

## Task 2 – ResNet18 Architecture with Pretrained=True

The hyperparameters for the model are:-

- 1) Batch Size – 32
- 2) Learning Rate – 0.0001
- 3) Epoch – 20
- 4) Patience – 5

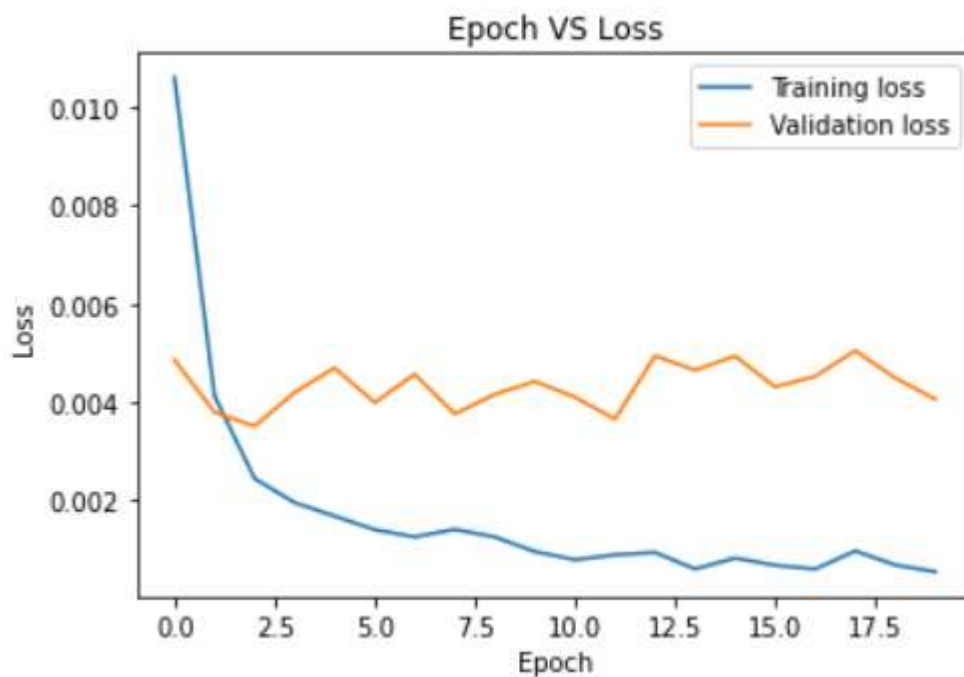
The loss of the model are as follows:-

- 1) Training Loss – 0.0005
- 2) Validation Loss – 0.0041

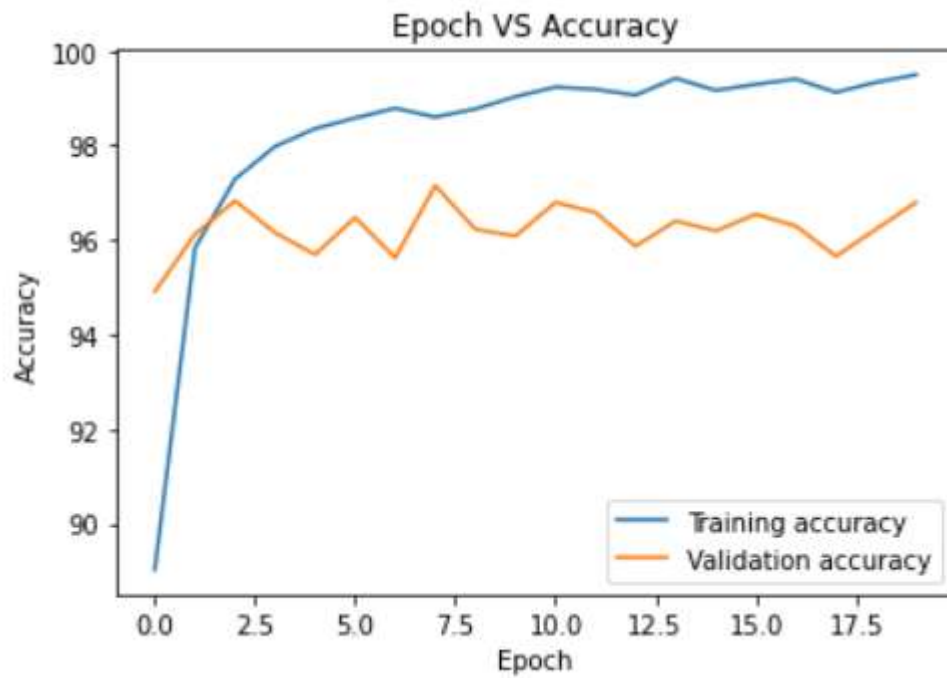
The accuracy of the model are as follows:-

- 1) Training Accuracy – 99.941%
- 2) Validation Accuracy – 96.795%
- 3) Test Accuracy – 96.981%

The plot of loss on the training and validation set is given below-



The plot of accuracy on the training and validation set is given below-



The Recall for each class is given below:-

AnnualCrop : 0.960

Forest : 0.995

HerbaceousVegetation : 0.975

Highway : 0.956

Industrial : 0.992

Pasture : 0.958

PermanentCrop : 0.912

Residential : 0.973

River : 0.972

SeaLake : 0.993

The four examples the model got wrong and was most confident about are given below:-

True: PermanentCrop  
Predicted: HerbaceousVegetation  
Prediction Probability: 1.000



True: Highway  
Predicted: PermanentCrop  
Prediction Probability: 1.000



True: AnnualCrop  
Predicted: Pasture  
Prediction Probability: 0.999



True: AnnualCrop  
Predicted: SeaLake  
Prediction Probability: 0.999



## Inference from the experiment

Here we are using the ResNet18 pretrained model which is trained on the ImageNet dataset with a huge volume of data. After that we are using transfer learning to modify the outer fully connected layer and then finetune on our dataset. For this reason, we are getting a good accuracy of around 96% which is much better than the CNN model which we trained on the Task 1.

## Task 3 – ResNet18 Architecture with Pretrained=False

The hyperparameters for the model are same as Task 2.

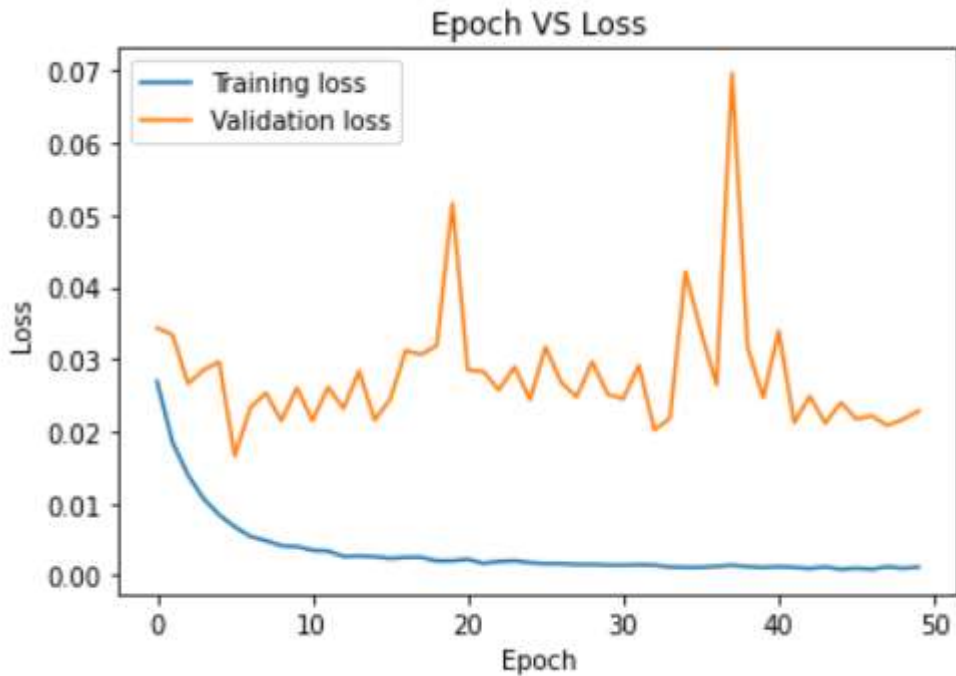
The loss of the model are as follows:-

- 1) Training Loss – 0.0011
- 2) Validation Loss – 0.0228

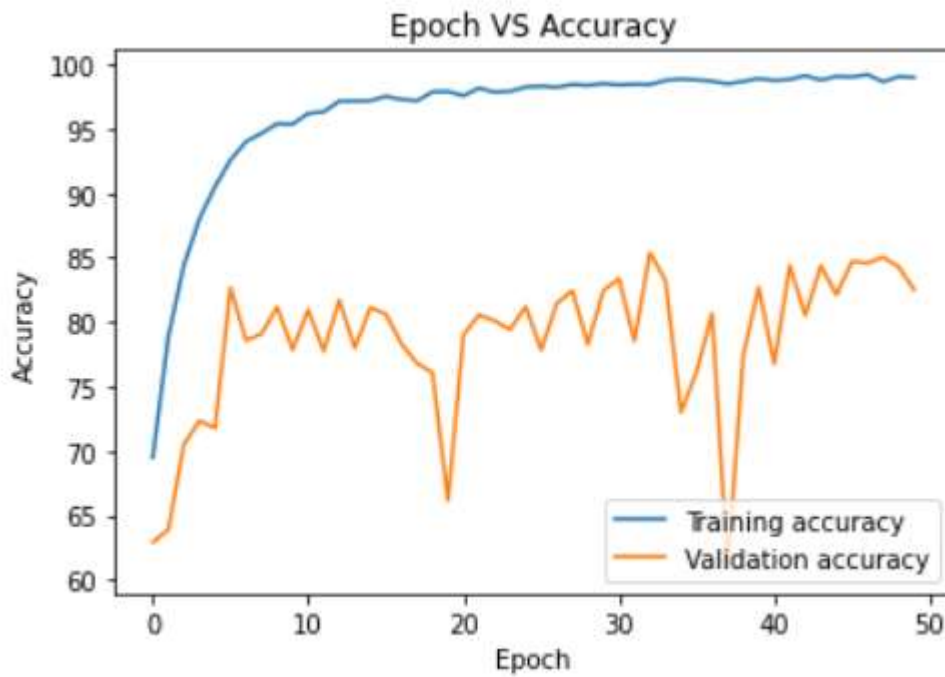
The accuracy of the model are as follows:-

- 1) Training Accuracy – 98.946%
- 2) Validation Accuracy – 82.514%
- 3) Test Accuracy – 82.852%

The plot of loss on the training and validation set is given below-



The plot of accuracy on the training and validation set is given below-



The Recall for each class is given below:-

AnnualCrop : 0.923

Forest : 0.847

HerbaceousVegetation : 0.647

Highway : 0.708

Industrial : 0.908

Pasture : 0.825

PermanentCrop : 0.686

Residential : 0.928

River : 0.816

SeaLake : 0.963

The four examples the model got wrong and was most confident about are given below:-

True: SeaLake  
Predicted: AnnualCrop  
Prediction Probability: 1.000



True: River  
Predicted: AnnualCrop  
Prediction Probability: 1.000



---

True: HerbaceousVegetation  
Predicted: PermanentCrop  
Prediction Probability: 1.000



True: Pasture  
Predicted: AnnualCrop  
Prediction Probability: 1.000



## Inference from the experiment

Here we are using the ResNet18 model with pretrained = False. We are training the model on our dataset entirely. For this reason, we are not getting a good accuracy as in Task 2. We are getting an accuracy of around 82%. Deep Learning models require huge datasets to train, but our dataset is not that huge and so the performance of the model is not so good as it was in Task 2 where we were using the pretrained model. Here we learned the benefit of using transfer learning in deep learning models.