Recognising German traffic signs using Neural Networks with Transfer Learning

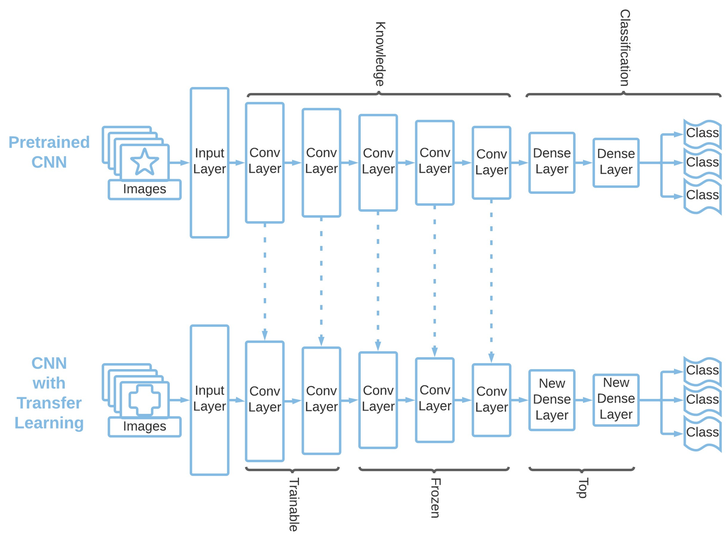
Darragh Sherwin
IT Sligo

Abstract

Recognising traffic signs is very important for autonomous vehicles. Convolutional Neural Networks (CNN) can classify images; however, they are computationally expensive to train and require vast amounts of data. Transfer learning allows the re-use of an existing knowledge base to classify a new set of images. We will demonstrate how CNNs can be quickly trained with a small dataset to accurately classify traffic signs through transfer learning.

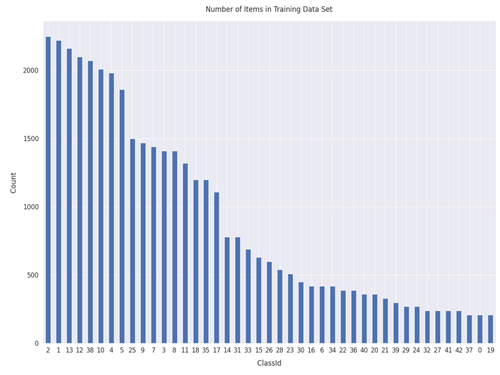
Introduction

Transfer learning is process of taking existing trained layers in a Convoluted Neural Network and transferring them to a new CNN model so that the existing knowledge can be utilised for a new set of problems.



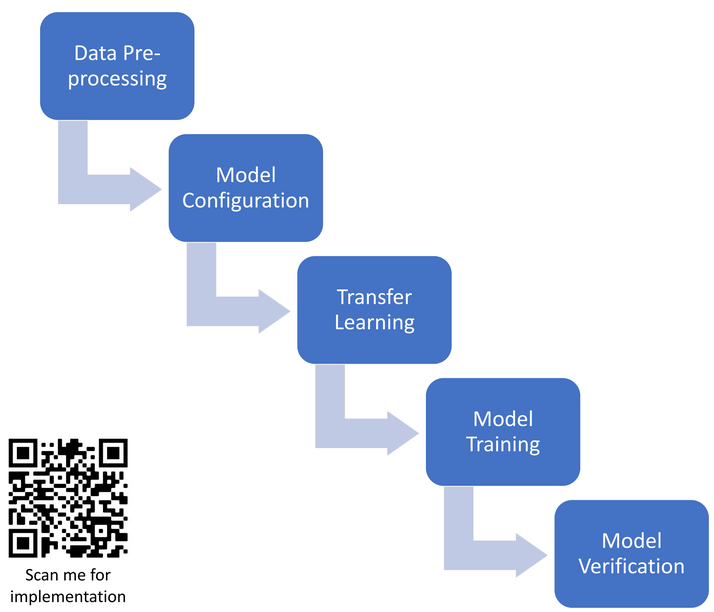
Datasets

Balance of Classes



Sample Images from dataset

Methodology

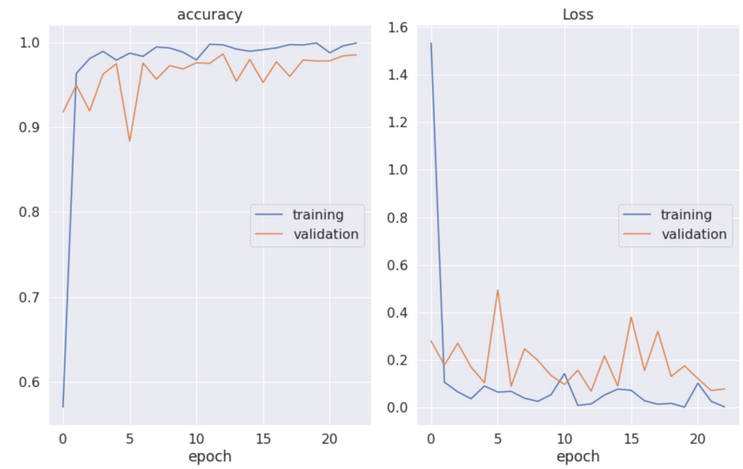


Scan me for implementation

Results

Model iteration accuracy

Iteration	Pre-processed Input	Trainable Layers	Epochs	Execution Time (h:m:s)	Training Accuracy	Training Loss	Validation Accuracy	Validation Loss	Testing Accuracy
1	No	0	14	41:55	97%	0.293	76.2%	13.103	73.71%
2	No	5	17	57:20	100%	0.001	96.5%	0.583	95.86%
3	Yes	5	21	1:11:15	99.9%	0.009	95.7%	0.612	96.17%
4	Yes	10	23	1:41:59	99.9%	0.002	98.5%	0.078	97.38%




```
accuracy
        training                (min:    0.570, max:    0.999, cur:    0.999)
        validation              (min:    0.884, max:    0.986, cur:    0.985)
Loss
        training                (min:    0.002, max:    1.533, cur:    0.002)
        validation              (min:    0.069, max:    0.494, cur:    0.078)
CPU times: user 59min 34s, sys: 16min 33s, total: 1h 16min 7s
Wall time: 1h 41min 59s
```

Most accurate model iteration accuracy and training loss

Conclusion

No. of Images	Training time	Accuracy
39,209	1:41:59	97.38%