

# Report on Performance of CNN on EuroSAT Dataset(RGB)

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## 1 CNN Model Hyperparameters:

- Batch Size - 64
- Learning Rate - 0.0001
- Total Epoch - 150
- Patience - 10

## 2 CNN Performance:

- Training Accuracy - 93.2152 %
- Validation Accuracy - 89.031339 %
- Test Accuracy - 88.370370 %

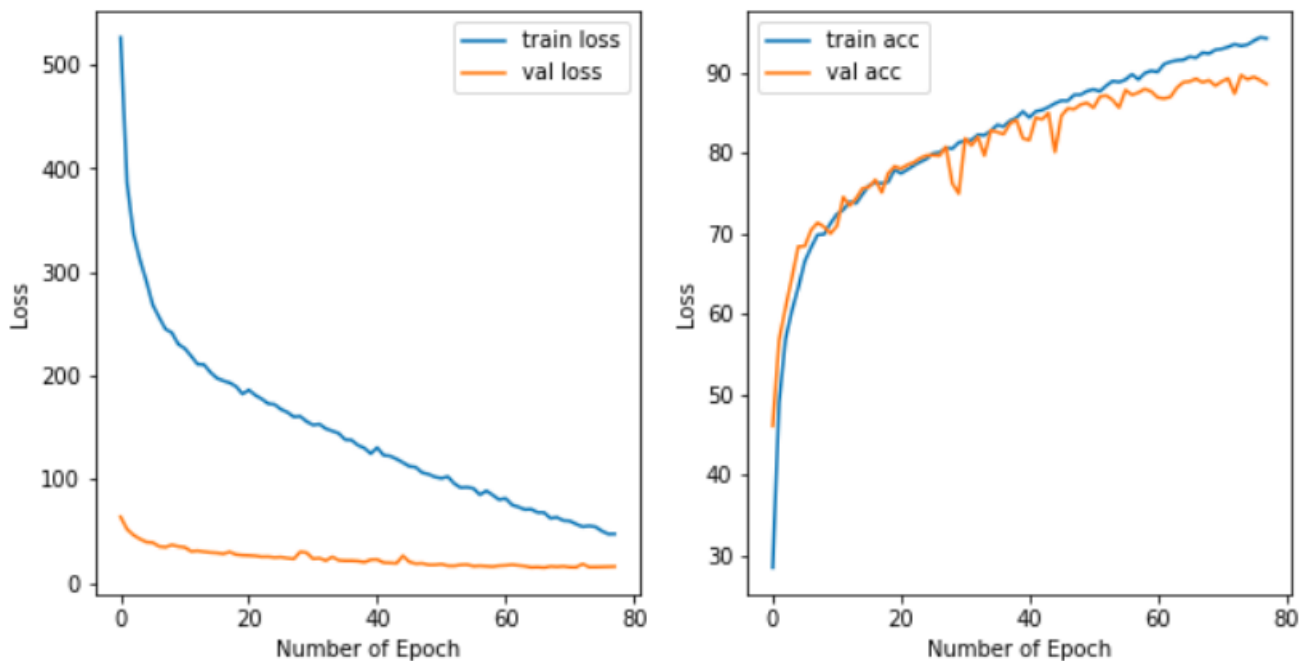


Figure 1: Plot of loss and accuracy on train and validation set

**NOTE:** The above accuracies corresponds to the best model i.e. model with least validation loss. Also, the values above may differ slightly from the values submitted in the notebook, as different values are generated at various runtime.

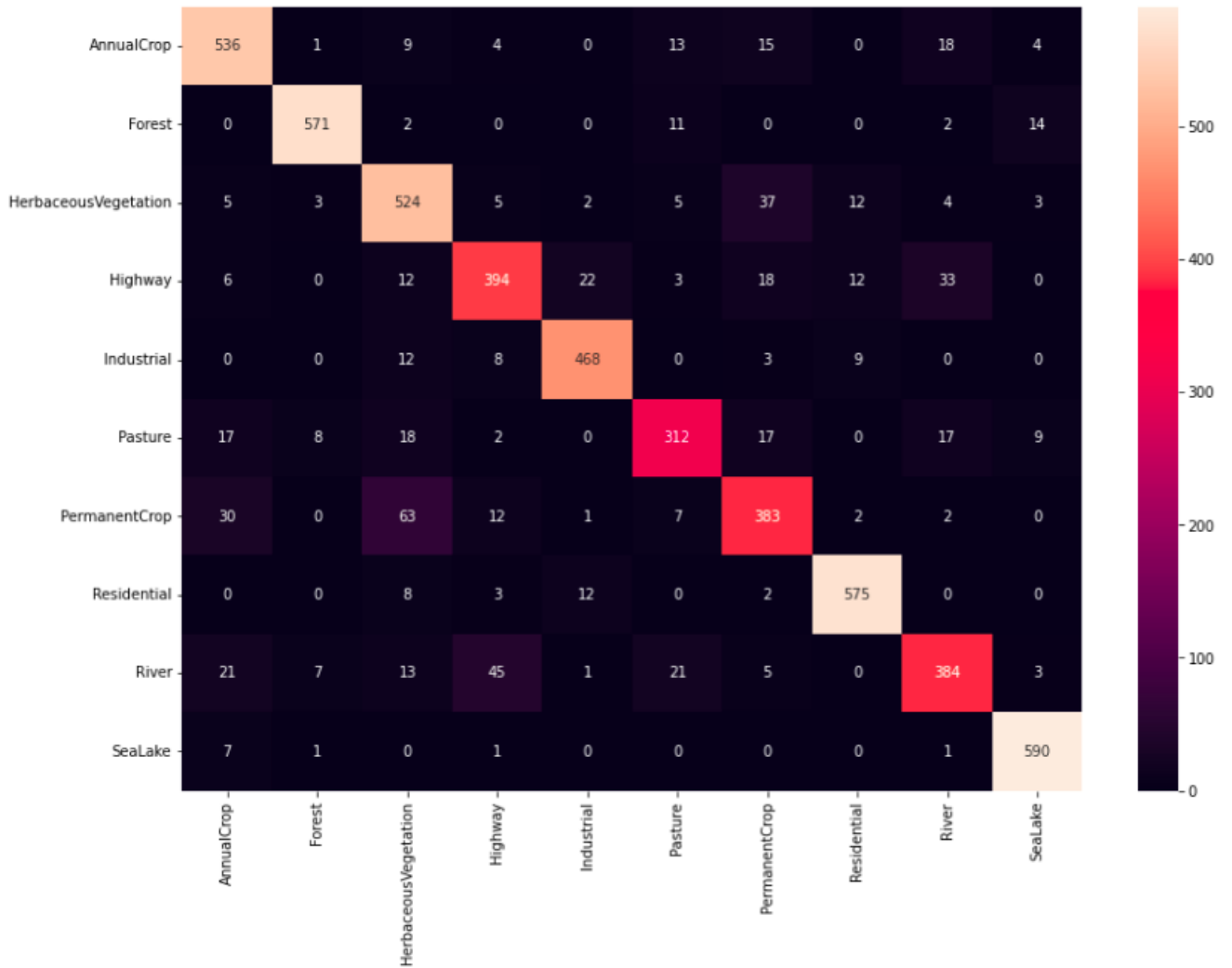


Figure 2: Confusion Matrix Heatmap of the test set

### 3 CNN Performance Analysis:

#### 3.1 Inferences Based on Model Hyperparameters:

- The model didn't perform well in cases of greater learning rate (e.g. 0.001, 0.01) and low patience (e.g. 5). This is because as soon as the validation loss seems to consolidate, the patience value was getting hit and hence early stopping was happening soon (e.g at epoch 15,16) resulting in low accuracy.
- The model also doesn't performs well for larger batch sizes like 256, 512. This is because in most implementations the loss and hence the gradient is averaged over the batch which means for a fixed number of training epochs, larger batch sizes take fewer steps which doesn't allow the model to travel far enough to reach the better solutions for the same number of training epochs

	precision	recall	f1-score	support
AnnualCrop	0.86	0.89	0.88	600
Forest	0.97	0.95	0.96	600
HerbaceousVegetation	0.79	0.87	0.83	600
Highway	0.83	0.79	0.81	500
Industrial	0.92	0.94	0.93	500
Pasture	0.84	0.78	0.81	400
PermanentCrop	0.80	0.77	0.78	500
Residential	0.94	0.96	0.95	600
River	0.83	0.77	0.80	500
SeaLake	0.95	0.98	0.96	600
accuracy			0.88	5400
macro avg	0.87	0.87	0.87	5400
weighted avg	0.88	0.88	0.88	5400

Figure 3: Classification Report of CNN on EuroSAT dataset(RGB)

### 3.2 Inferences Based on Model Performance:

- Since, the training accuracy is greater than the validation and test accuracy, we can say that the model is **slightly overfitted**.
- From Fig.1, we observe that the validation loss consolidates around 65 epochs, resulting in early stopping at epochs in range 75-85 in most of the cases.
- From the classification report in Fig.3, we observe that the class 'Forest' was predicted with the highest precision while class 'Residential' was predicted with highest recall.