Project: Traffic Sign Classifier - Report

Dataset Exploration:

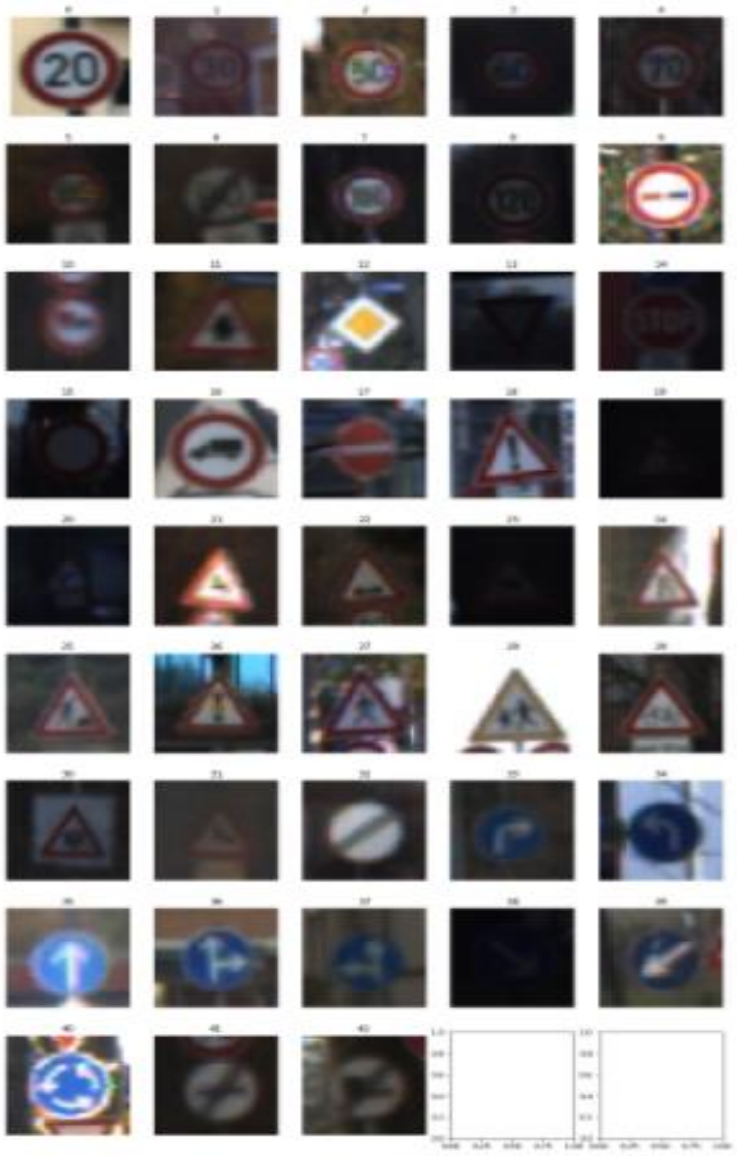
Dataset Summary:

The dataset is divided into three categories

1. Training set with 34799 examples
2. Validation set with 4410 examples
3. Test set with 12630 examples
4. Number of classes – 43
5. Shape of the image – 32, 32, 3

Exploratory Visualization:

Each image of a unique class is displayed in the picture below along with its label class.



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Design and Test a Model Architecture:

Preprocessing:

- The image provided is cropped to remove the unnecessary region.
- It is filtered using Gaussian Blur to remove the noise from the image.

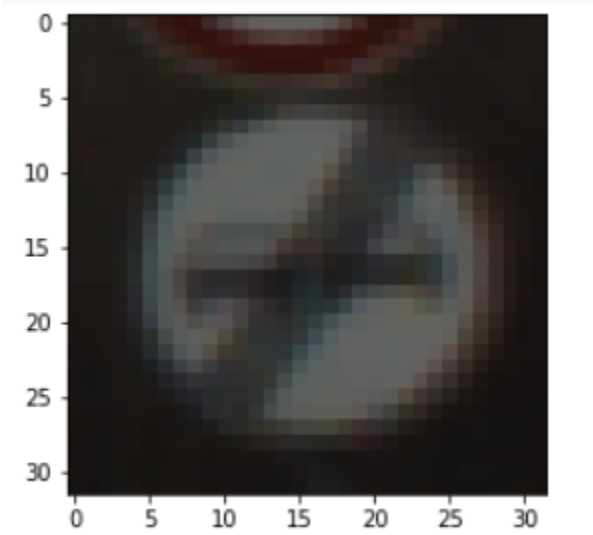


Figure 1: Original image

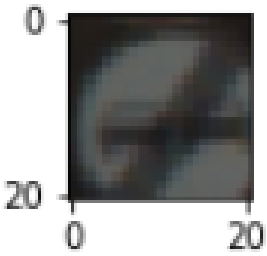


Figure 2: Cropped Image

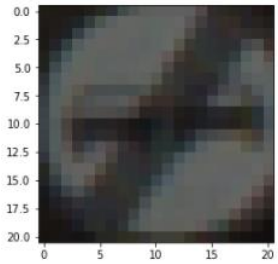
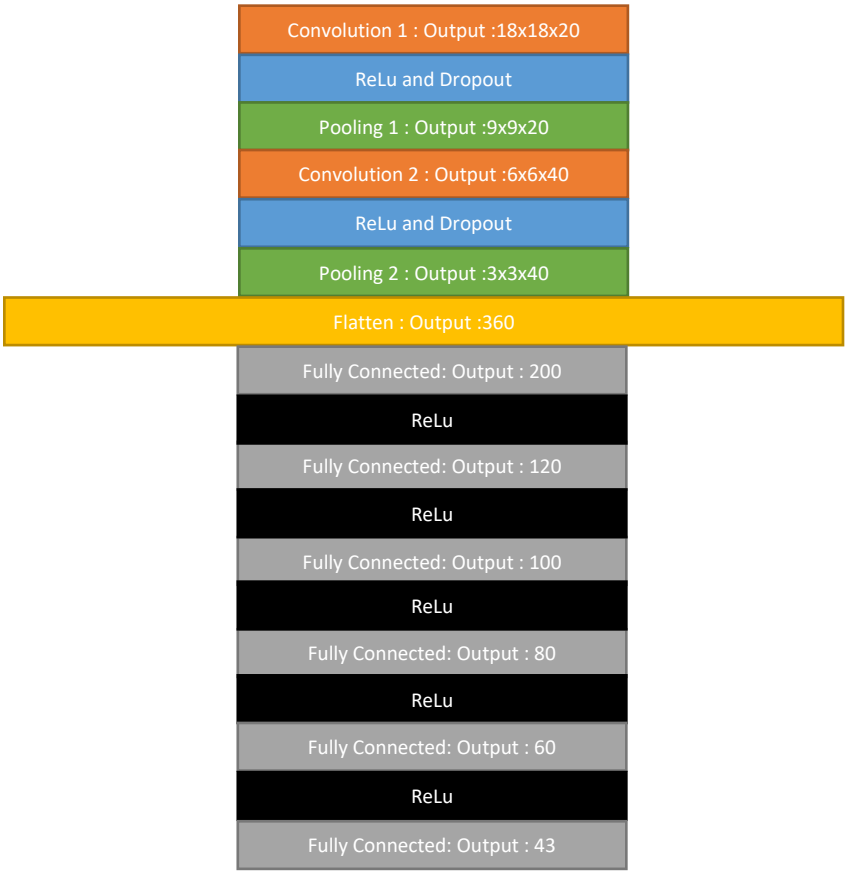


Figure 3: Gaussian Blurred Image

Model Architecture:

To improve the performance two convolutional layer with six fully connected layers are used.



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Dropout layers are included to prevent the misfit of the model parameters. The additional fully connected layers improved the accuracy of the model. The size of the convolutional layers are chosen to enhance the smooth convolution of the network.

Model Training:

The model uses Adam optimizer with learning rate of 0.0005 and the mean and standard deviation to choose the weights are kept at 0 and 0.05. The probability for drop out is set at 0.9. The number of epochs are chosen as 35 and batch size is 128.

Solution:

The valuation is done for each epoch and the required accuracy of 93.0% is achieved at Epoch 4. Epoch numbers are chosen to get the better accuracy of the test image set. The validation set accuracy is 97.0%. Test image set returns the accuracy of 95.1%

Test a Model on New Images:

The following images are downloaded from internet. They are Keep Left, Round about mandatory, Children Crossing, No entry and Yield.

Their corresponding classes are mentioned in their title. These numbers are passed on to evaluate the accuracy of the model.

Performance on New Images:

The accuracy on the new images is 100% and the test set is 94.4%. The accuracy is good in new image set when compared to the test set.

Model Certainty - SoftMax Probabilities:

The certainty of the model looks good with the certainty values very close to 1, which can be observed in the matrix below.

```
[[  1.00000000e+00   1.79922351e-14   1.94531577e-15   1.88479590e-15
    7.68984949e-16]
 [  1.00000000e+00   4.32205554e-20   9.05061118e-28   1.21481405e-31
    6.44520834e-33]
 [  1.00000000e+00   1.38212246e-14   1.32726912e-14   9.81309375e-16
    1.35719063e-21]
 [  1.00000000e+00   3.35173625e-11   4.24050581e-16   5.63726565e-18
    3.11158928e-19]
 [  1.00000000e+00   2.48587872e-36   6.64831640e-37   3.59990302e-37
    1.64604455e-37]]
```

The class indices respect to the above SoftMax matrix is shown below:

```
[[39 28 37 15  8]
 [40 38 39  2  5]
 [28 29 24 30 19]
 [17 26  0 29 33]
 [13 15 30 38 12]]
```