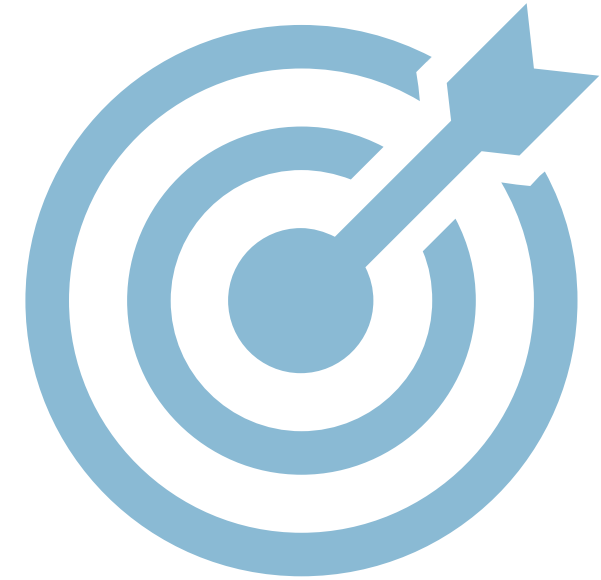# ROAD SIGN CLASSIFICATION

AI – IVU PROJECT

Santello Veronica 870320

GOAL

The goal of this project is to test two different implementation of Convolutional Neural Network and evaluate the strengths and weaknesses of each.

The two versions chosen are:

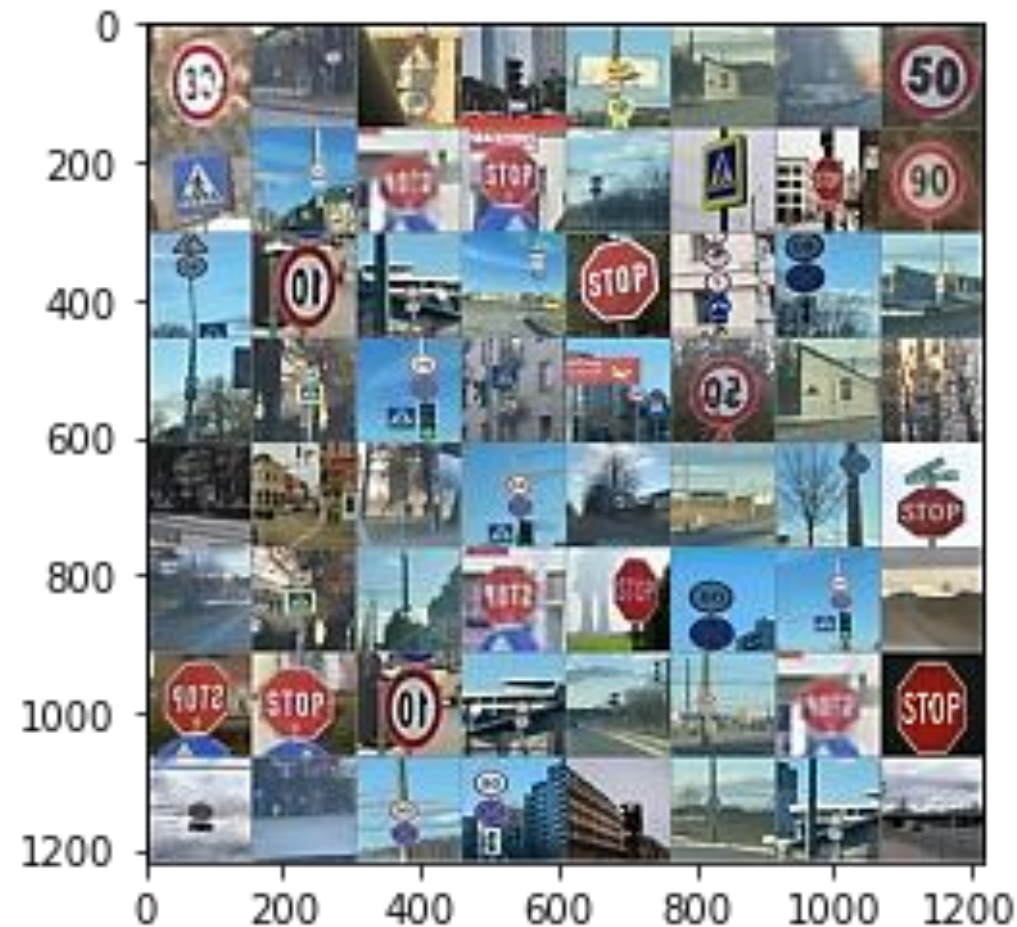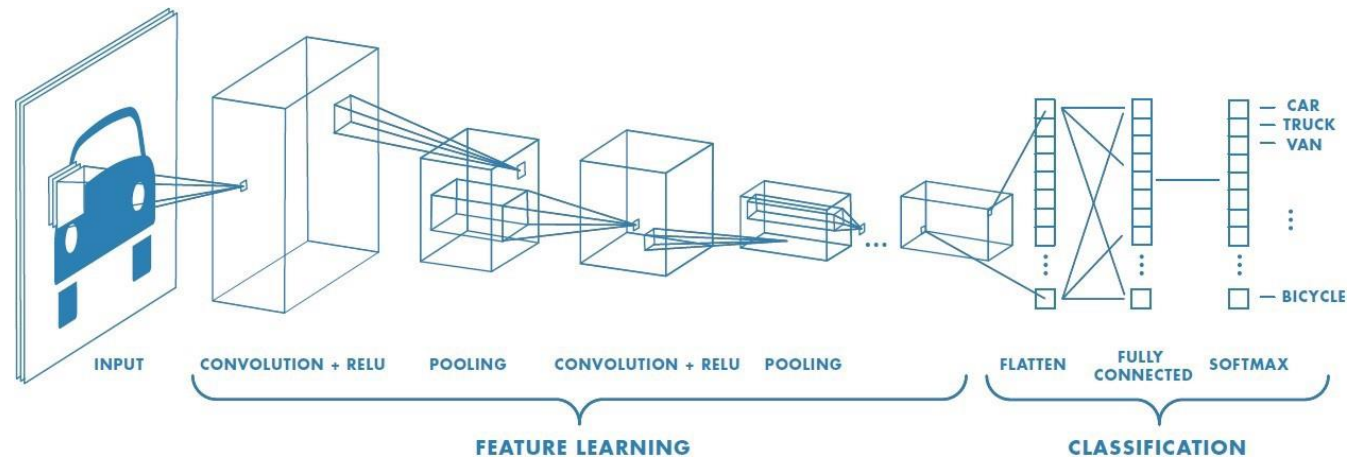- CNN with FC as final layer
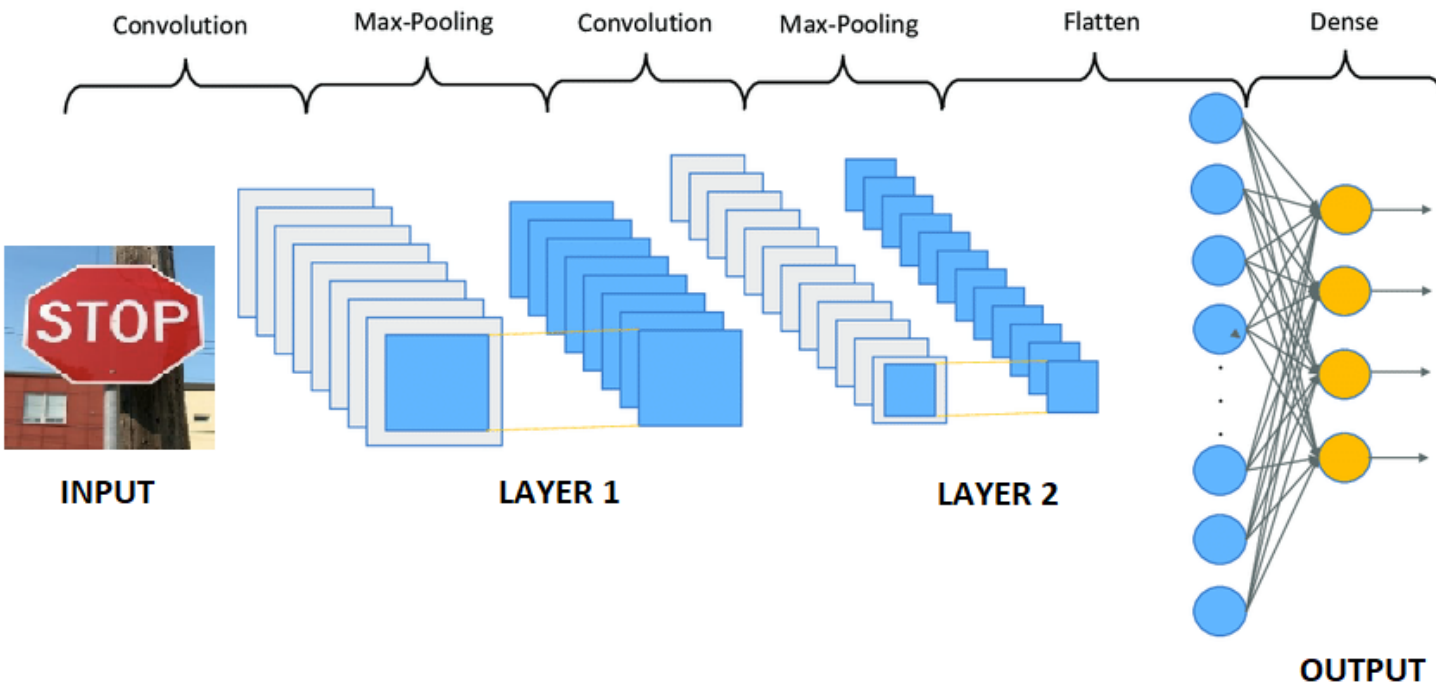- CNN with SVM as final layer

TRAINING SET IMAGES

4 CLASSES:

778 IMAGES FOR TRANING
441 IMAGES FOR VALIDATION

- TRAFFICLIGHT
- SPEED LIMIT
- STOP
- CROSSWALK

CONVOLUTIONAL NEURAL NETWORKS

MY C-NN WITH FC AS FINAL LAYER

TRAFFICLIGHT   SPEED LIMIT   STOP   CROSSWALK
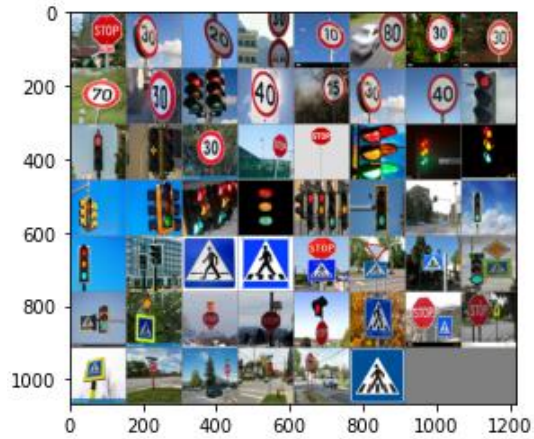
CLASSIFICATION RESULTS

Layer (type)	Output Shape	Param #
conv2d_2 (Conv2D)	(None, 32, 32, 32)	896
max_pooling2d_2 (MaxPooling2	(None, 16, 16, 32)	0
conv2d_3 (Conv2D)	(None, 16, 16, 32)	9248
max_pooling2d_3 (MaxPooling2	(None, 8, 8, 32)	0
flatten_1 (Flatten)	(None, 2048)	0
dense_2 (Dense)	(None, 128)	262272
dense_3 (Dense)	(None, 4)	516

Total params: 272,932
Trainable params: 272,932
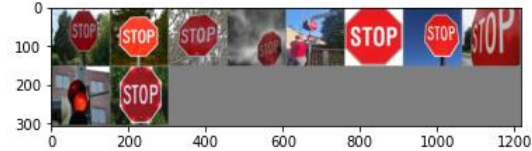Non-trainable params: 0

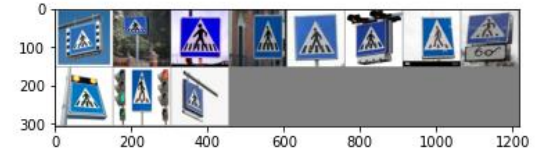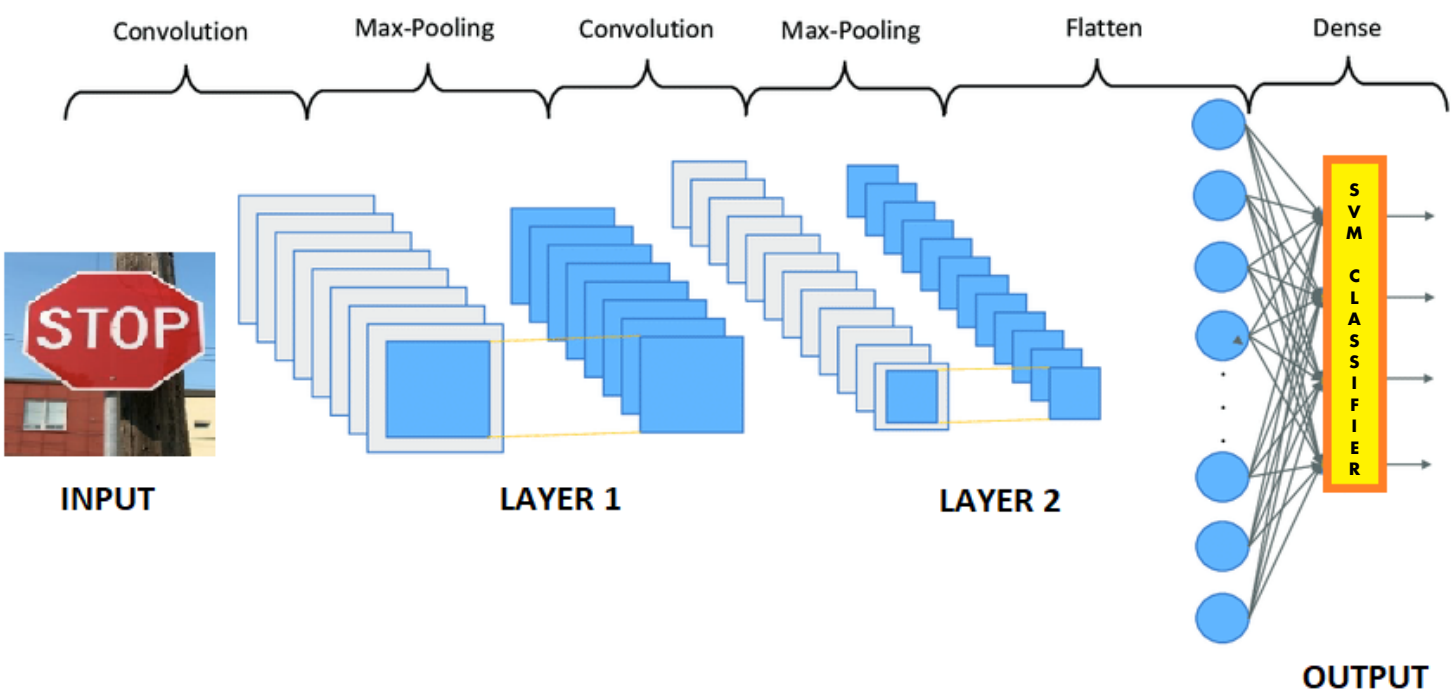# MY C-NN WITH FC SVM FINAL LAYER
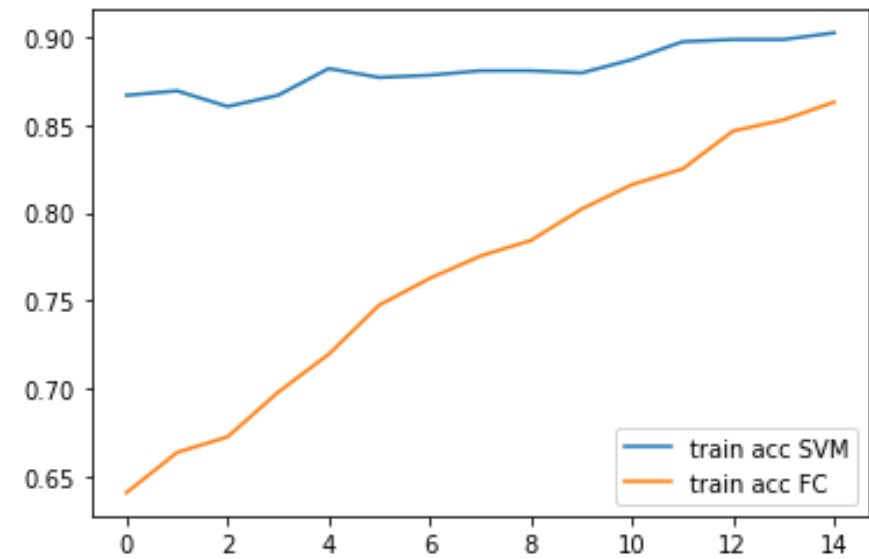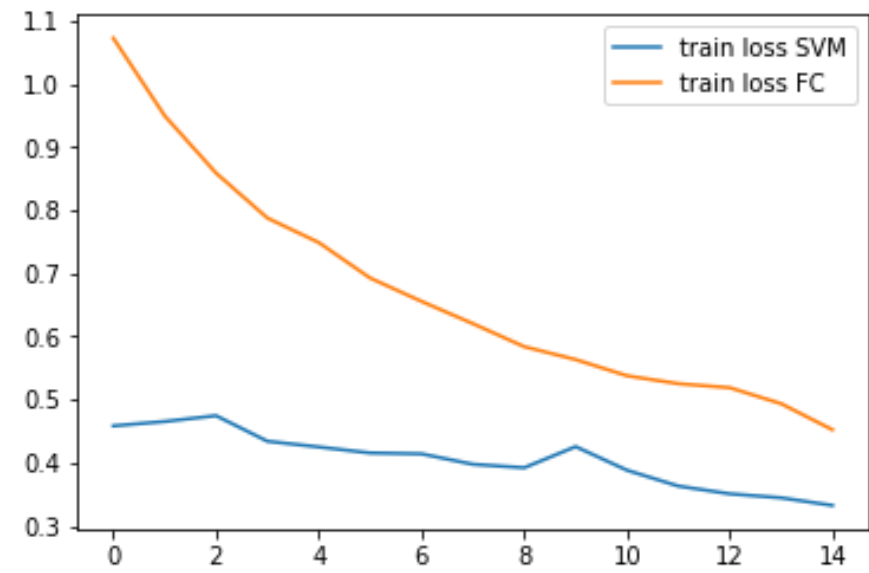
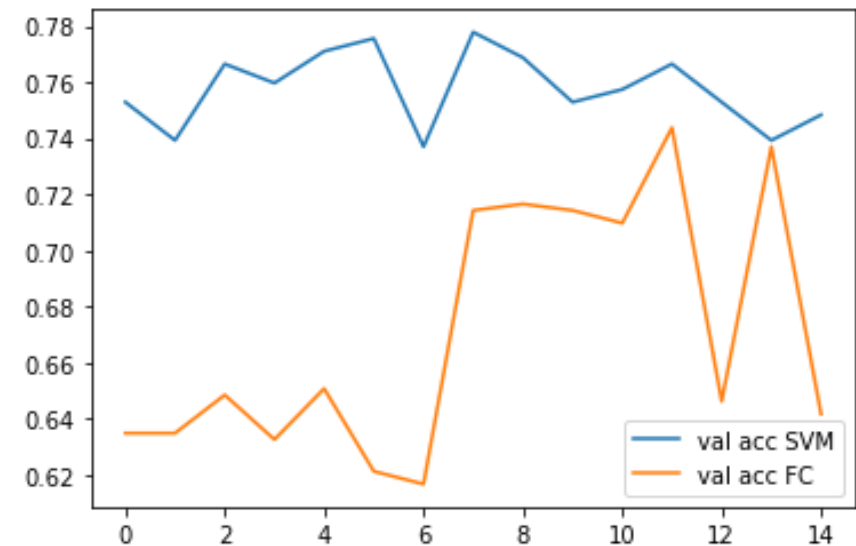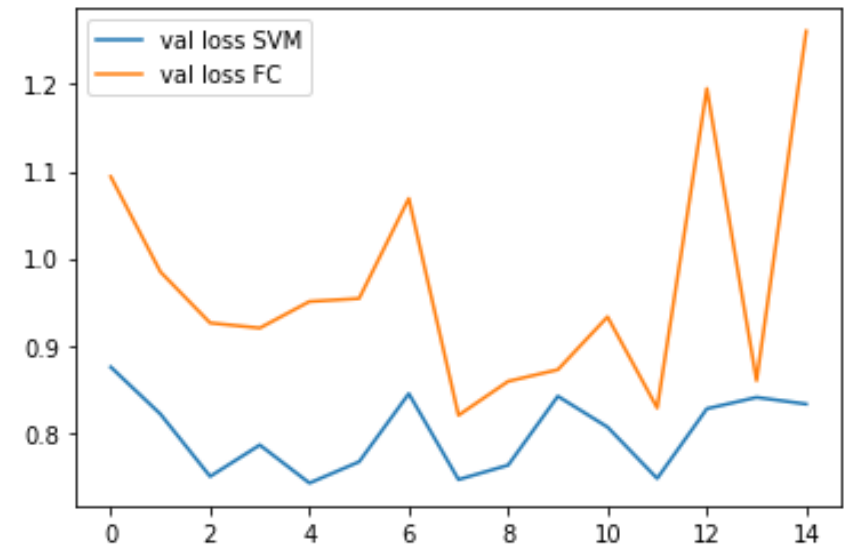TRAFFICLIGHT   SPEED LIMIT   STOP   CROSSWALK

CLASSIFICATION RESULTS

COMPARISONS ON TRAIN DATA

COMPARISONS ON VALIDATION DATA

COMPARISONS ON EXECUTION TIME

Epoch	CNN – FC	CNN – SVM
1	6.72991	6.82955
2	12.8691	12.911
3	18.8857	18.9328
4	24.8869	24.9804
5	30.8982	30.9874
6	36.929	37.0182
7	42.9616	43.033
8	48.9799	49.0663
9	54.9917	55.0826
10	61.0373	61.0894
11	67.1454	67.0838
12	73.2706	73.0883
13	79.3023	79.0991
14	85.4821	85.1088
15	91.7351	91.1165

CONCLUSIONS

- CNN with SVM as final level turns out to be more accurate both during the training phase and during the validation phase.

- The loss is also slightly lower in CNN with SVM as the final layer in both phases.

- There are no relevant differences in terms of execution time between these two algorithms.

THANK YOU FOR LISTENING ☺

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