267: HW#4

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Flowers Classification using SqueezeNet

1. Data Analysis and Visualization

This dataset contains 4242 images of flowers. The data collection is based on the data Flickr, Google images, Yandex images. You can use this data set to recognize plants from the photo. The pictures are divided into five classes: chamomile, tulip, rose, sunflower, dandelion.

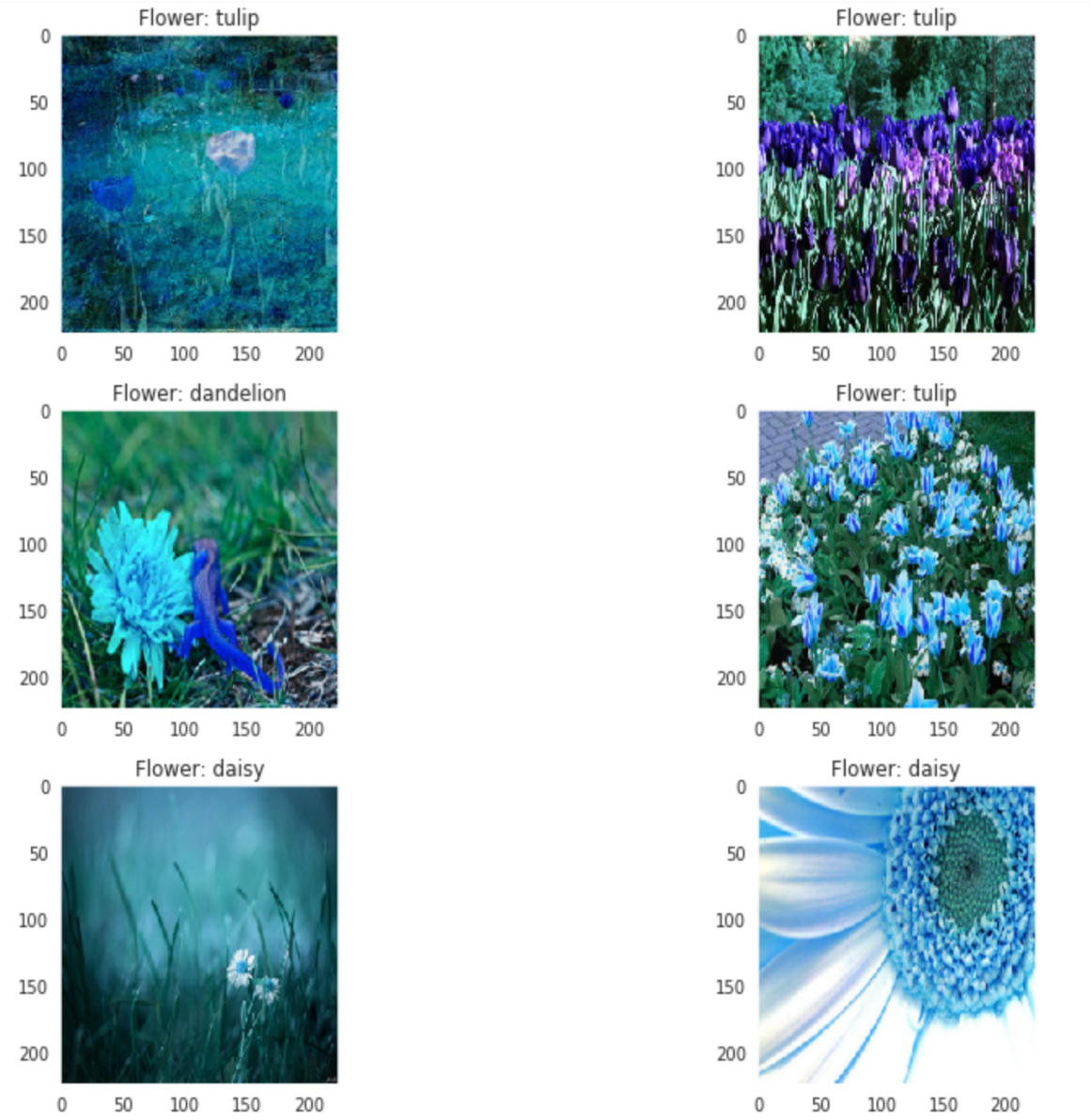

Figure 1: Random images from the data set

For each class there are about 800 photos. Photos are not high resolution, about 320x240 pixels. Photos are not reduced to a single size; they have different proportions!

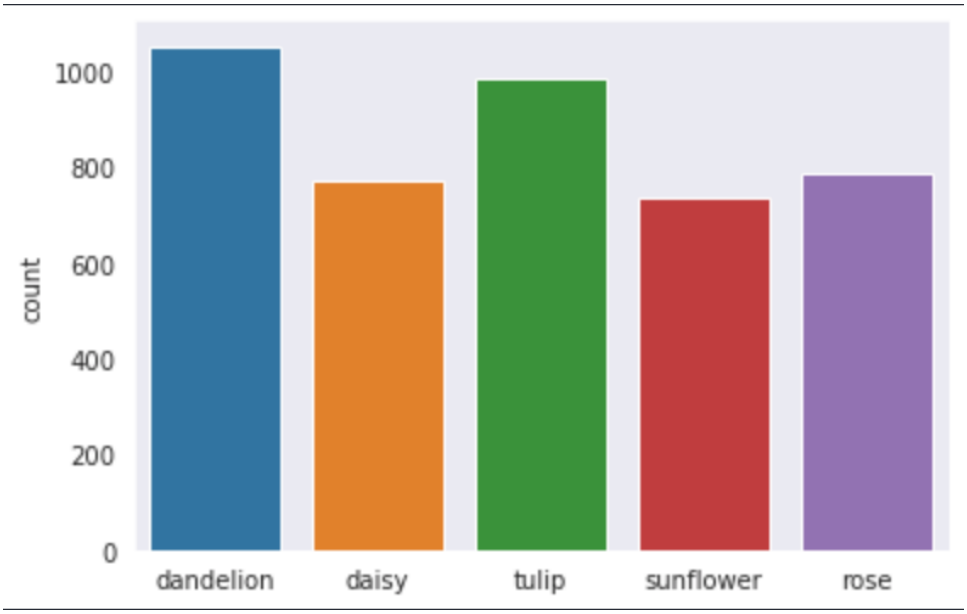

Figure 2: Number of images in each class

2. Model Implementation and Improvement

In this assignment we are going to apply Squeezenet [1] to classify the flowers. Squeezenet is a CNN architecture that has 50× fewer parameters than AlexNet and maintains AlexNet-level accuracy on ImageNet. We will discuss the result of different Hyperparameters.

	Training Accuracy	Test Accuracy
1. Base Model	85.76%	53.49%
2. Adam Optimizer (etha=0.001)	95.27%	66.73%
3. Dropout (0.4)	96.31%	69.82%
4. Increased Batch Size (290)	99.97%	73.16%

Table 1: Studying results of changing hyperparameters

In the base model we used RMSProp optimization method with 0.0001 learning rate and set the learning rate decay to 1e-5. The batch size was set to 256 and there was no dropout. As we can see there is about 32% difference in test and training accuracy. In the next model we changed the optimization method to Adam and decreased the learning rate and its decay. So, the accuracy in both test and training was improved but we still had the overfitting problem. To tackle this issue, Dropout regularization method had been

added to the model, but unfortunately there is 26.49% difference in our accuracies. Finally, increasing the batch size from 256 to 290 gave is the best accuracy but by studying all 90 epochs of our training, it is understood that our model has strong overfitting issue, because in some epochs the training accuracy reaches to 100%.

Figure 3: The loss and Accuracy of training and validation set in model 3

Figure 4: The loss and Accuracy of training and validation set in model 4 (best performance)

3. Conclusion

We have implemented a Squeezenet model to classify flowers dataset using transfer-learning. In the base model, the test and training accuracies were down, and we made changes to increase the model performance, as mentioned in table 1.
By studying this dataset, we have got these results and suggestions:

1. Adam Optimizer can improve the model performance, in comparison with RMSProp.
2. Adding dropout can help the solving overfitting problem but we need more changes.
3. Increasing batch size can increase the test accuracy but worsens the overfitting.
4. Data augmentation may improve the model performance, but because of Memory and RAM limitation in Kaggle, we could not examine this method.

By studying other codes in this Kaggle competition, we suggest applying simpler models to classify this dataset. It is also proved by the overfitting issue in our models.

**I have tried different models and I will submit at least two of the codes. The best performance is Model #4. Thank you.*

Bibliography

[1] Iandola, F.N., Moskewicz, M., Ashraf, K., Han, S., Dally, W., & Keutzer, K, "SqueezeNet: AlexNet-level accuracy with 50x fewer parameters and <1MB model size.," *ArXiv, abs/1602.07360.,* 2016.