Mandar Angchekar
386916341

Human Sign Language Detection
Project Report

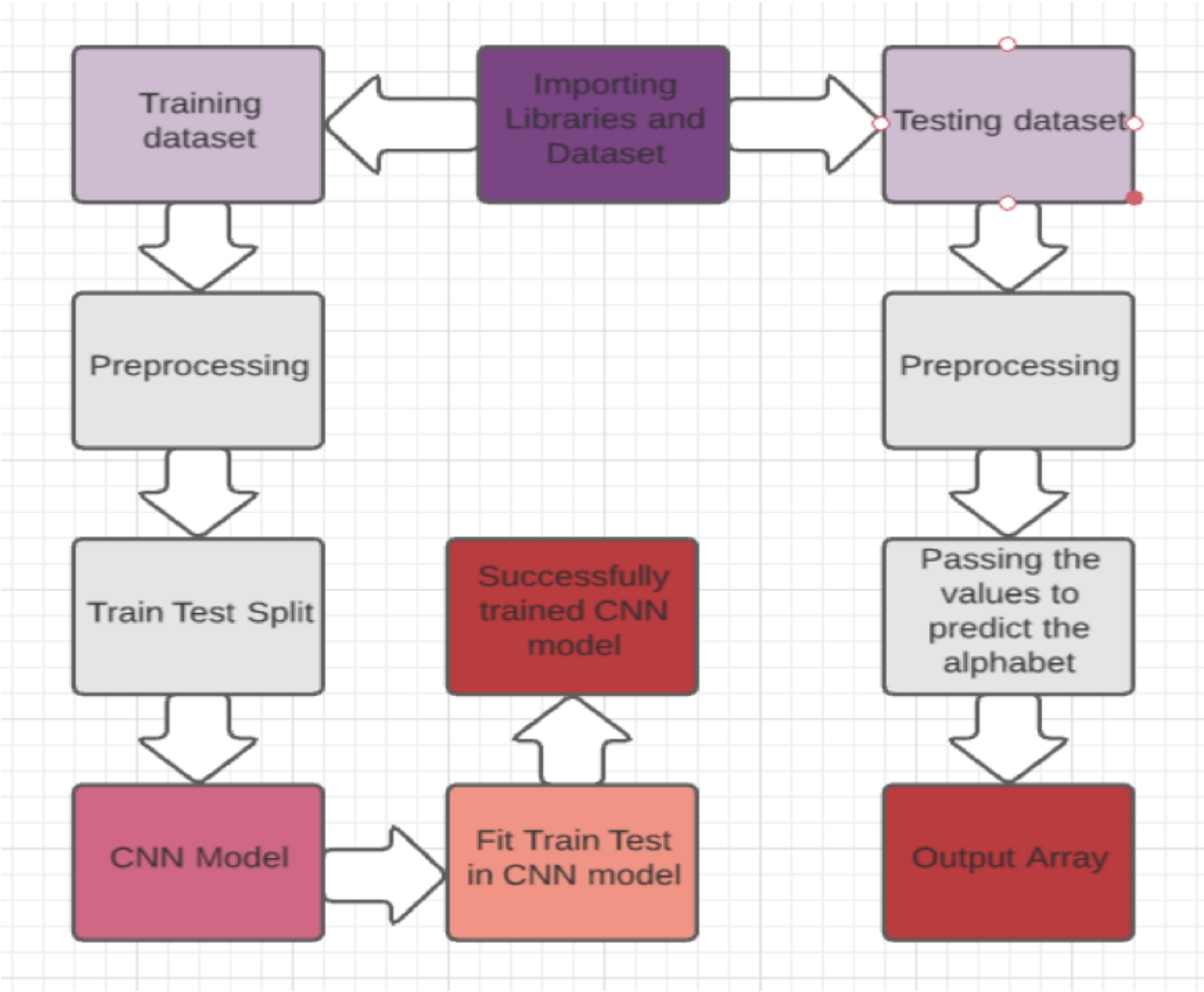
Introduction:

- Societal Impact:
    a) About 466 million people are deaf in our world.
    b) The 2022 U.S. Census (2022) estimates 11.5 million Americans have varying degrees of hearing differences which is 3.5% of the population.
    c) They are deprived of various social activities.
    d) They are under-estimated to our society.
    e) Communication problem.
- Application:
  For deaf people, access to sign language is key to breaking down communication barriers and participating in society just like anyone else. Sign language is not only helpful for deaf people but also people suffering from autism , down syndrome , apraxia of speech , cerebral palsy.

Problem Statement:

Understanding the exact context of symbolic expressions of deaf and dumb people is the challenging job in real life until unless it is properly specified. The objective of my project is to identify the symbolic expression through images so that the communication gap between a normal and hearing impaired person can be easily bridged.

WorkFlow of System:



Algorithm with Implementation details:

- I have used the mnist dataset from kaggle.
- Then I dropped the labels column from the dataset as that is what I have to predict.
- Then after applying pre-processing to the labels column I have divided the training and testing data set.
- Later after reshaping the training and testing dataset I was ready to implement the model.
- I have used a CNN model in this project

- The first layer is a Con2D layer which is a keras layer basically and uses 64 filters with 3X3 as its filter size
- Next is a MaxPooling2D layer which has a pool size of 2X2 as it changes the dimension by giving the max value.
- Later these layers are repeated more two times with the use of a “relu” function and an input shape of (28, 28, 1)
- The “relu” function basically applies a linear expression on a node and decides whether that node should fire or not fire.
- I then implement the Flatten and the Dense layer with activation set to “softmax”.
- Softmax basically plots the value on the curve and decides if it is active or not.
- Also Dropout is used which drops unnecessary nodes (0.2).
- I then fit the training data into the model and later by applying the same preprocessing to the testing dataset I predict the values for the test images.

Experimental Setup:

I analyze 4,800 images of sign images which is ISL of the English alphabet, which have a spread of 26 class labels assigned to them.

Each class label is a set of sign images of the English alphabet.

- For this project I used the mnist dataset from kaggle.
- I have two .csv files, one is the training dataset and the other is the testing dataset.
- I then further divide the training dataset into train and test.
- Keeping the testing dataset only for final prediction testing.
- In our dataset we have labels and pixels. I have divided training and testing part in a ratio of 7:3.

Results:

- Achieved a training score of around 96-98% and a test score of around 95 – 98%.
- With correct prediction of images, I also achieved good accuracy.

Conclusion:

- Communication is always having a great impact in every domain and how it is considered the meaning of the thoughts and expressions that attract the researchers to bridge this gap for every living being. The objective of this project was to identify the symbolic expression through images so that the communication gap between a normal and hearing impaired person can be easily bridged.
- In this work, I proposed an idea for feasible communication between hearing impaired and normal people with the help of- Deep Learning ,CNN , Machine Learning and Data Science.

- CNN is essentially precomputing an evaluation function to make directly on a given situation.
- CNN does have better prospects in achieving accuracy if properties would be more extensively researched.

References:

- Ameen, S., & Vadera, S. (2017). A convolutional neural network to classify American Sign Language fingerspelling from depth and colour images. Expert Systems.
- Naresh Kumar(2017). Sign Language Recognition for Hearing Impaired People based on Hands Symbols Classification. International Conference on Computing, Communication and Automation (ICCCA2017)
- Menna ElBadawy, A. S. Elons, Howida A. Shedeed and M. F. Tolba. Arabic sign language recognition with 3D convolutional neural networks.
- Tao Liu, Ingang Zhou, and Houqiang Li. Sign Language Recognition With Long Short-Term Memory . 2016 IEEE International Conference on Image Processing (ICIP) 1/17/2019 21 Department of Computer Application