

# *Nepali Consonant Character Classification Using Artificial Neural Network*

Team:

Ashok Subedi

Giridhari Paudel

Indra Paudel

Pitambar Mahato

# *Contents*

- 1) Introduction
- 2) Literature Review
- 3) Requirement Analysis and Feasibility study
- 4) Methodology
- 5) Structuring System Requirements
- 6) Testing
- 7) Result and Analysis

# *Introduction*

- Nepali Character is one of the most spoken language in Nepal.
- Artificial Neural Network provides classification and regression capabilities to the machine.
- Backpropagation is the algorithm that was used during the training of the neural networks.

# *Problem Statement*

- To change the hardcopy into softcopy form is the time consuming task.
- Without the classification or recognition of the characters it is not possible to make the OCR system.
- So we are here to classify the nepali characters

# *Objective*

- To build a neural network model that can classify the scanned or handwritten isolated Nepali characters.
- To classify the Nepali consonant characters.

# *Project Questions*

- Does ANN gives the optimum result for the classification of nepali characters?
- What is the main purpose of that project?
- What methods is going to be used for the achievement of the results in this project?

# *Scope and Limitations*

- Our system recognizes the nepali isolated scanned or handwritten character but in case of the joined set of characters our system can't work.
- Our system only works for the images of size  $32 \times 32$  but in case of the images greater than that the system can't work.

# *Applications*

- Banking
- Legal
- HealthCare
- Other sectors



# *Literature Review*

- Related Works

- Character Recognition (CR) is somewhat limited until 1980 due to lack of powerful hardware and data perception devices.
- The periods from 1980-1990 witness a growth in CR system development due to rapid growth in information technology.
- Research progress on the offline and on-line recognition during 1980 -1990.
- After 1990, image processing technique and pattern recognition were combined using artificial intelligence.

# *Requirement Analysis and Feasibility Analysis*

- Operational Feasibility Analysis
- Technical Feasibility Analysis
- Economic Feasibility Analysis
- Schedule Feasibility Analysis

# Use Case Diagram



# Methodology



# *Model Training*

- Input nodes: 1024 input neurons
- Output nodes: 36 output nodes
- Activation Function: Sigmoid
- Number of Hidden layer: 1 hidden layer with 340 nodes
- Learning Rate: 0.075
- Training algorithm: Error Back Propagation(Mean Squared Error)

# *Algorithm of The System*

Step 1: Start

Step 2: Train the Neural Network Model

Step 3: Load the model into the system

Step 4: Draw the character into the canvas

Step 5: Save the Drawn character into the .png(image) format

Step 6: Input the saved image into the system

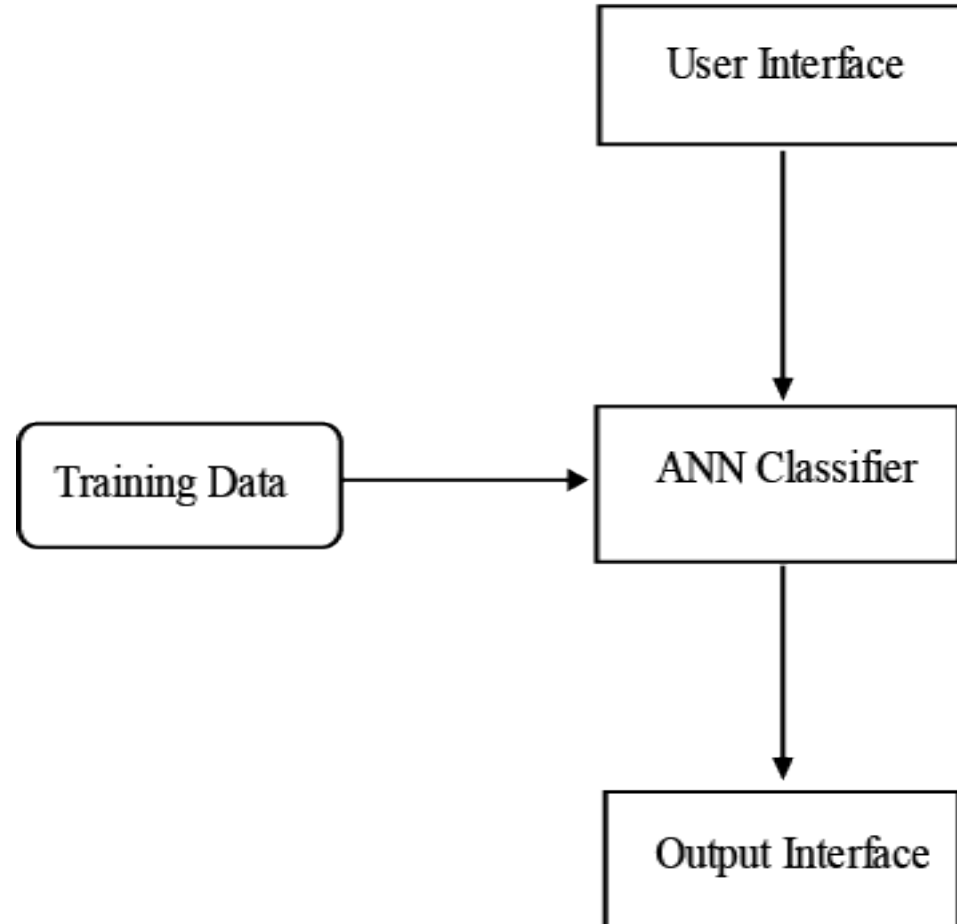
Step 7: Feed the character to the Neural Network Model

Step 8: Display Output

Step 9: Stop

# Structuring System Requirements

## System Architecture



# Data Flow Diagram





# Class Diagram



# Activity Diagram



# Sequence Diagram



# Testing

## Unit Testing

| S.no. | Test Case                  | Input              | Expected Result                     | Test Result                       |
|-------|----------------------------|--------------------|-------------------------------------|-----------------------------------|
| 1.    | Drawing Canvas             | Character          | Character Drawn                     | User Can draw on canvas           |
| 2.    | Clear Button               | Press clear button | Canvas clear                        | Canvas is clear                   |
| 3.    | Prediction label           | Draw character     | Drawn character should be predicted | The drawn character was predicted |
| 4.    | Preprocess data            | Image Dataset      | Reshape Dataset into 32*32 Image    | Dataset was reshaped successfully |
| 5.    | Training Model             | Training Dataset   | Model Should be trained.            | The model was trained.            |
| 6.    | Recognize Nepali Character | Test Data          | Predict the drawn character.        | The character was predicted.      |
| 7.    | Model Performance          | Nepali character   | Predicted in a second.              | Got result in a second.           |

## Integration Testing

| S.no. | Test Cases | Input                            | Expected Result              | Test Result                              |
|-------|------------|----------------------------------|------------------------------|------------------------------------------|
| 1.    | Load Model | Input test and training datasets | Model must load successfully | The model was loaded                     |
| 2.    | Prediction | Draw Character                   | Predict the drawn character  | The character was predicted successfully |

## System Testing

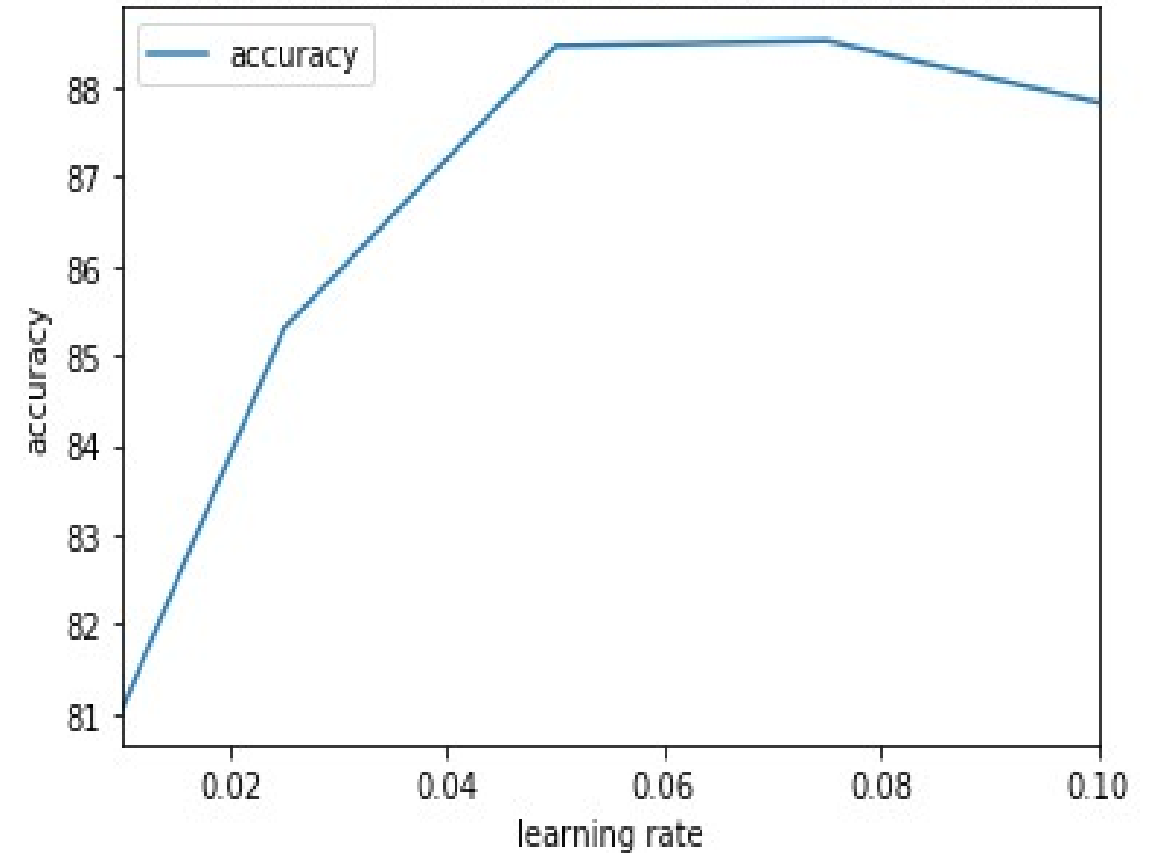
| S.no. | Test Case               | Input                        | Expected Result                                   | Test Result  |
|-------|-------------------------|------------------------------|---------------------------------------------------|--------------|
| 1.    | Predict Drawn Character | Draw Character on the canvas | Prediction Label filled with the drawn character. | As expected. |

# Analysis

Accuracy Graph According to epochs



Accuracy Graph based on learning rate at 5 epochs



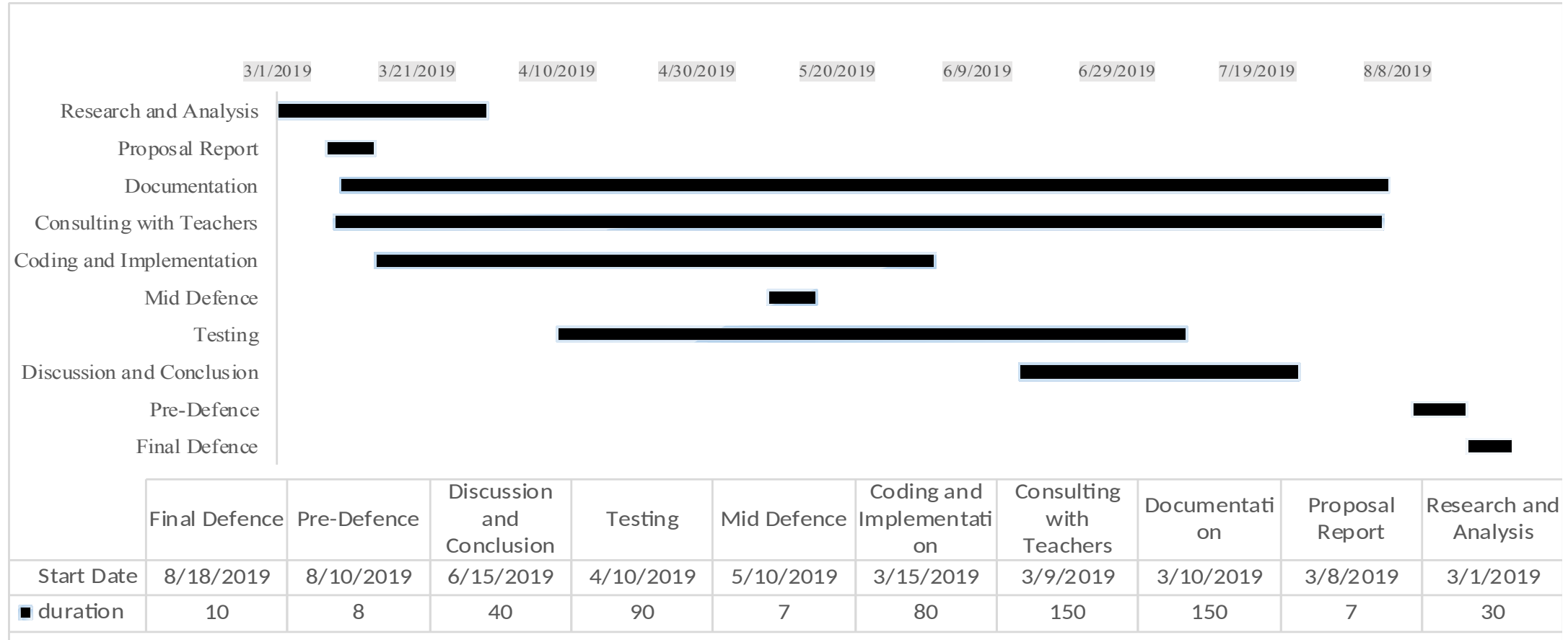


# Output





# Time Frame



# References

- [1] S. Acharya, "Deep Learning Based Large Scale Handwritten Devnagari Character Recognition," Kathmandu, 2015.
- [2] Pranjali Pohankar, Namrata Taralkar, Snehalate Karmare, Smita Kulkarni, "Character Recognition using Artificial Neural Network," April, 2014.
- [3] Anna Tigunova, "Detection of Textual Information Using Convolutional Neural Networks," November 10, 2017.
- [4] Azmi Can Ozgen, "Text Detection in Natural and Computer-Generated Images," Istanbul, Turkey, 2011.
- [5] "Skymind," [Online]. Available: <https://skymind.ai/wiki/backpropagation>.
- [6] "MachineLearningMastery,"[Online].Available: <https://machinelearningmastery.com/learning-rate-for-deep-learning-neuralnetworks/>.
- [7] Bal Krishna Bal, Rajesh Pandey, Samir Tuladhar, Shanti Shakya, "INTERIM REPORT ON NEPALI OCR," Kathmandu, Nepal.
- [8] S. Shakya, A. Basnet, S. Sharma, A. Gurung, "Optical Character Recognition for Nepali, English Character and Simple Sketch Using Neural Network," Kathmandu, Nepal, 2016.
- [9] Ahmed Muaz, "Urdu Optical Character Recognition System," Lahore, Pakistan .
- [10] Chris J Maddison, Aja Huang, Ilya Sutskever, David Silver, "Move evaluation in go using deep convolutional neural networks," 2014.
- [11] Vasu Negi, Suman Mann, Vivek Chauhan, "Devanagari Character Recognition Using Artificial Neural Network".

*Thank You*