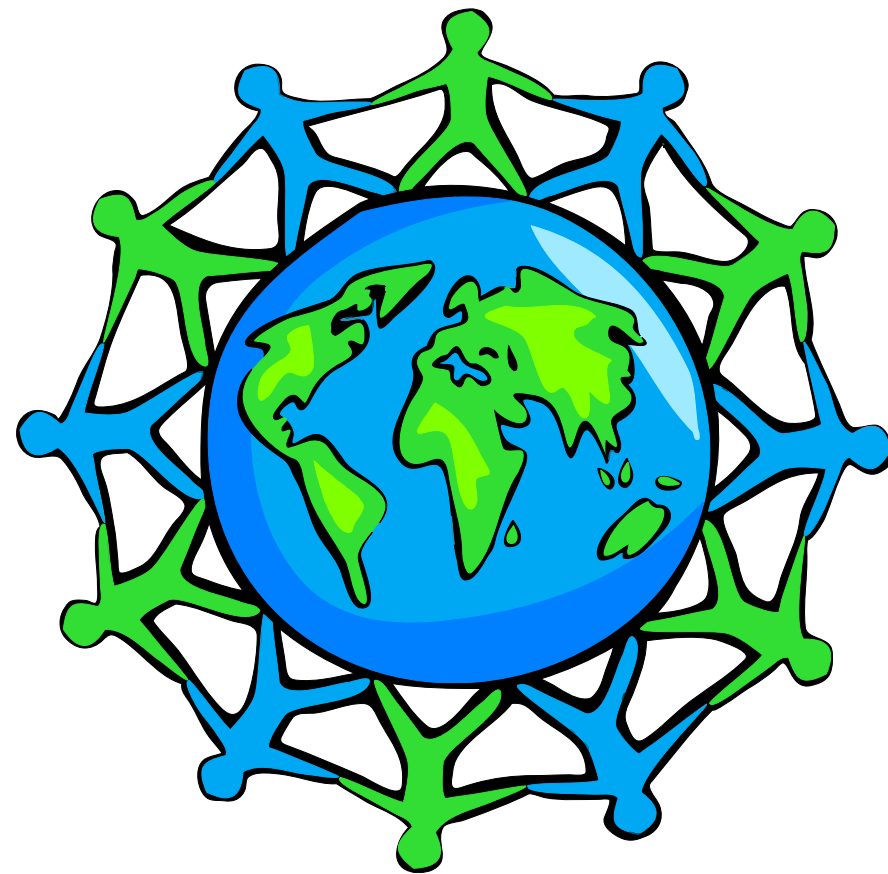
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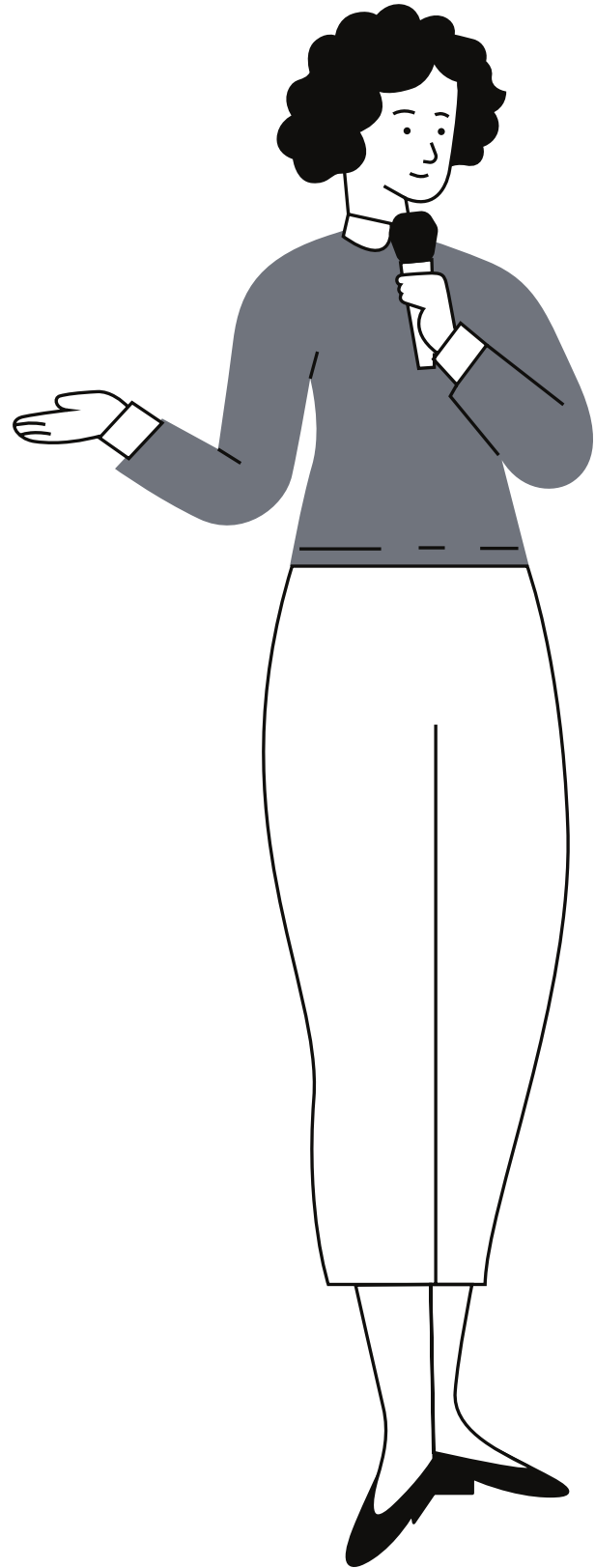


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Introduction

Handwriting Recognition is the mechanism for converting the handwritten text into machine-encoded text.

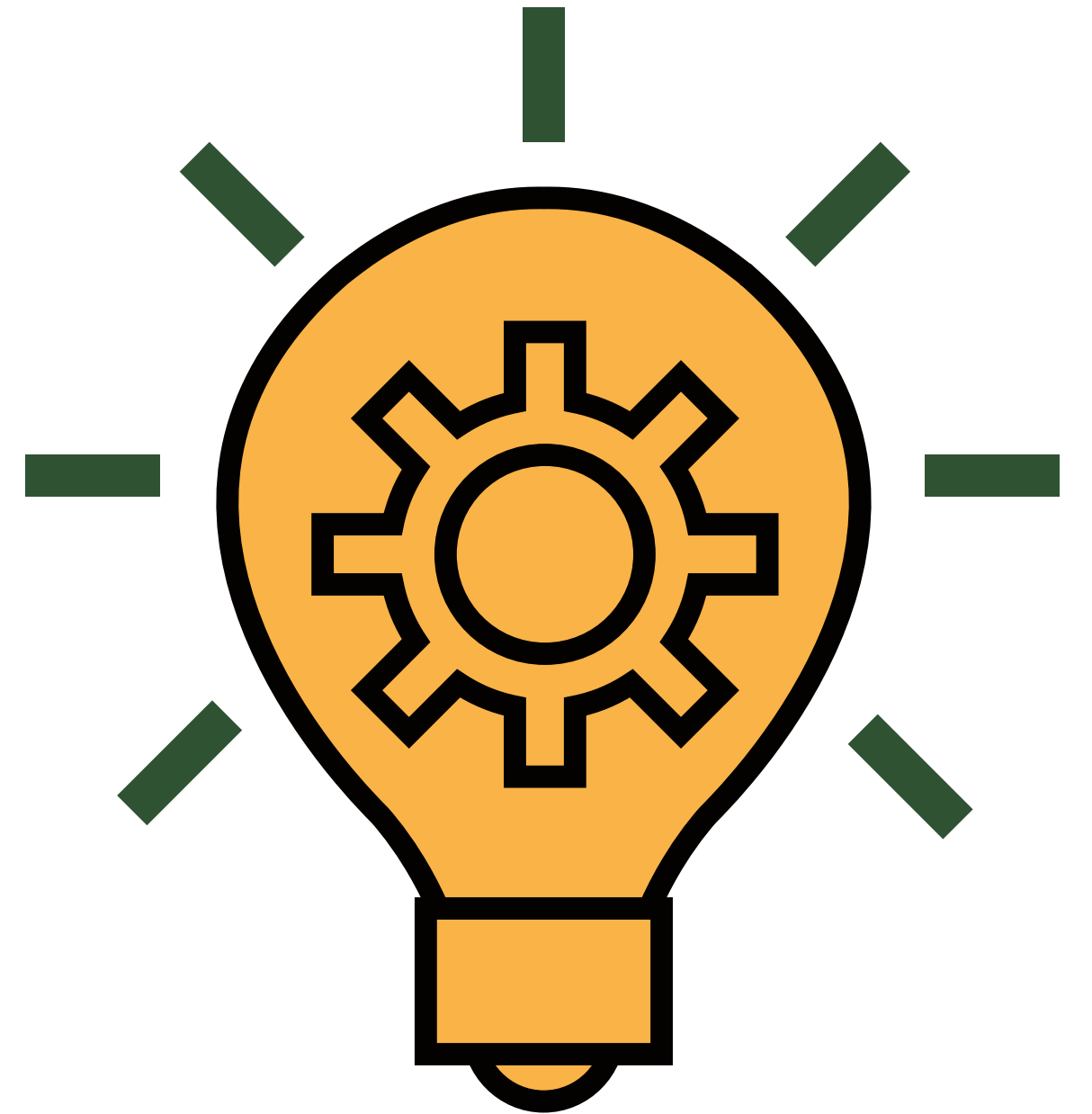


Problem Statement

- Old handwritten documents to be worn and lost in future.
- Paperwork provides lack of security and is time consuming.

Objective

A system to convert Nepali Handwritten Text into digital form.



Methodology

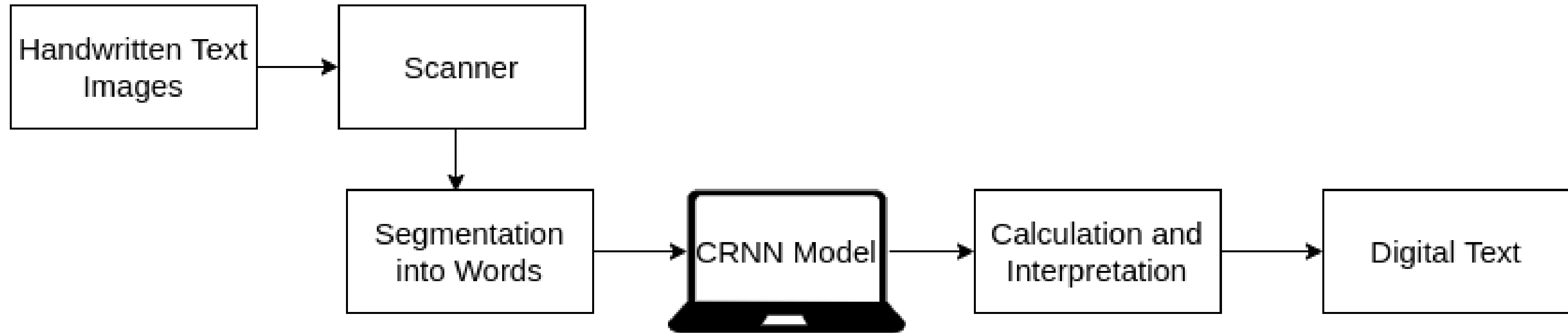
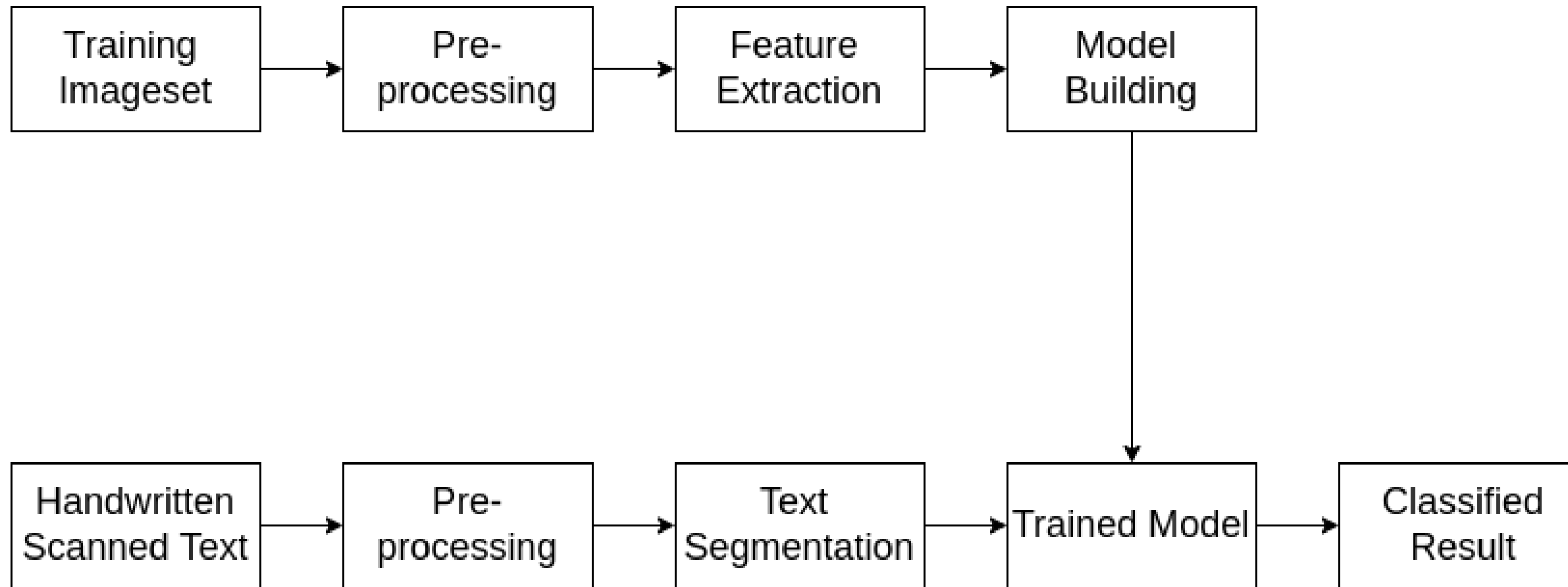


Figure 1: General Block Diagram of the System

Methodology Contd

Training Phase



Recognition Phase

Figure 2: Training and Recognition Phase

Data sets

- The 25000 word level devanagari dataset is collected from CVIT.
- Every image is properly labeled giving image path and ground truth text in image.

Word Segmentation

- Read Image
- Resize Image
 - Canny Edge Detection Process
- Word Detection

Word Segmentation

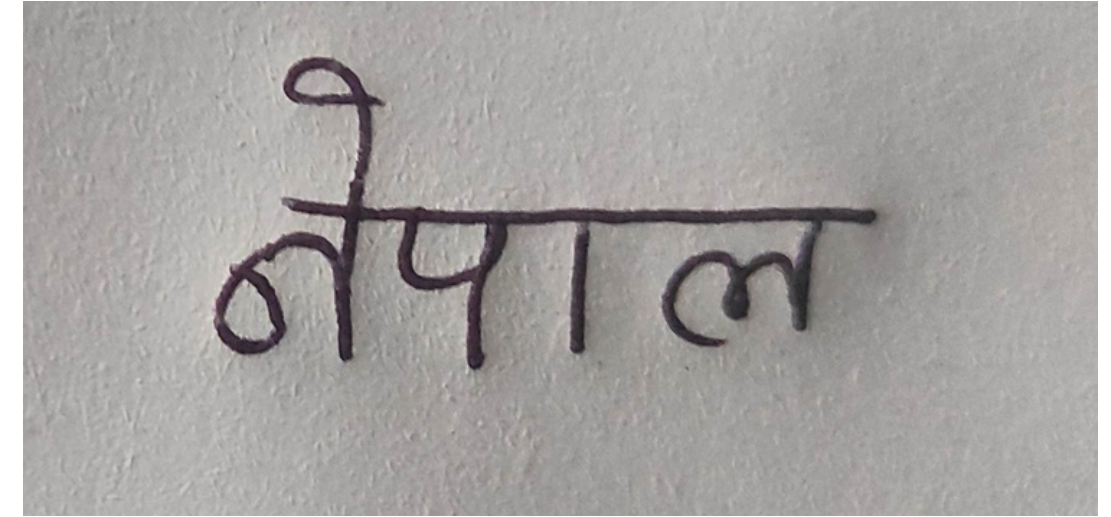
सगरमाथा नेपालको पहिचान हो ।
गाई नेपालको राष्ट्रिय जनावर हो ।
ढोका खोलि तिमी बाहिर को
आए जस्तो द हेर्न जाउ त .
प्रमोद खरेलले राम्रो गीत गाउँछ
तिमी र सँगै मिलेर घरघरा

सगरमाथा नेपालको पहिचान हो ।
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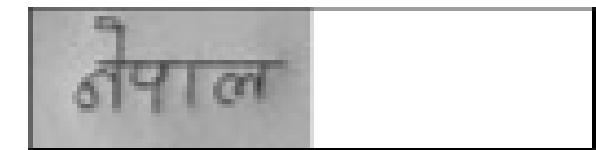
Figure 3: Word Segmentation from Image

Image Preprocessing

- Grayscale conversion
- Image resize
- Transpose
- Normalization.



Gray scaled image



Resized image

Feature Extraction

The preprocessed image is passed to CNN to extract the important features.

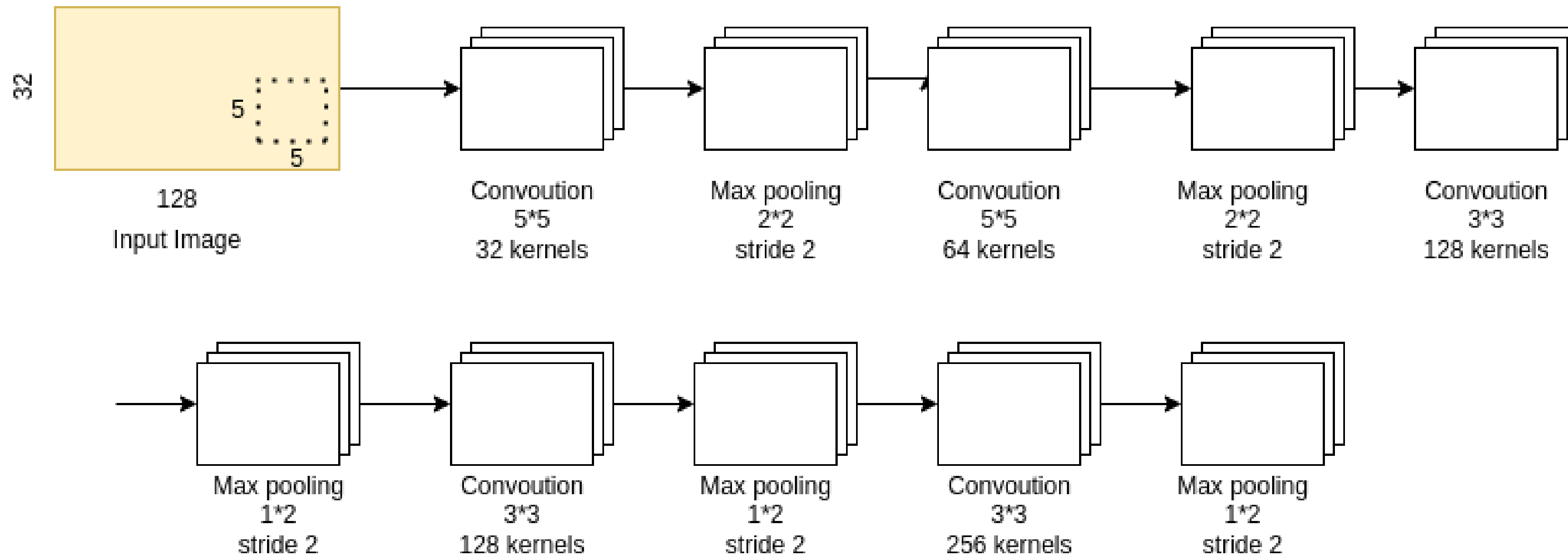


Figure 4: CNN Layers

Feature Extraction Contd

Relu activation function is used.

The 256 feature maps of size 32x1 are extracted from the CNN layer.

Model Building

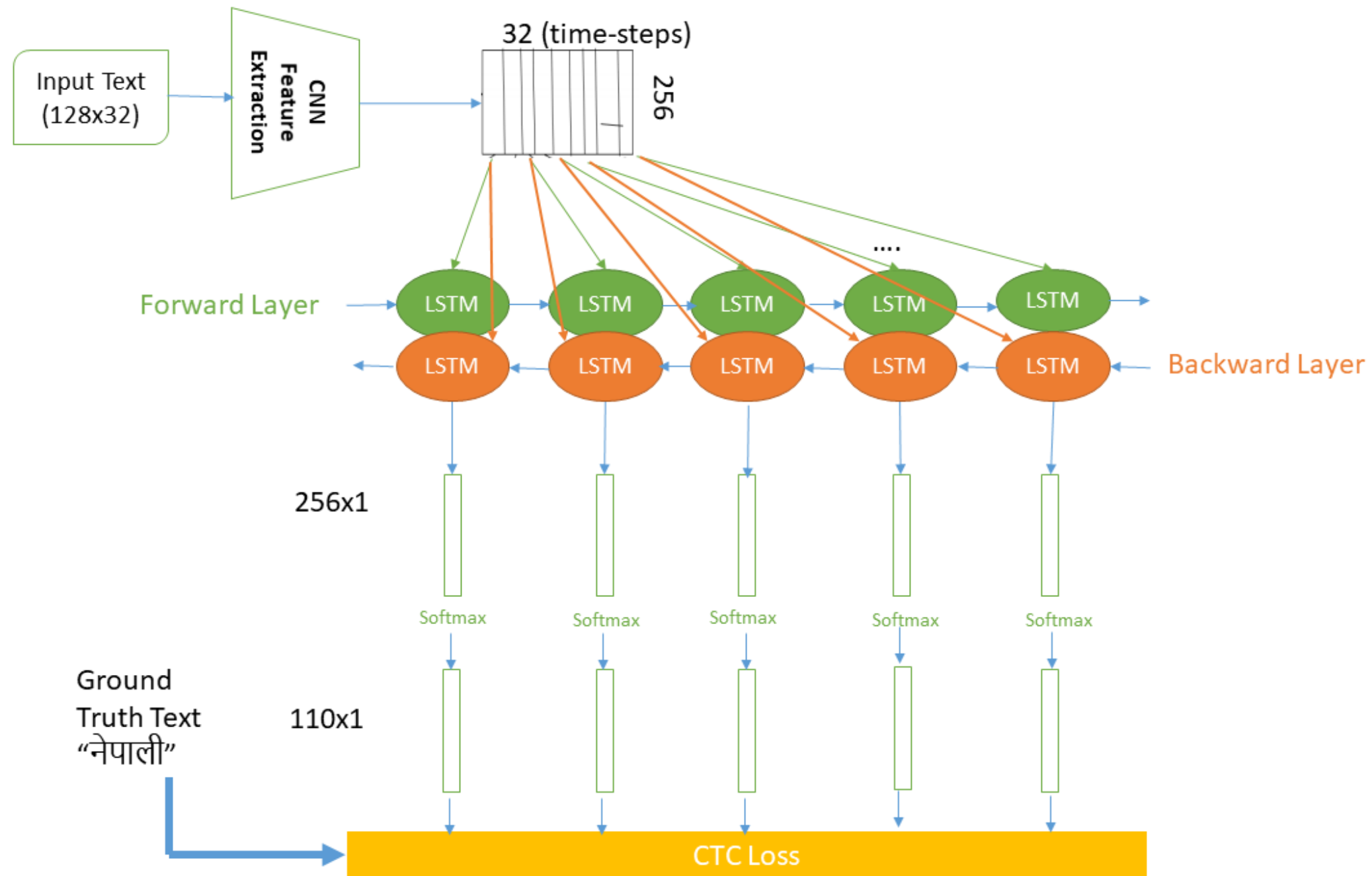


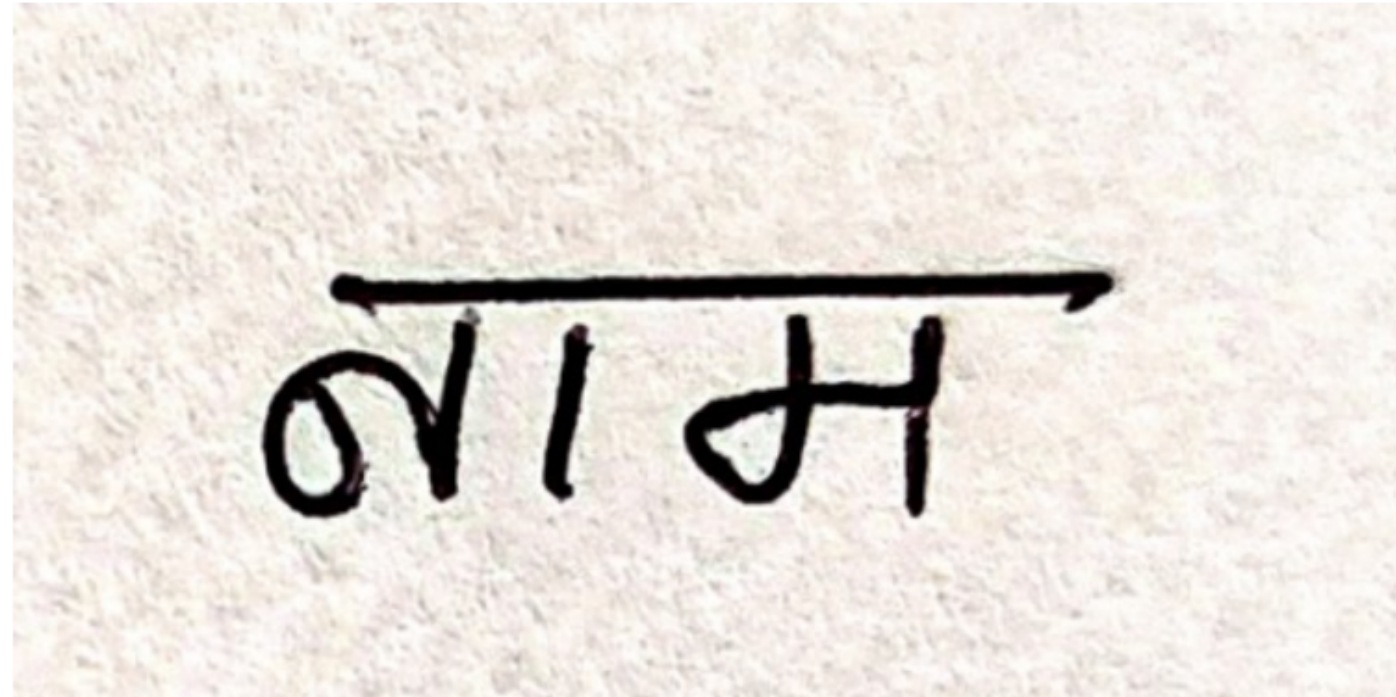
Figure 5: Architecture of Model

Configuration Table

SN	Particular	Applied Configuration
1	Image Samples	25,000
2	Validation Samples	2,500
3	Epoch	50
4	Batch Size	25
5	Learning Rate	0.0001
6	Optimizer	RMSProp
7	Loss Function	CTC Loss
8	GPU	Google Colab Tesla K80
9	Training Duration	5 hours

Result and Analysis

Select a file to upload



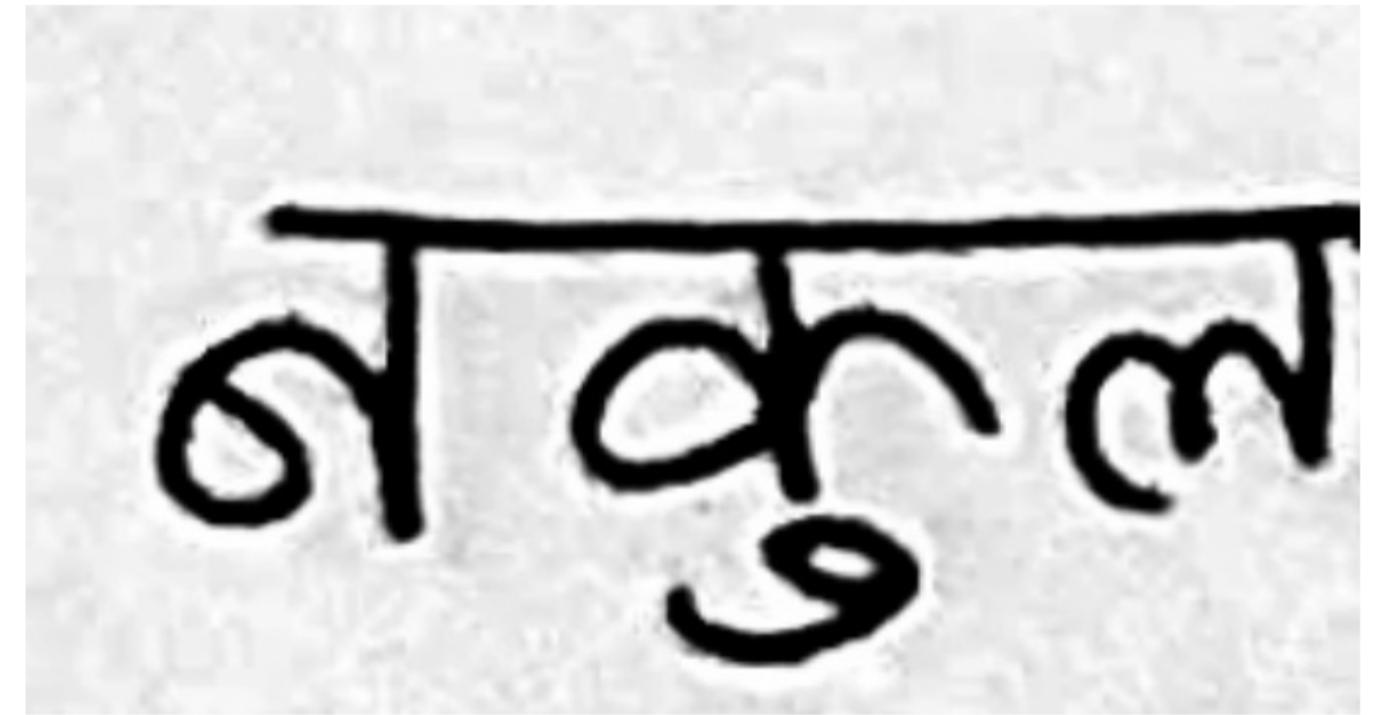
Recognized text is:

नाम

Recognized Probability is:0.69802207

Copy text

Select a file to upload



Recognized text is:

नकुल

Recognized Probability is:0.25149283

Copy text

Figure 6: Obtained Outputs

Result and Analysis

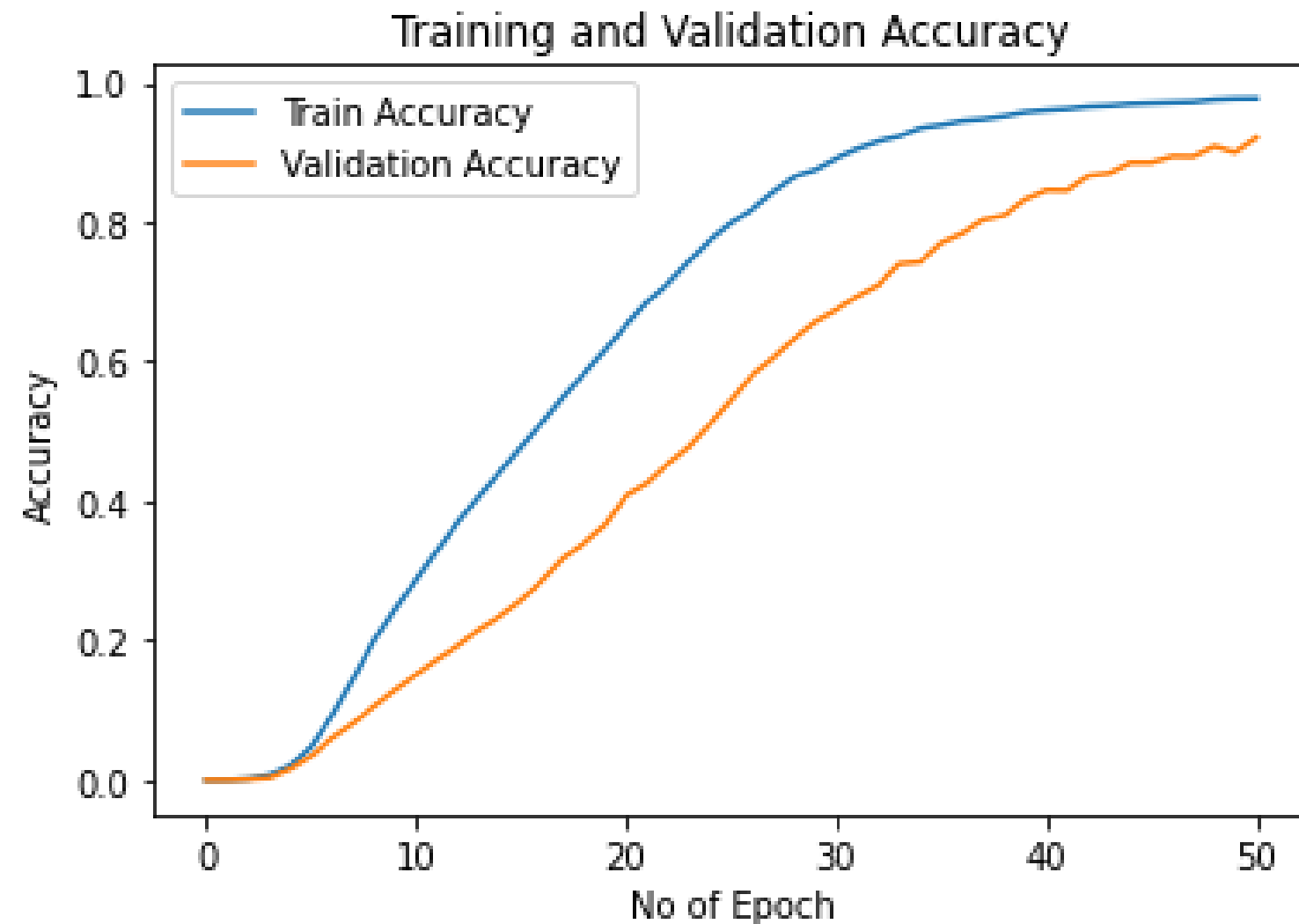


Figure 7: Training and Validation Accuracy Graph

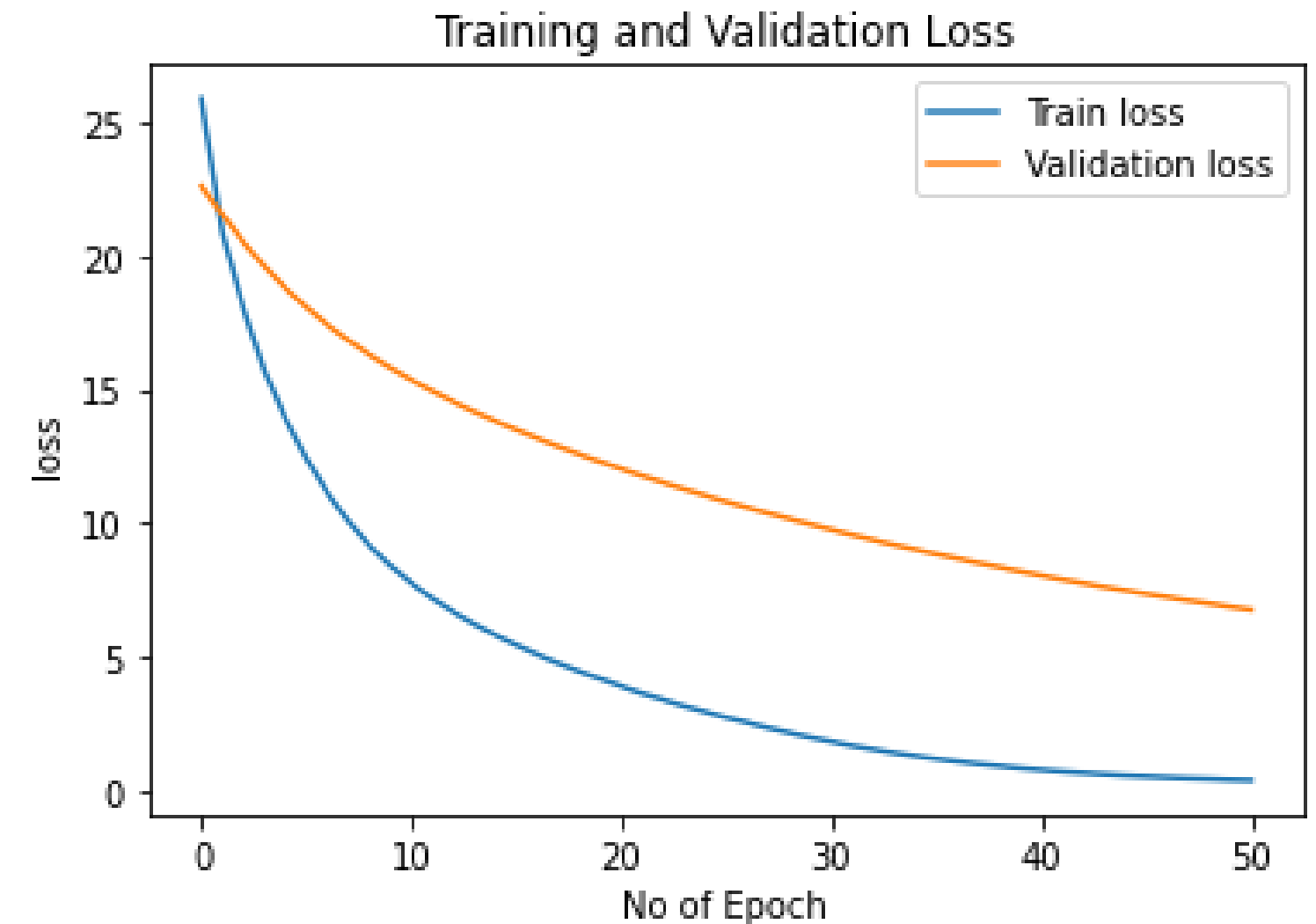


Figure 8: Training and Validation Loss Graph

Result and Analysis

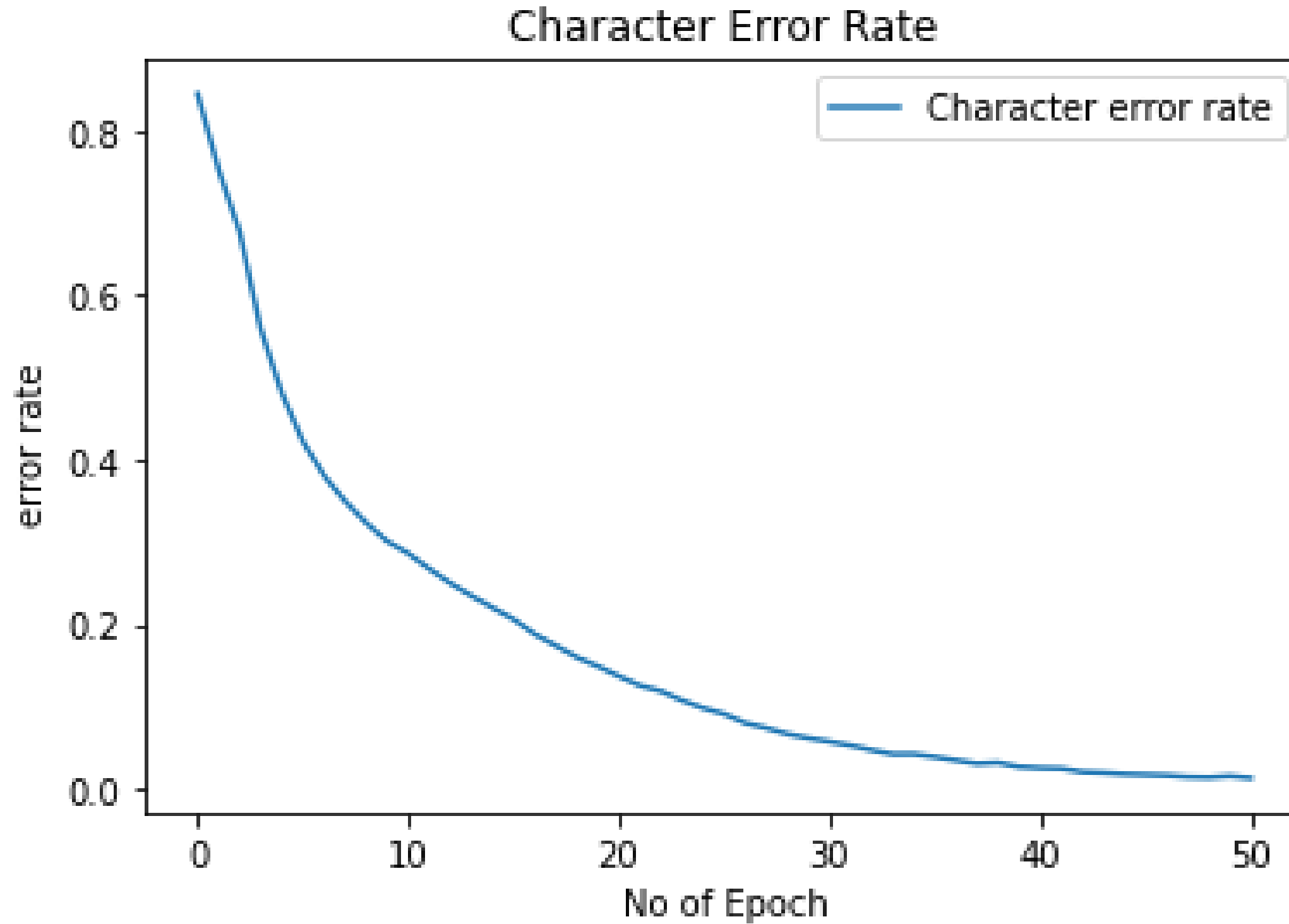


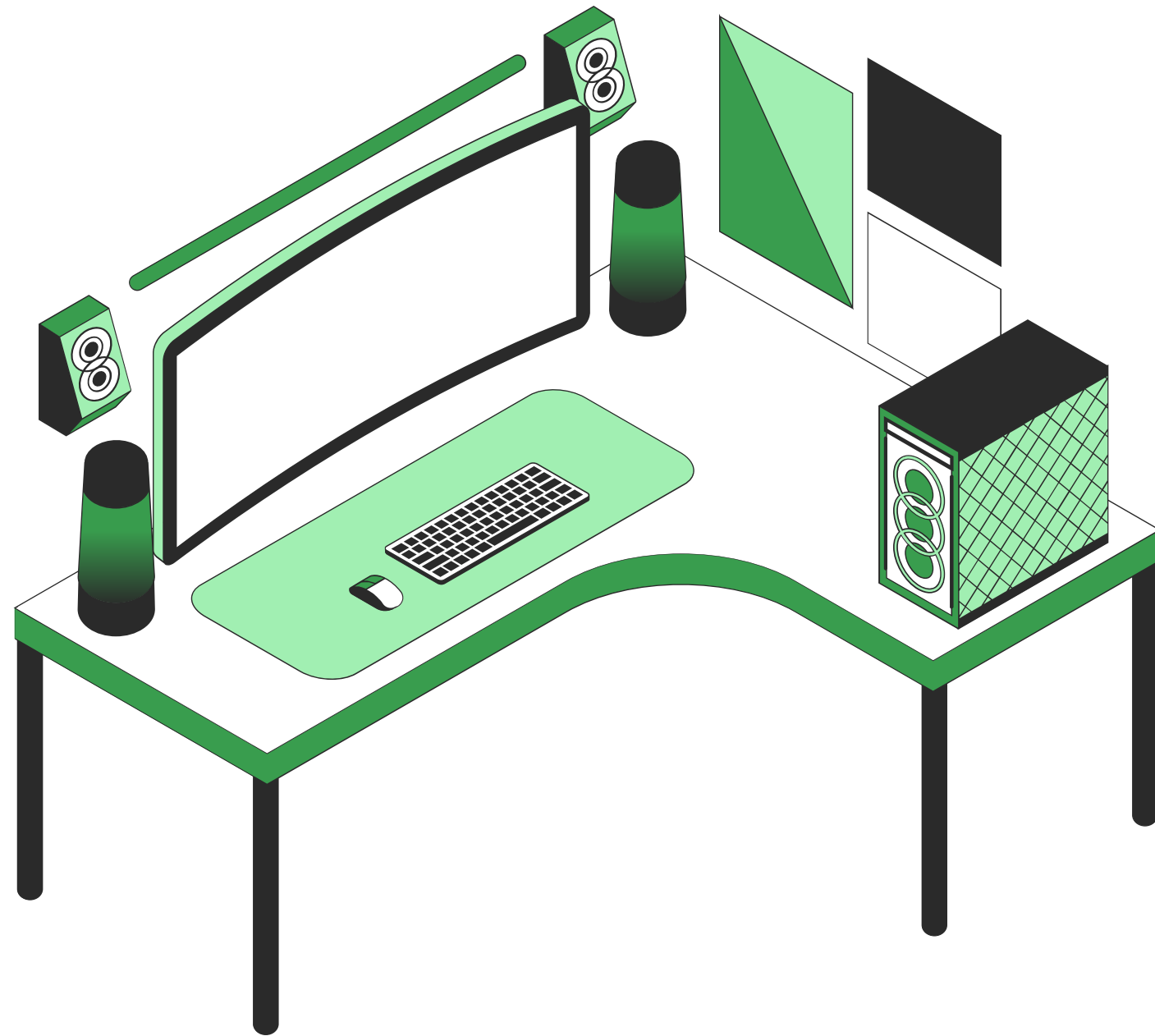
Figure 9: Character Error Rate Graph

Challenges Faced

- Difficulty in training the model due to the low specification of the computer.
- Difficulty in finding learning materials related to our project.
- It was really a challenging task working with machine learning project for the first time.

Limitations of Project

- May not recognize all the words present in Nepali dictionary.
- Image must be captured with proper lighting and at a particular angle.
- Have to work with limited resources so a great accuracy could not be achieved.



**Thank
you**