American Sign Language Alphabet Classification

G07

Presentation By:
K N V RAMANA - 40217265
J ASHISH REDDY - 40217896
ANMOL CHABBRA - 40221995

Project Overview

By harnessing deep learning models and a combination of supervised and semi-supervised decision tree models, our project aims to:

- Develop a robust ASL alphabet recognition tool.
- Comparing models on various metrics.
- Achieve higher accuracy models.

Project Goal

Our project focuses on developing a robust ASL alphabet recognition tool that achieves higher accuracy in interpreting American Sign Language (ASL) alphabets.

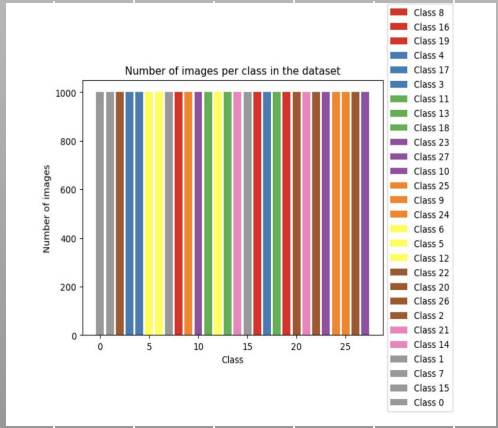
This allows us to overcome limitations like :

- Reduce communication barriers.
- Promote inclusivity.
- Enable seamless communication for individuals with and without hearing impairments.

Dataset:

- American Sign language (Link: American Sign Language | Kaggle)
- Total number of Images in the dataset are 165K (Size: 4.98 GB)
- Total Categories ‘28’

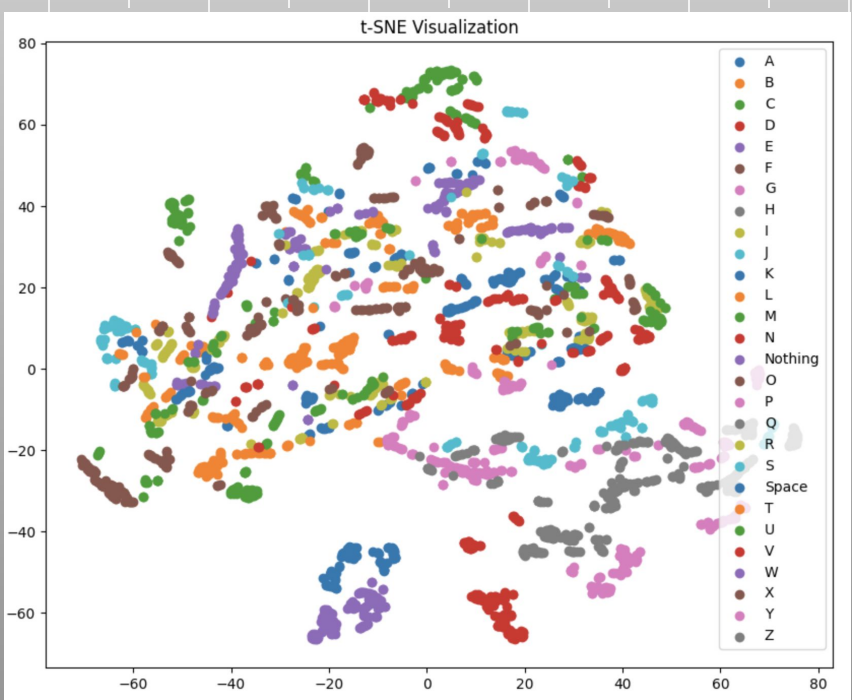
Dataset attributes	ASL dataset
Before Trimming Dataset	
Image size	400x400x3
Image count	165k
Class count	28
After Trimming Dataset	
Image size	256x256x3
Class count	28
Image count	28,000

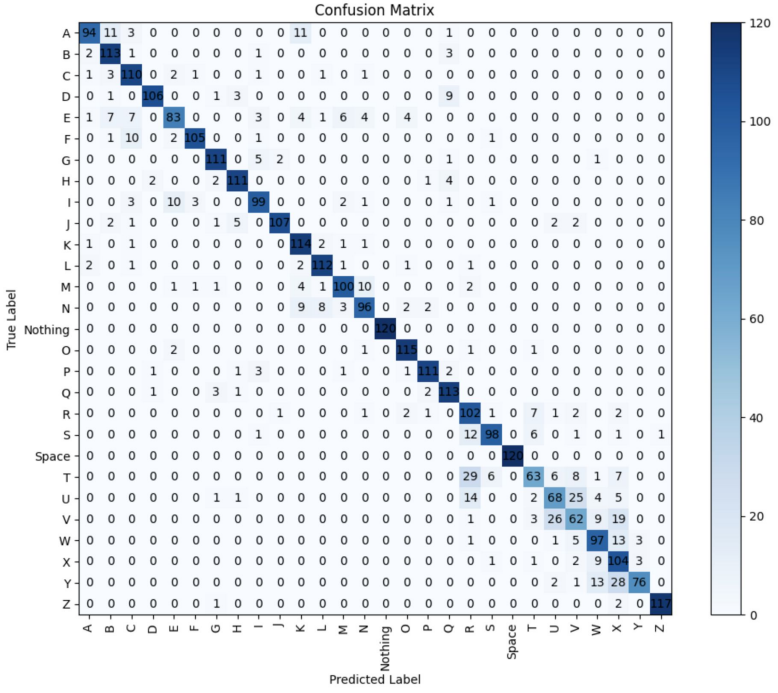


Methodology

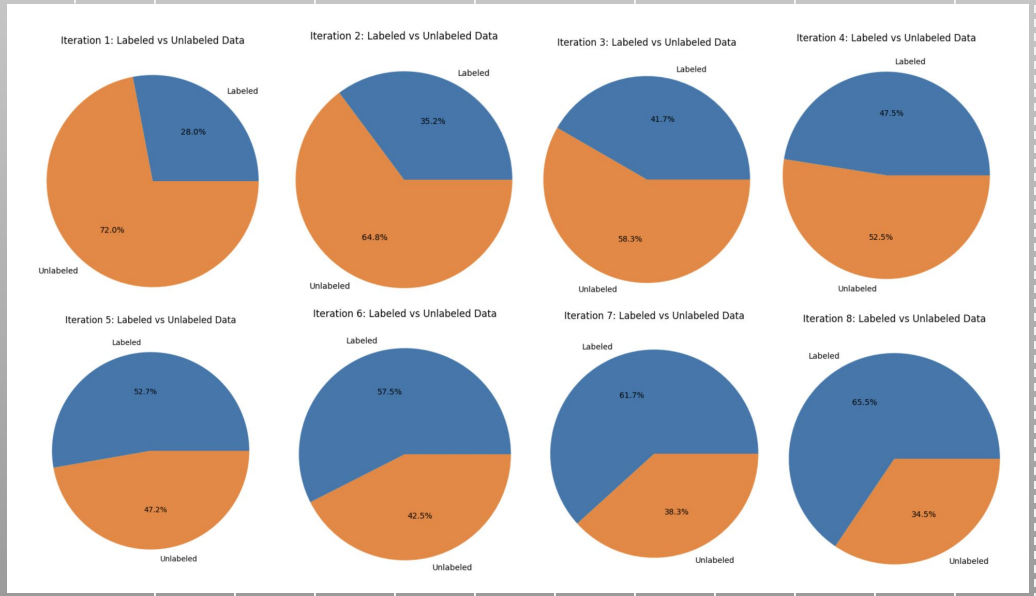
1. Supervised learning Classification with Decision Trees
2. Semi-supervised learning Classification with Decision Trees
3. Supervised learning Classification with CNN model.

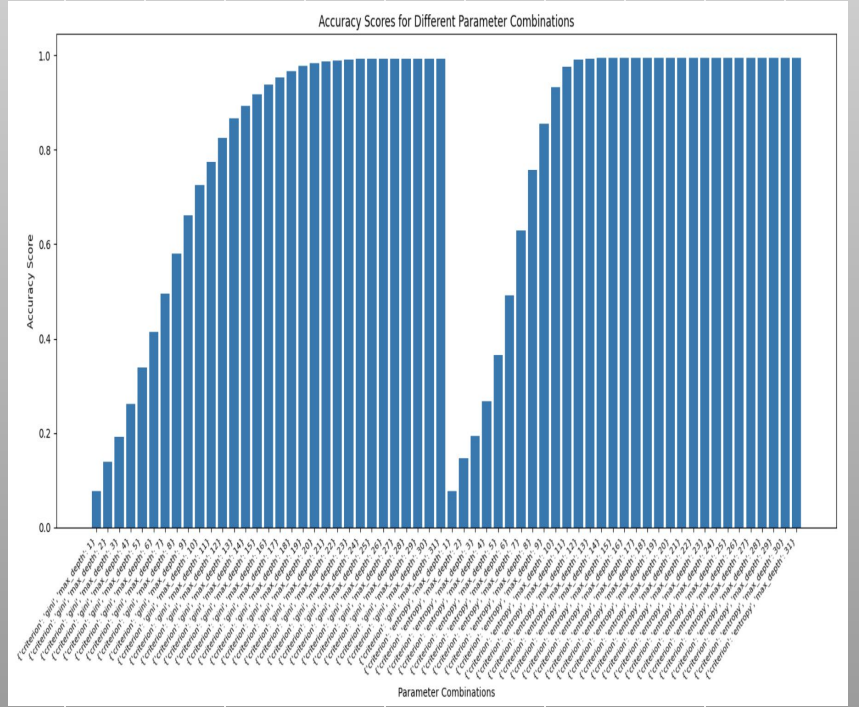
Results for Supervised learning Classification with Decision Trees





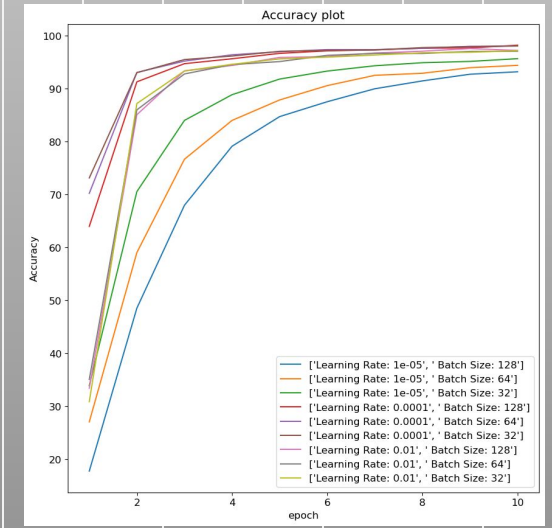
Results for Semi-supervised learning Classification with Decision Trees

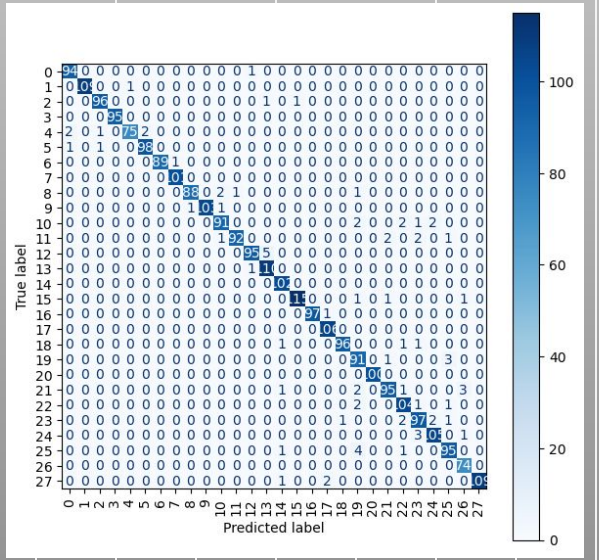




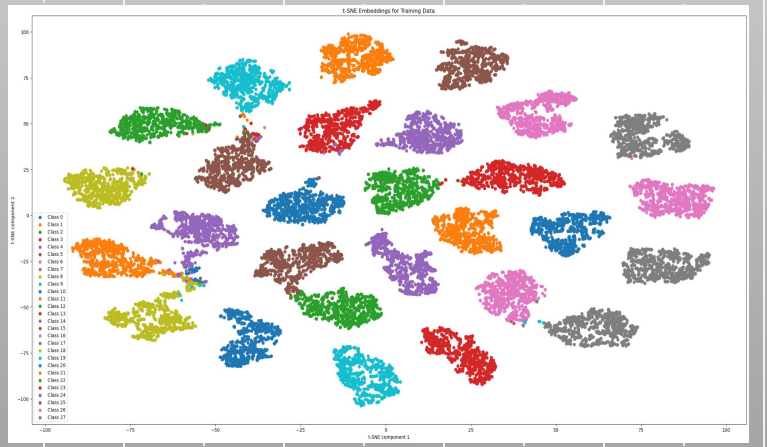
Results for Supervised learning Classification with CNN model

- Achieved test accuracy of 98.5% (Batch size: 128 and learning rate: 0.0001)
- CNN model gives the best result on the dataset as compared to decision trees.
- Residual connections enable deeper networks to be trained more effectively.
- Hyper parameter tuning with batch size (32, 64, 128) and learning rate (0.01, 0.0001, 0.00001).





- Larger batch size less training time.
- 0.0001 learning rate lead to most optimal accuracies.



t-SNE Plot

Metrics	Accuracy	Precision	Recall	F1-measure
CNN	0.99	0.99	0.99	0.99
Supervised	0.89	0.88	0.87	0.87
Semi-Supervised	0.85	0.84	0.82	0.82

Metrics Evaluation

References

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