Assignment 4 Report

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CS577 – S20

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Problem Statement:

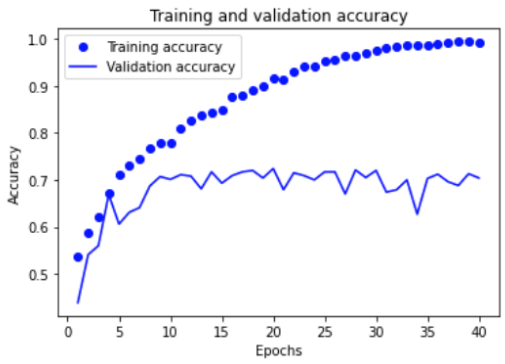
To train the network for binary classification – Cats and Dogs and tune the various model parameters.

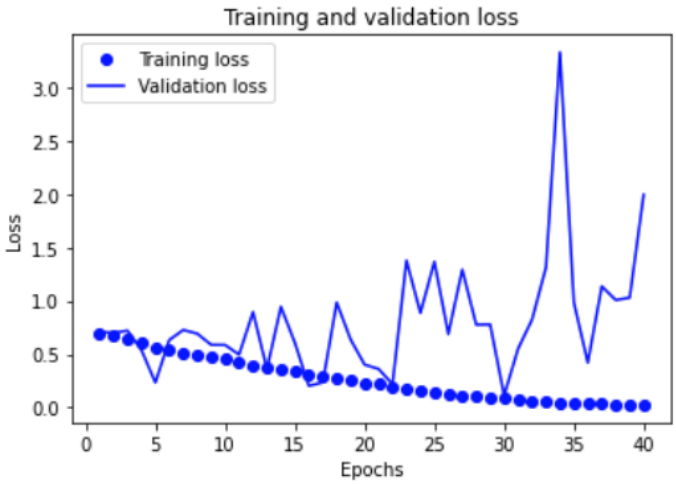
Implementation details:

1. I downloaded the data from Microsoft Kaggle Cats and Dogs Database.
2. I created a directory named data1.
3. I created 3 subdirectories in data1 that are train, test & val.
4. I split the data into 2000 images of Cats and Dogs in the train directory, 500 images of Cats and Dogs in val directory and the remaining 500 images of Cats and Dogs in test directory.
5. Then I created a convnet model using keras and performed hypermeter tuning by adding a dense layer of 512 tensors.
6. Then I used VGG16 Convnet and freeze VGG16 and evaluated the performance of the model.
7. Then I unfreeze VGG16 Convnet and tuned VGG16 by training and evaluating performance.
8. At last I performed Data Augmentation with VGG16 frozen model.

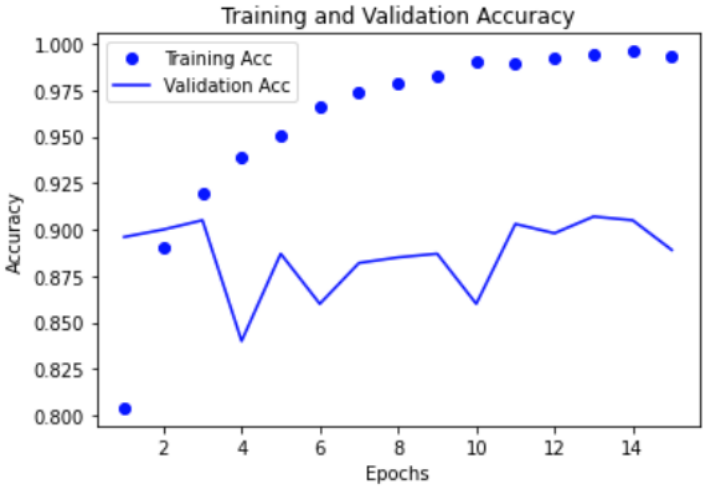
Results:

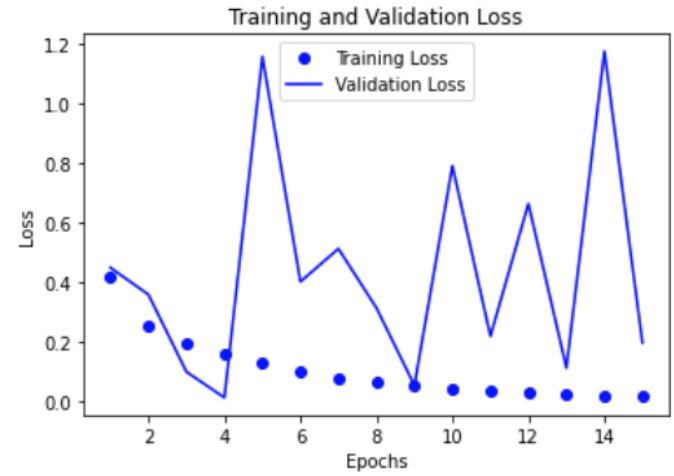
1. In the first step I created a normal convnet model using keras. I got a test accuracy as 65.25 and after adding the dense layer I got an Test accuracy of 70.39%.



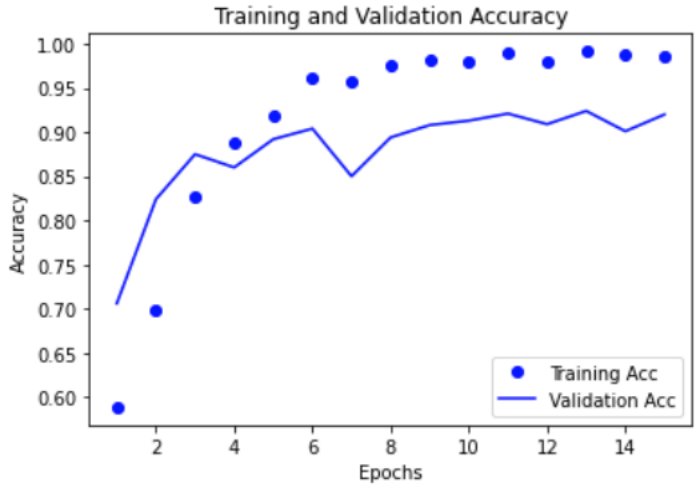


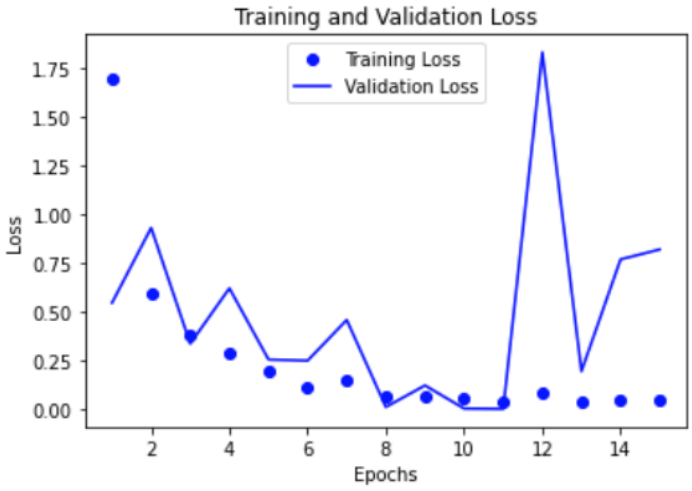
2.Then I freeze the VGG16 convolution base and trained only the fully connected network. Because the network gets trained in direction of VGG16 and to make sure that the existing weights of VGG16 model is not lost. I trained the model for 15 epochs and got the accuracy of 88.89%.



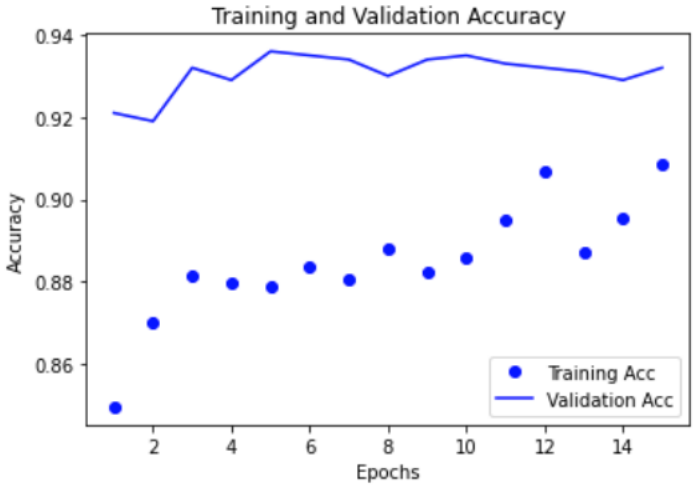


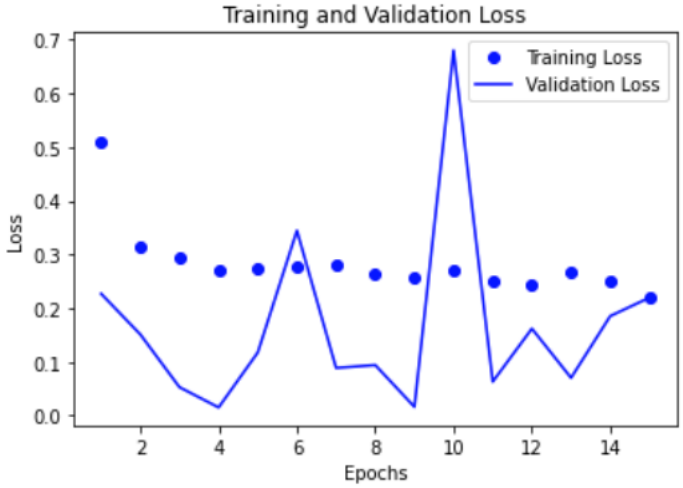
3.In the third step I unfreeze the model by setting the trainable field to True so now the whole model is updated to move in direction of output. I again trained the model for 15 epochs and got the accuracy of 92.00%.





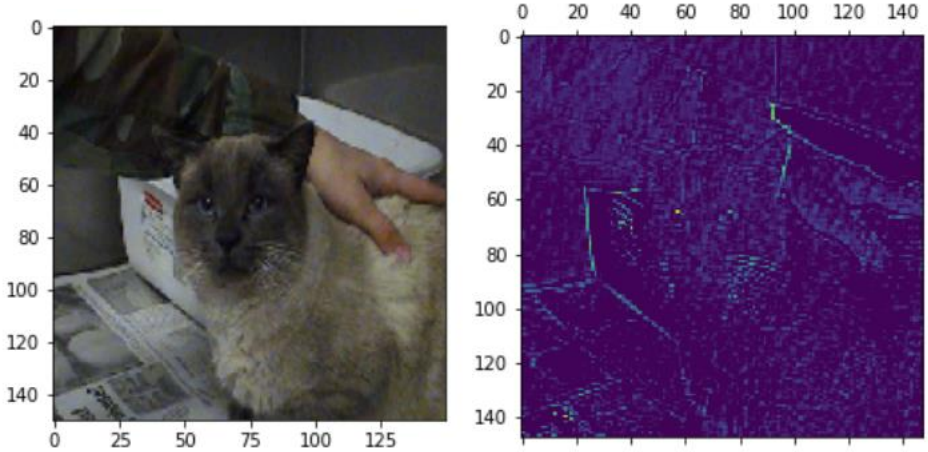
4.At last I did Data Augmentation in this we set the Trainable field back to False. Then we retrain the model so that we can generalize better than the previous step. So I performed Data Augmentation by modifying different attributes of the training image to imitate real world scenario. I again trained the model for 15 epochs and got the accuracy of 93.19%.

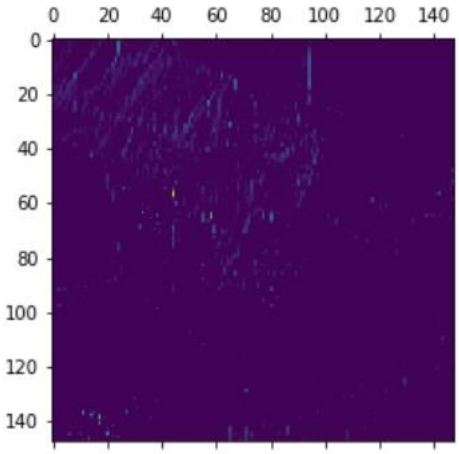




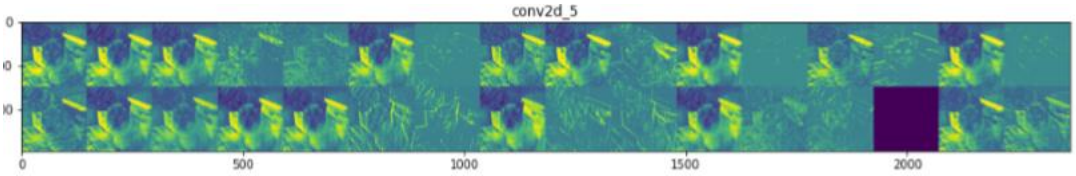
Visualization:

Activation Function Visualization:

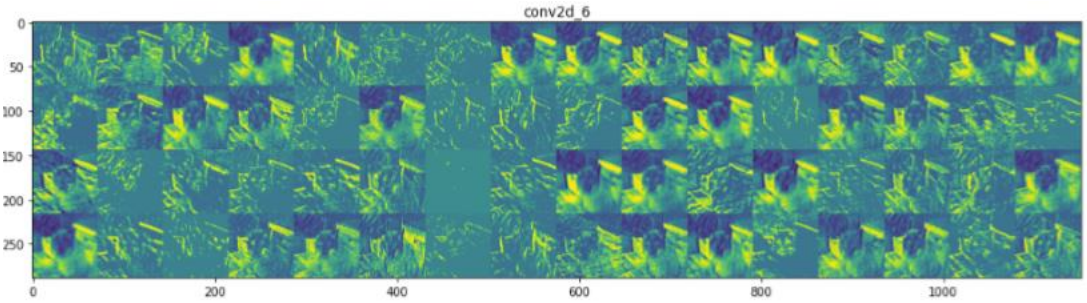




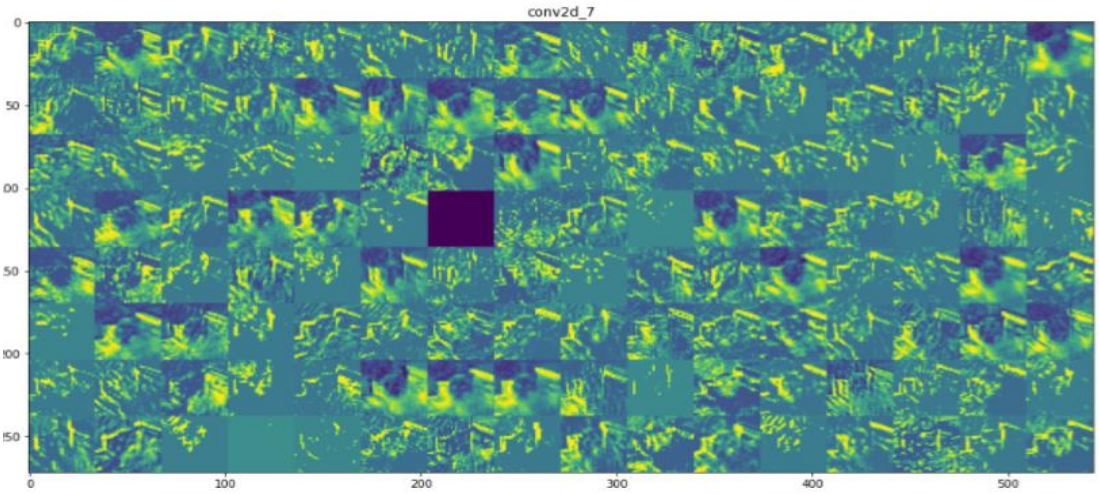
We are going to visualize the above image of cat.



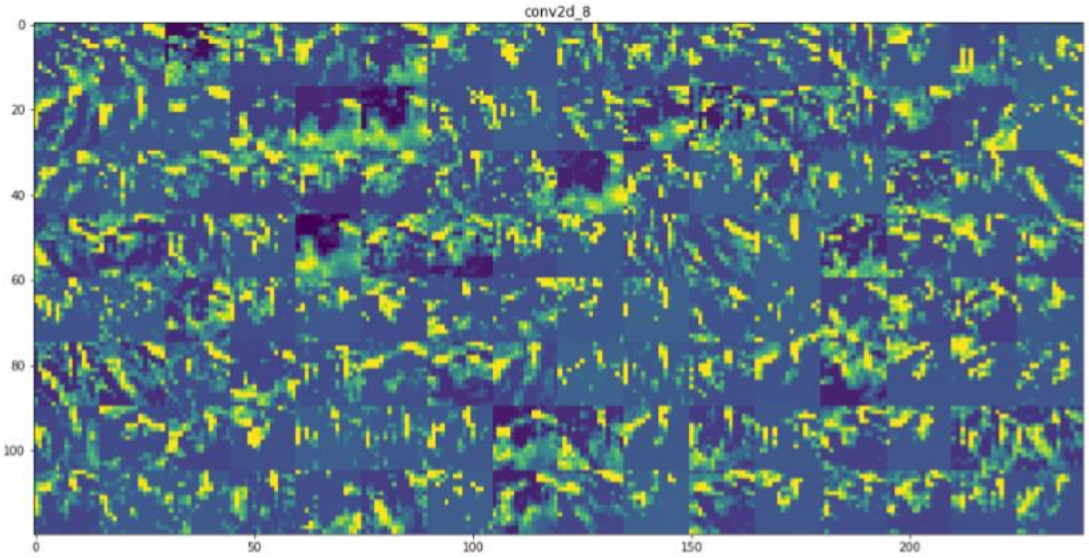
From the above image we can visualize that it is trying to detect the edges from the image.



From the above image we can visualize that it is trying to detect the body edges of cat.

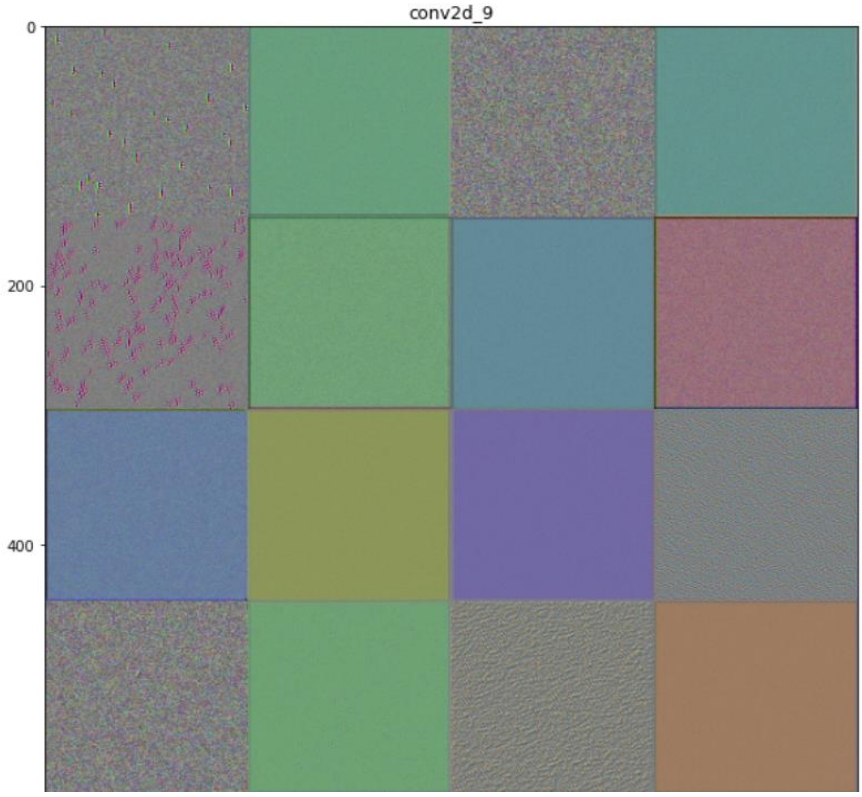


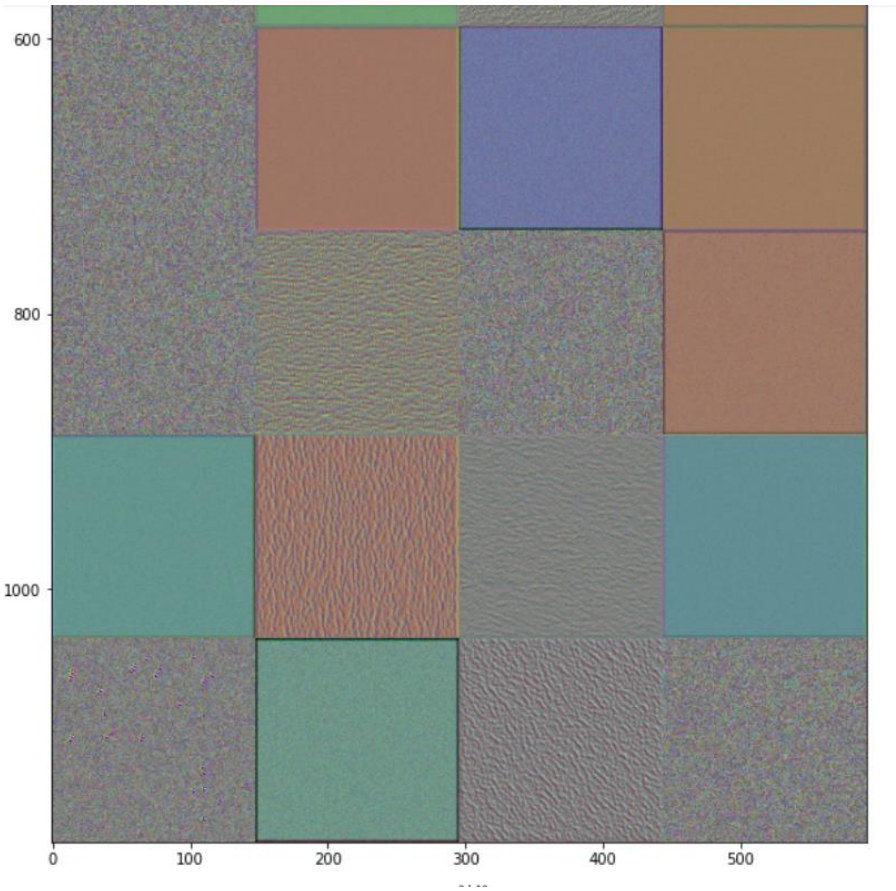
From the above image we can visualize that it is trying to detect the different parts of cat such as eyes, nose etc.



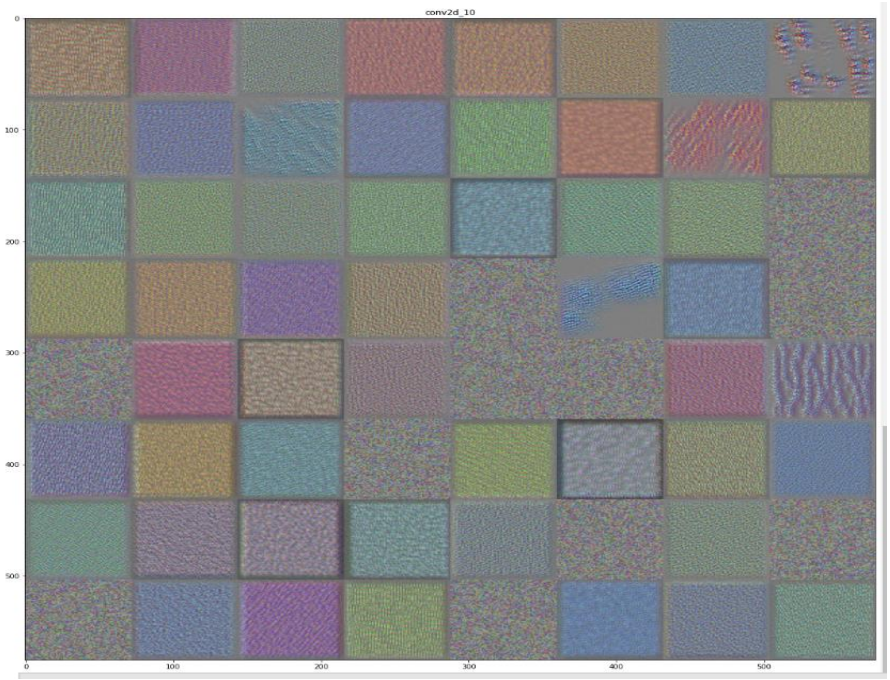
From the above image we can visualize that it is trying to get higher level representation of cat's understanding by going deep in different parts of cat such as eyes, nose etc.

Filter Visualization:

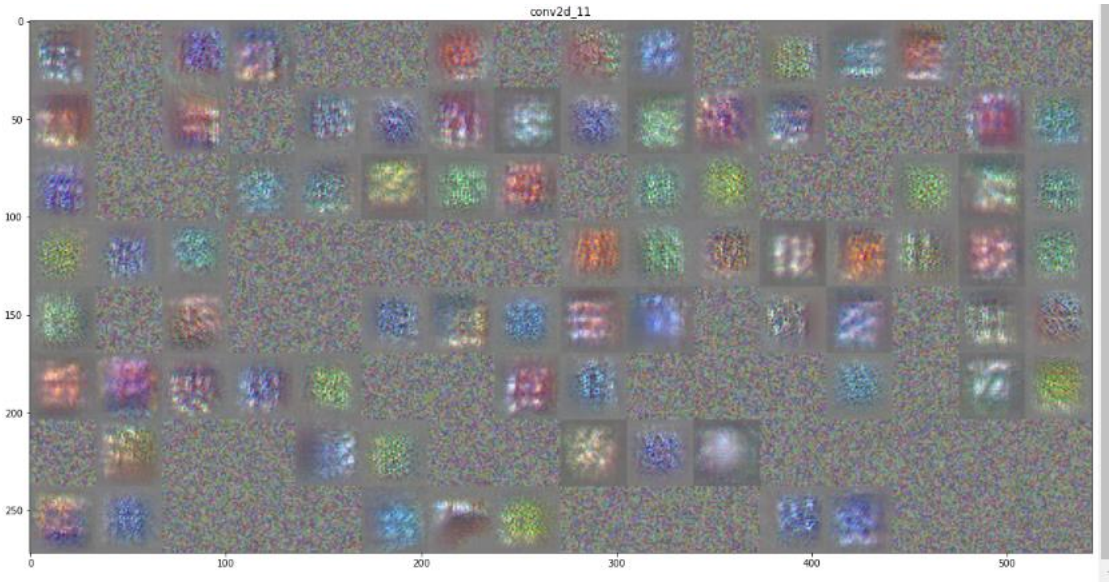




From the above picture we can visualize basic colors, patterns and textures.



In the above image we can see combination of patterns from the previous image.



In the above image we can see more complex combination of patterns from previous image.

Conclusion:

From the above experiments we see that we get when training the model VGG16 frozen we get better accuracy then the simple convnet model. Similarly as the model is better with data when using VGG16 unfrozen it gives even better accuracy then VGG16 frozen model. At last we get a much better accuracy with Data Augmentation then any of the other models.