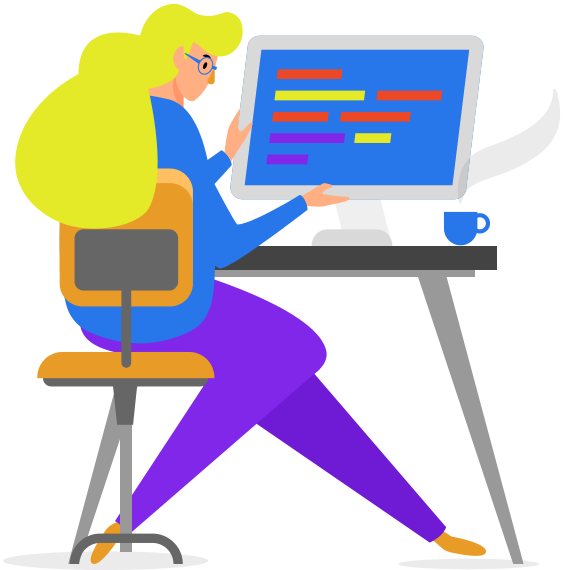
Traffic signs classification

Artificial Intelligent (II) CPCS-432

Traffic signs classification



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Introduction

Traffic signs displayed on the roads play an important role in our lives while driving. They provide crucial information to road users. As a result, they must regulate their driving behavior to ensure that they strictly follow the road regulations currently enforced without causing any trouble to other drivers and pedestrians. Also, with the advent of autonomous vehicles, it has become important to have an automated system for traffic sign classification to inform and warn a driver or autonomous vehicles beforehand to avoid violation of rules and accidents.

Related works

Title	Dataset	Model	Performance
Traffic sign classification using CNN	GTSRB dataset is used, with 39209 images and 43 different classes	CNN	90.07%
Traffic sign classification using CNN	GTSRB dataset Generated dataset	CNN	93% on GTSRB 69% on generated dataset
Traffic signs classification and detection of Indian signs using deep learning	GTSRB	CNN ,YOLO v3-v4 and BLOB	87%

Dataset

01 Traffic signs classification dataset from the Kaggle website.

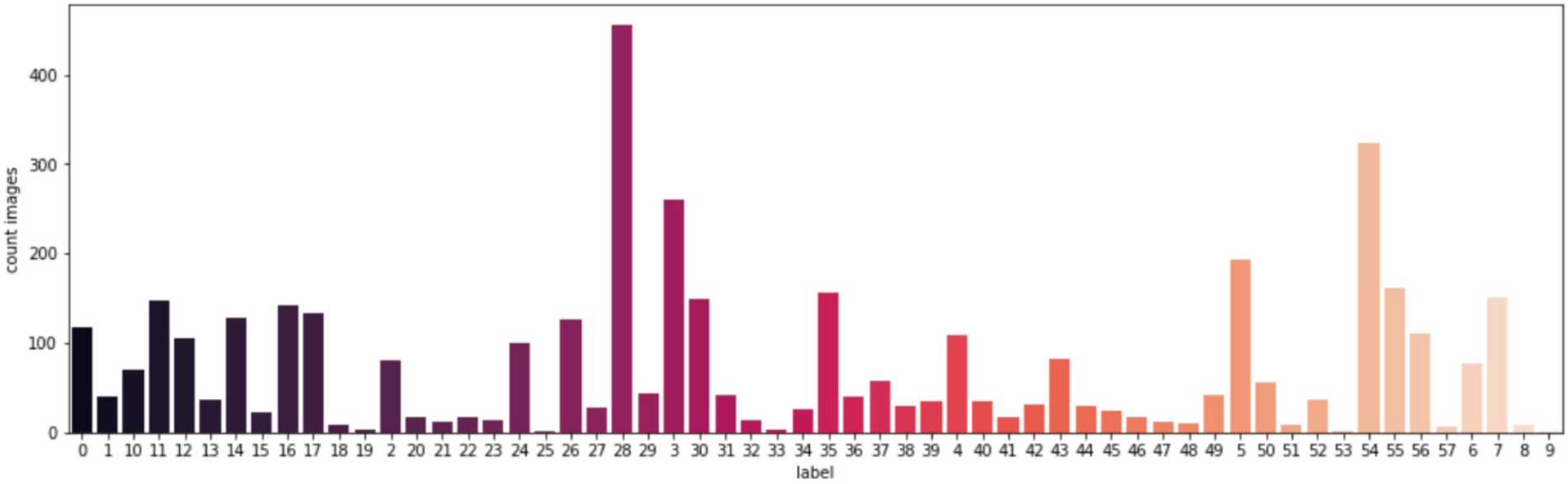
02 It contains different classes of traffic signs.

03 It has around 49 classes and each class has around 120 images.

04 Preprocessing technique in order to modify some features for all data.

05 Applied customized partitioning.

The Number of Images per Each Label



Methods

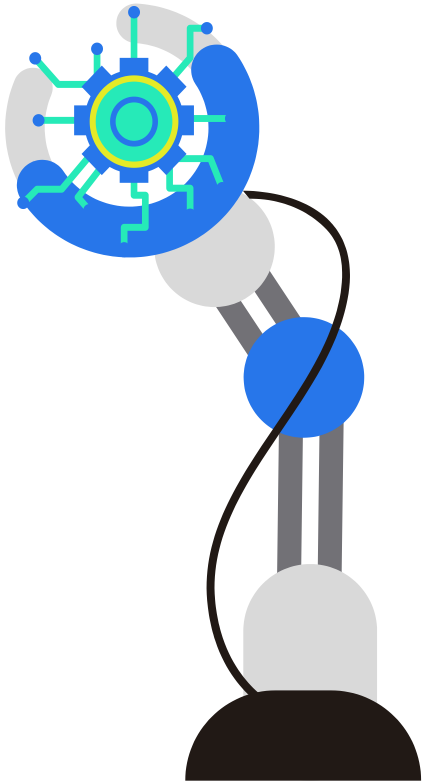
01 Convolutional neural network.

02 EfficientNetB0 as the base model.

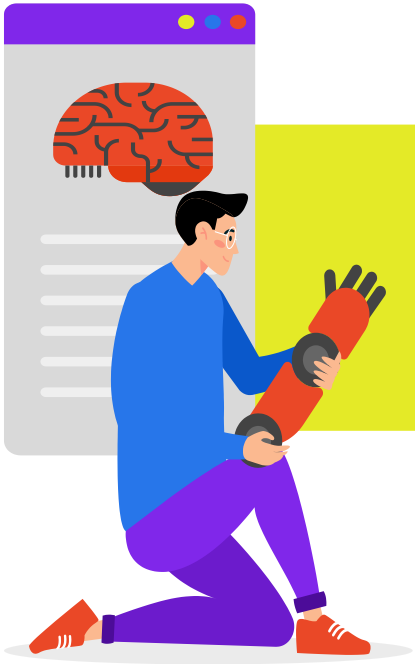
03 The first layer is Batch normalization.

04 The second layer is the dense layer.

05 The last layer is the output layer.



Evaluation Method



Accuracy measures the ratio of correct predictions over the total number of instances evaluated.

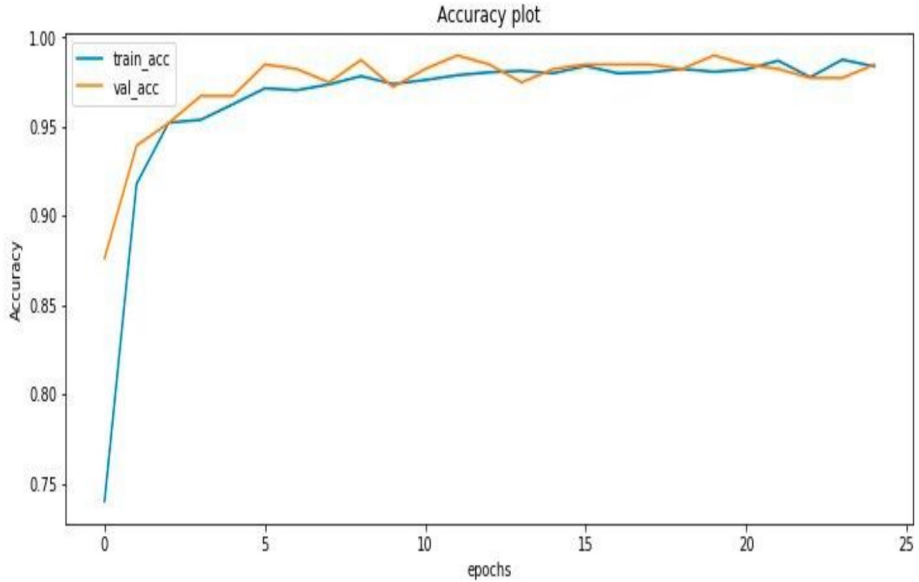
Training accuracy

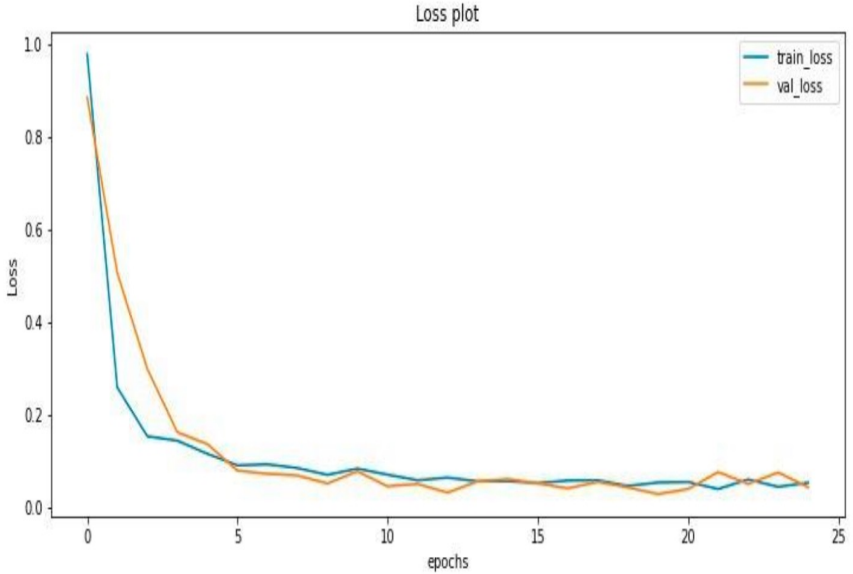
98.37%

Testing accuracy

96.61%

Evaluation Method



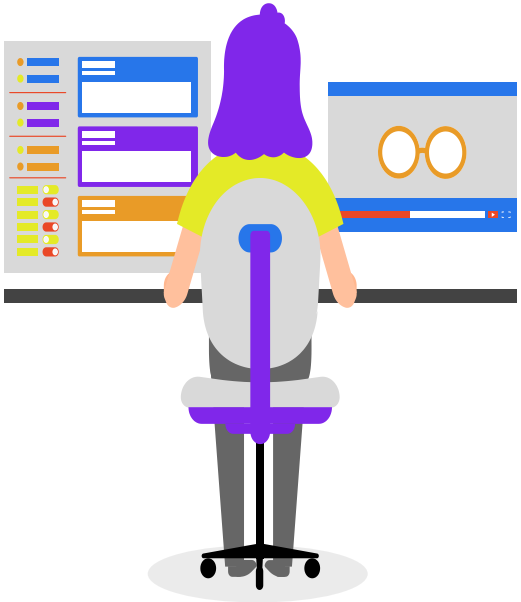


Experiments

01 Comparison with Previously Published Work

Our project utilizes the advantages of the CNN algorithm and trained the model with the big dataset to get an improvement in the model accuracy as clarified in the following points:

1. It achieved 98.37% accuracy for training and 96.61% for testing.
2. It used EfficientNet-b0, a convolutional neural network trained on more than 1 million images from the ImageNet database.
3. It applies three layers, batch normalization, dense layer and the output layer.



Experiments

02 Different Number of Epochs

No. of Epochs	Accuracy
2	81.02%
4	83.33%
6	86.98%
8	93.13%
10	97.16%
12	98.87%
14	98.89%

Experiments

03 Different Splitting of the Dataset

No. of Trials	Accuracy
1	97.76%
2	96.08%
3	97.36%
4	98.11%

Experiments

04 Different Optimizer Types

Optimizer	Accuracy
Adam	97.76%
Gradient Descent	82.23%
AdaDelta	78.89%

Results

`tf.Tensor([1], shape=(1,), dtype=int64)`

Class: **1 (Speed limit (15km/h))**

`tf.Tensor([22], shape=(1,), dtype=int64)`

Class: **22 (Go Left)**

`tf.Tensor([34], shape=(1,), dtype=int64)`

Class: **34 (Danger Ahead)**

Results

`tf.Tensor([38], shape=(1,), dtype=int64)`

Class: **38 (Dangerous curve to the left)**

`tf.Tensor([46], shape=(1,), dtype=int64)`

Class: **46 (ZigZag Curve)**

`tf.Tensor([43], shape=(1,), dtype=int64)`

Class: **43 (Go right or straight)**

Conclusion

Learned while working on the project

We are dealing with new Python libraries and improving computer vision skills for classifying images

Challenges

Unbalanced data

Future Work

Get more data in order to get an equal number for all classes.

Traffic signs classification

Thank you!

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