REPORT ON ASSIGNMENT 5 (MACHINE LEARNING LAB)

❖ PROCEDURE

The *Flower recognition* dataset was downloaded that included 4,242 images of five different classes of flowers: tulip, sunflower, daisy, rose and dandelion.

★ PRE-PROCESSING OF THE DATASET

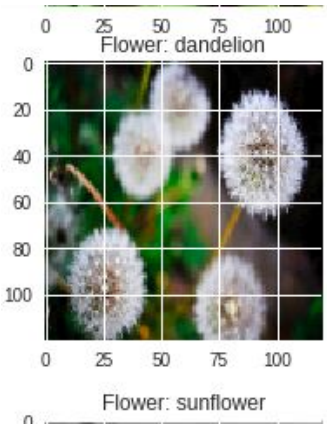
- Since the assignment was to apply CNN on both RGB as well as grayscale images, the pre-processing was done simultaneously for both RGB and grayscale images.
- The images were of varying sizes, so all of them were resized to a size of 120 X 120 pixels.
- All images were randomly shuffled to create training, test, and development set with a ratio of 90:10:10, respectively.

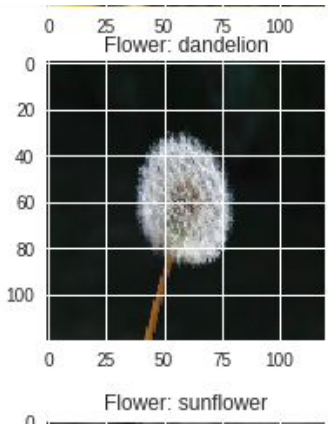
★ TRAINING AND CLASSIFICATION (IN KERAS)

- A convolutional neural network (CNN) having two CNN layers was used in the model chosen for training on the color images.
- For the grayscale images, three CNN layers were used.In addition, batch normalization was also used between the layers.
- From the test set, the images of ten different flowers were taken and their class was predicted.
- The graph for loss and accuracy vs epoch for the training set, and the graph for accuracy vs epoch for the development set were plotted.

RESULTS

1. Preview of sample images from different classes after resizing





2. The model summary

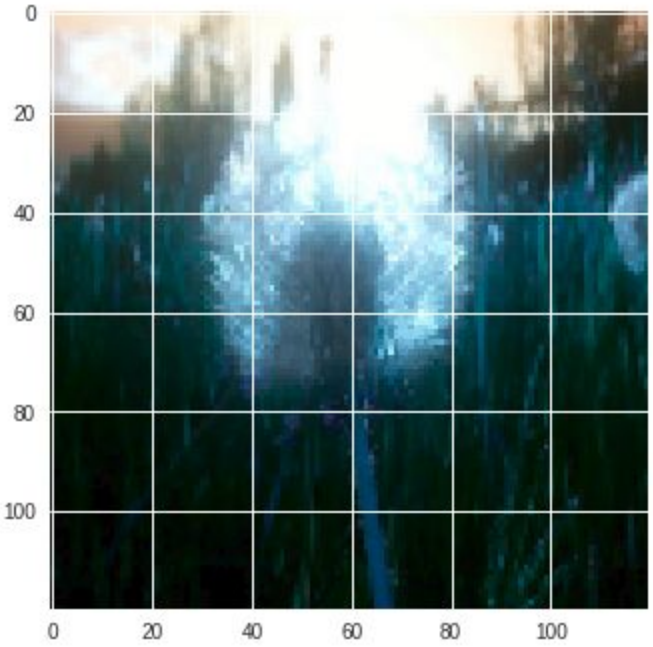
Layer (type)	Output Shape	Param #
conv2d_15 (Conv2D)	(None, 120, 120, 32)	2432
max_pooling2d_15 (MaxPooling	(None, 60, 60, 32)	0
conv2d_16 (Conv2D)	(None, 60, 60, 64)	18496
max_pooling2d_16 (MaxPooling	(None, 30, 30, 64)	0
conv2d_17 (Conv2D)	(None, 30, 30, 128)	73856
max_pooling2d_17 (MaxPooling	(None, 15, 15, 128)	0
flatten_8 (Flatten)	(None, 28800)	0
dense_15 (Dense)	(None, 512)	14746112
activation_8 (Activation)	(None, 512)	0
dense_16 (Dense)	(None, 5)	2565

Total params: 14,843,461
Trainable params: 14,843,461
Non-trainable params: 0

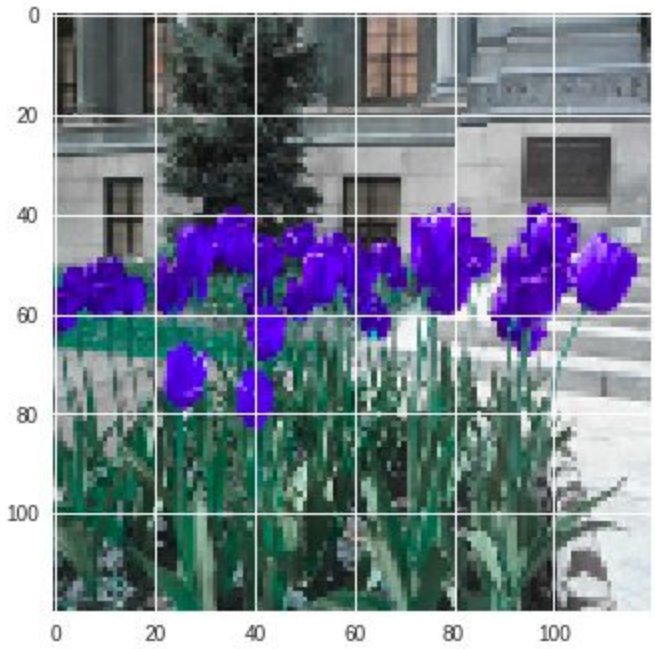
3. Prediction on sample images

a) On color images

ground truth: dandelion
prediction: dandelion



ground truth: tulip
prediction: tulip



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ground truth: dandelion
prediction: dandelion
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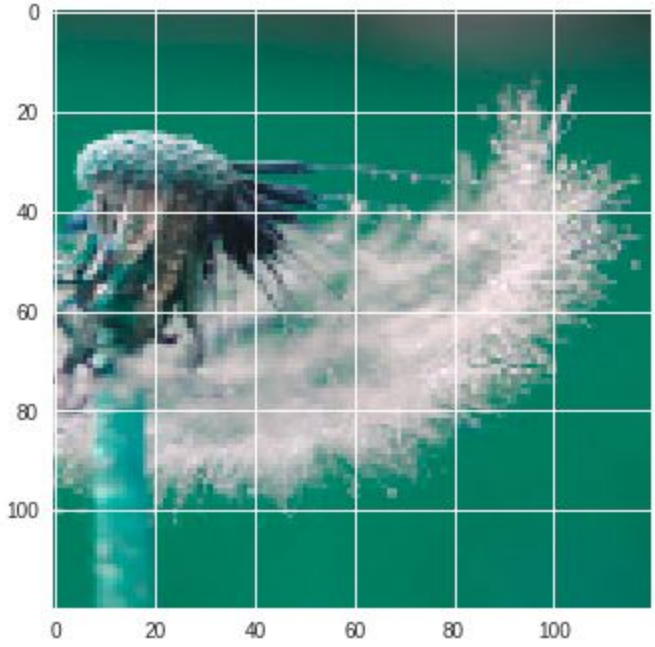


```
ground truth: daisy
prediction: daisy
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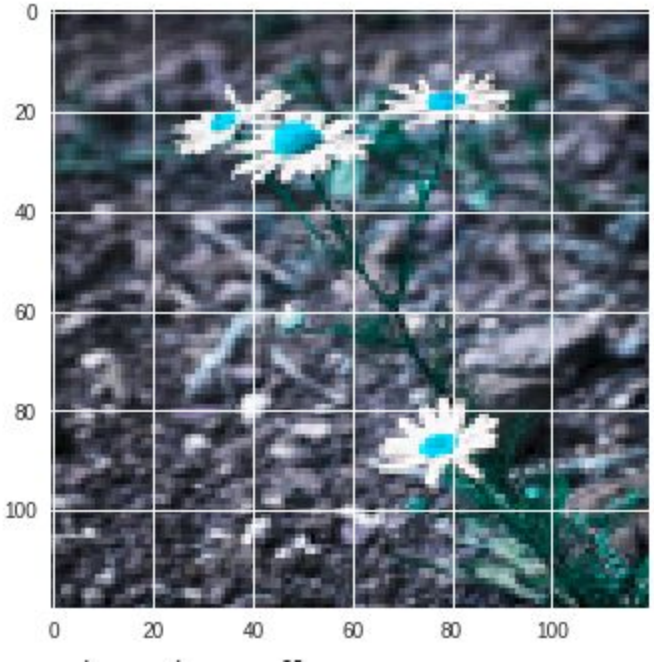
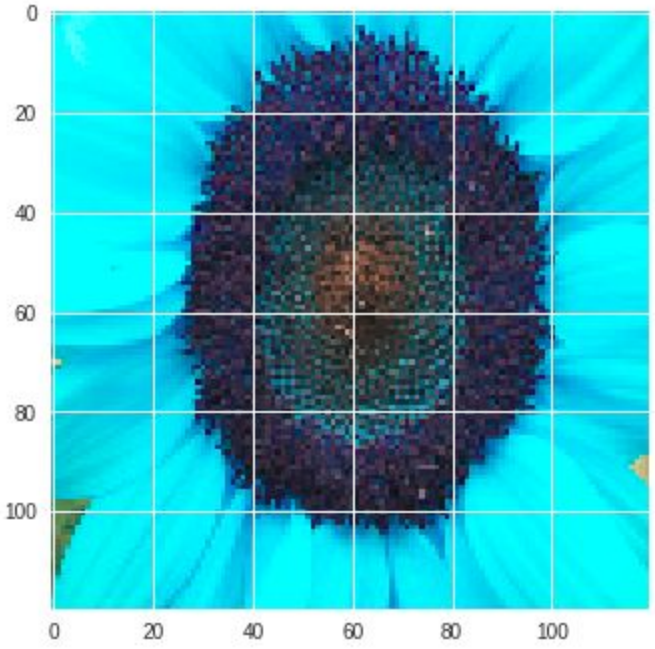
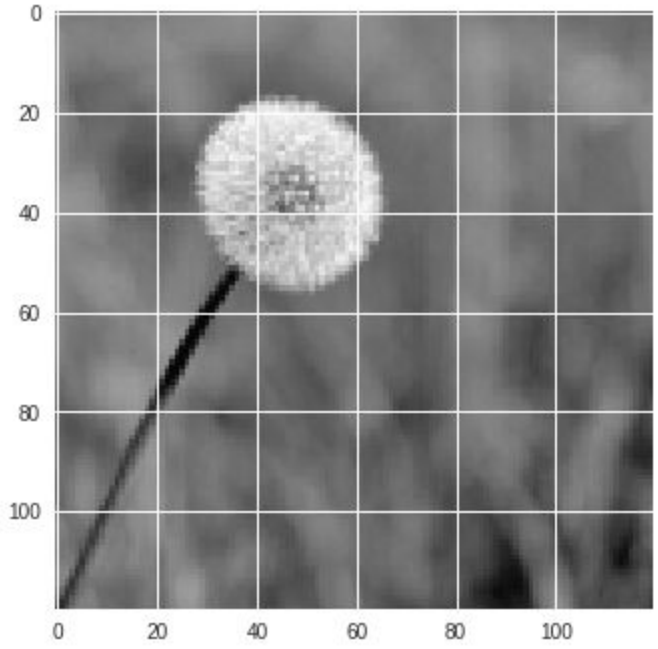


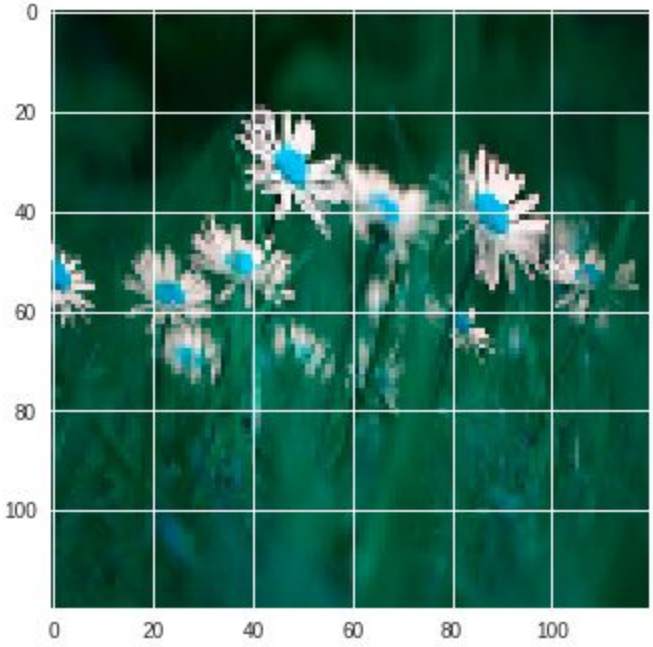
ground truth: sunflower
prediction: sunflower



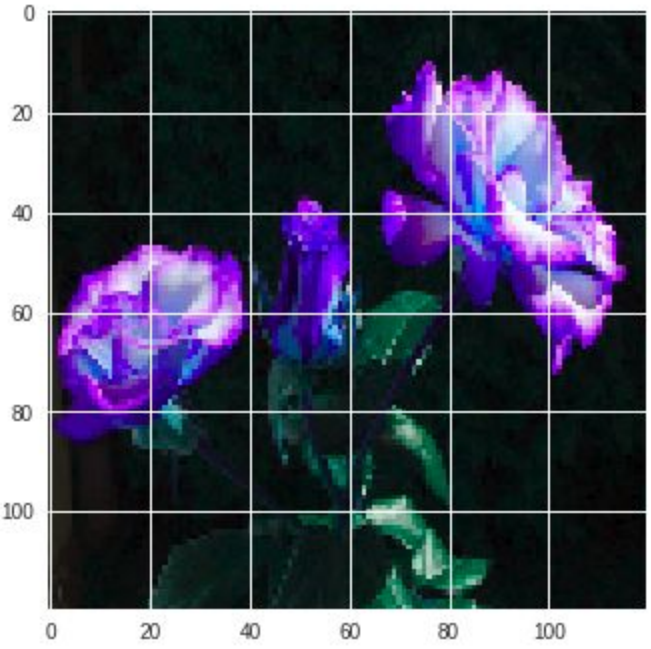
ground truth: dandelion
prediction: dandelion



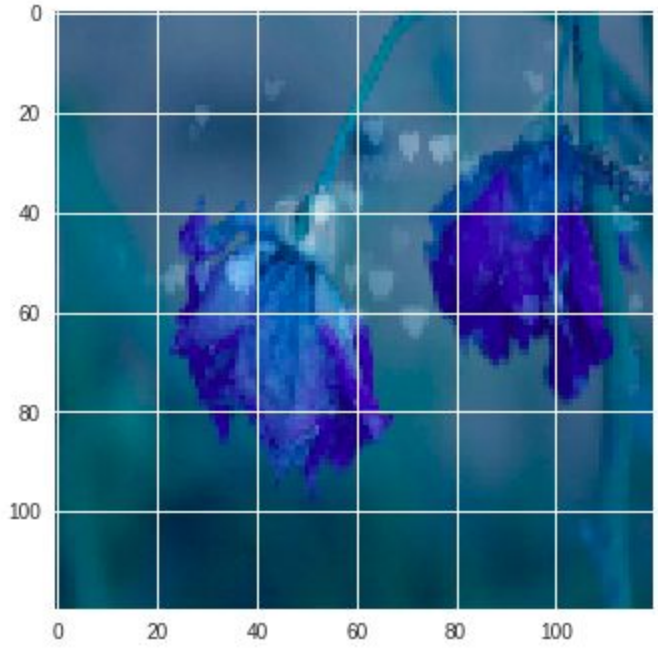
ground truth: daisy
prediction: daisy



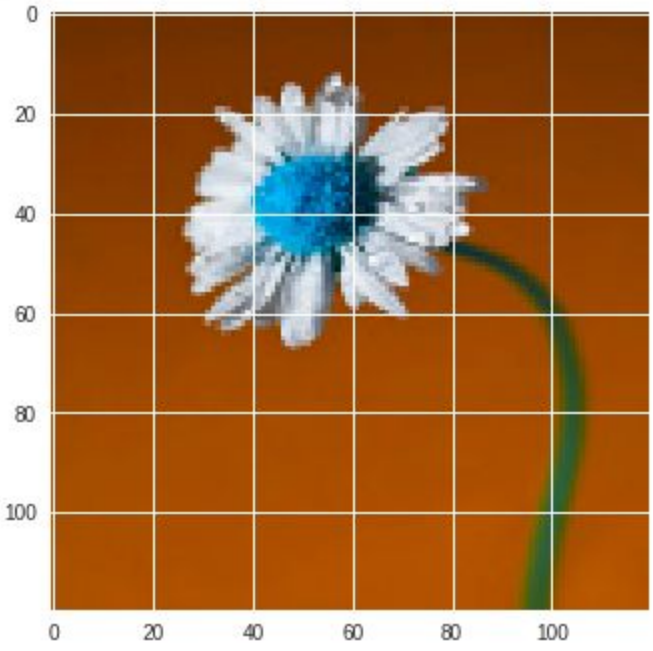
ground truth: rose
prediction: tulip



ground truth: rose
prediction: tulip

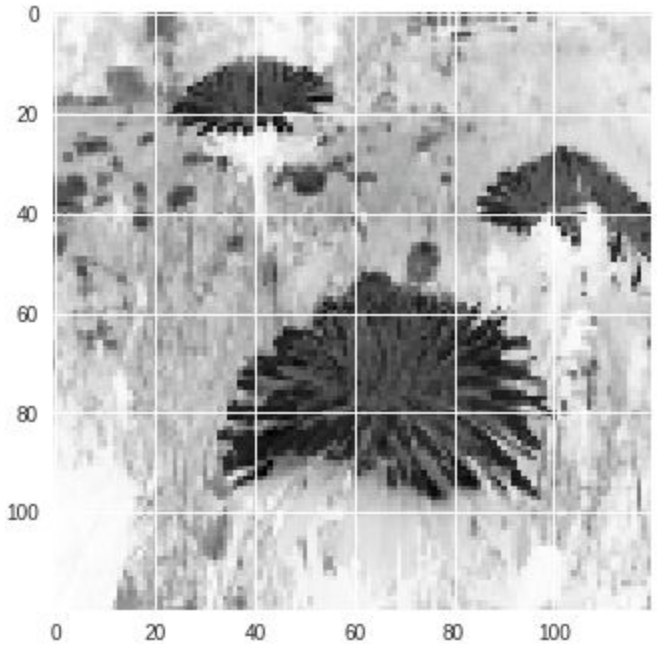


ground truth: daisy
prediction: daisy

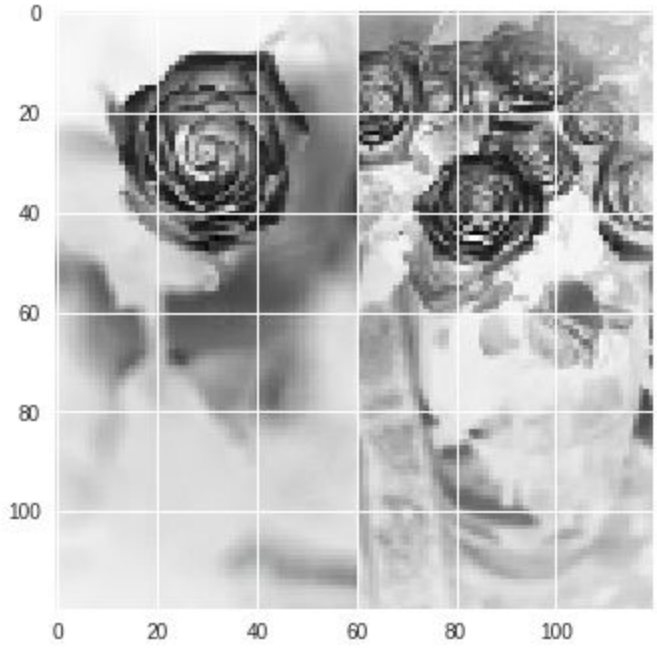


b) On grayscale images

ground truth: dandelion
prediction: tulip



ground truth: rose
prediction: tulip



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ground truth: rose
prediction: tulip
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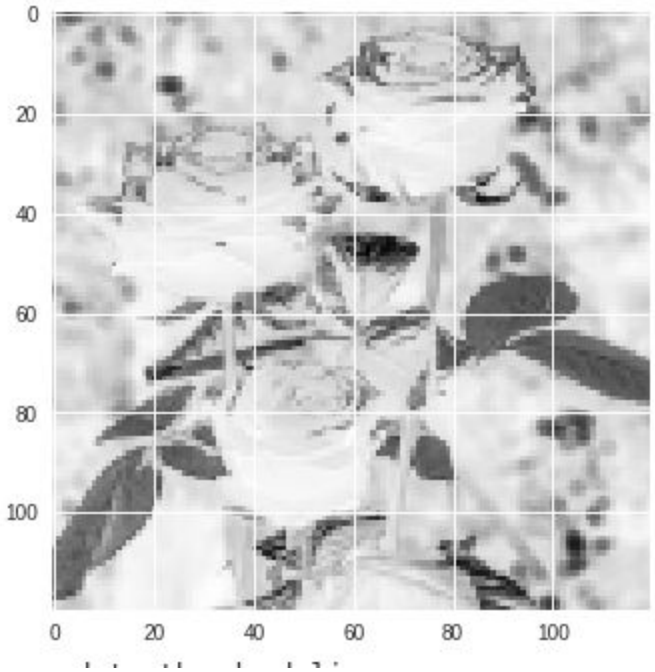


```
ground truth: dandelion
prediction: tulip
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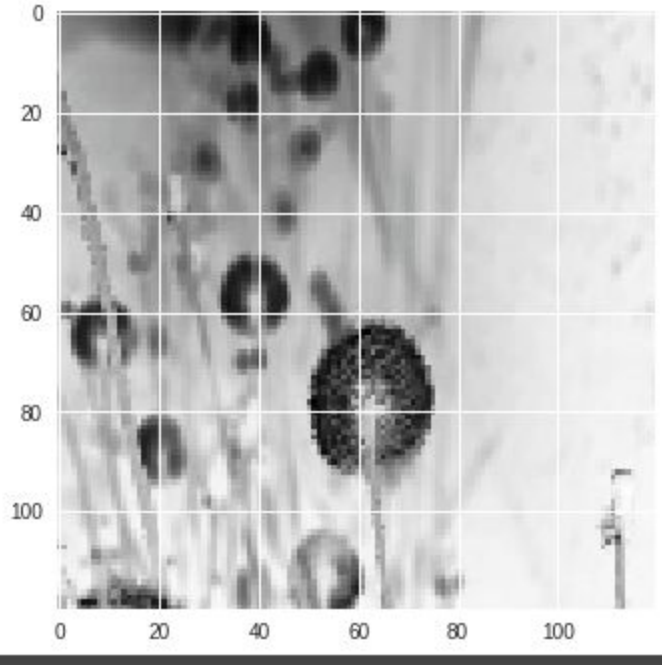
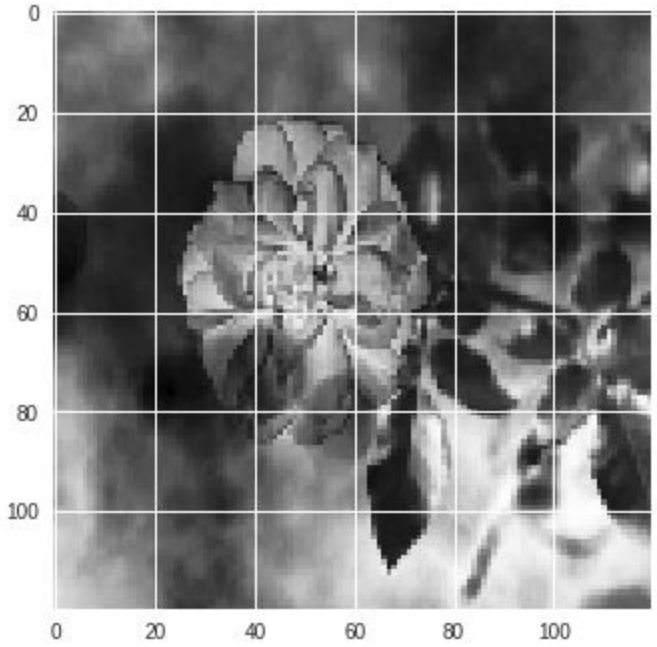
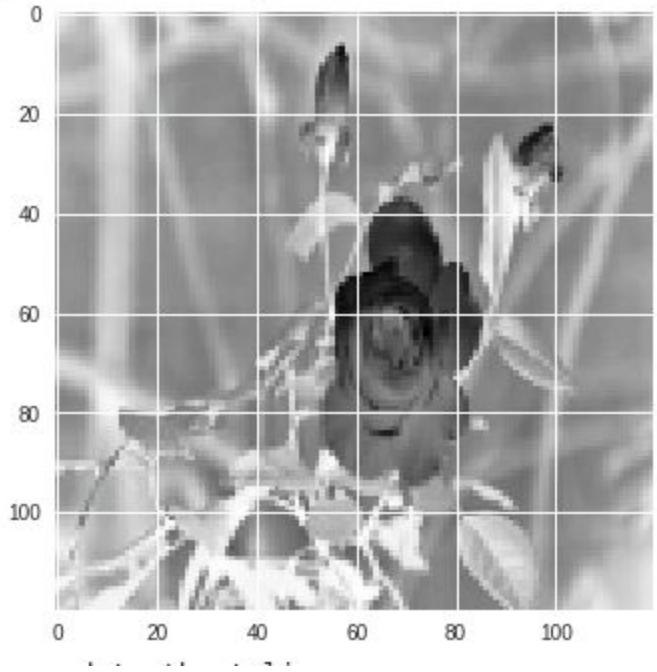


ground truth: rose
prediction: tulip



ground truth: rose
prediction: tulip



```
ground truth: tulip
prediction: tulip
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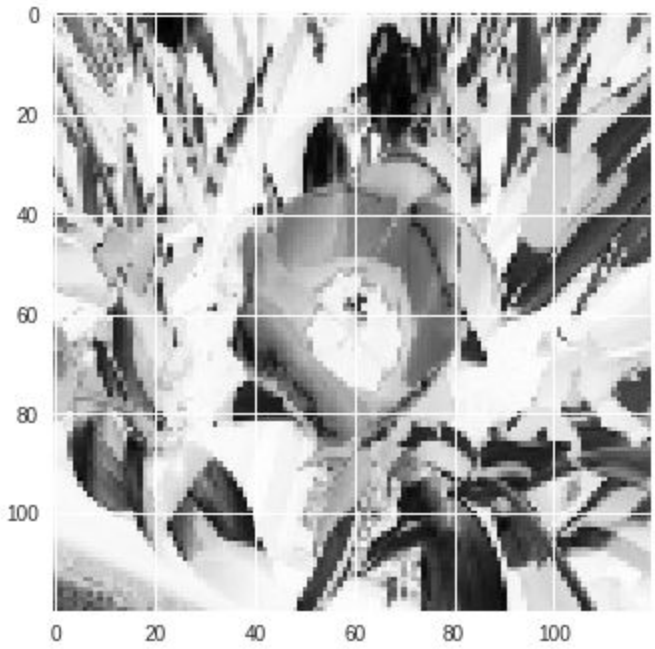
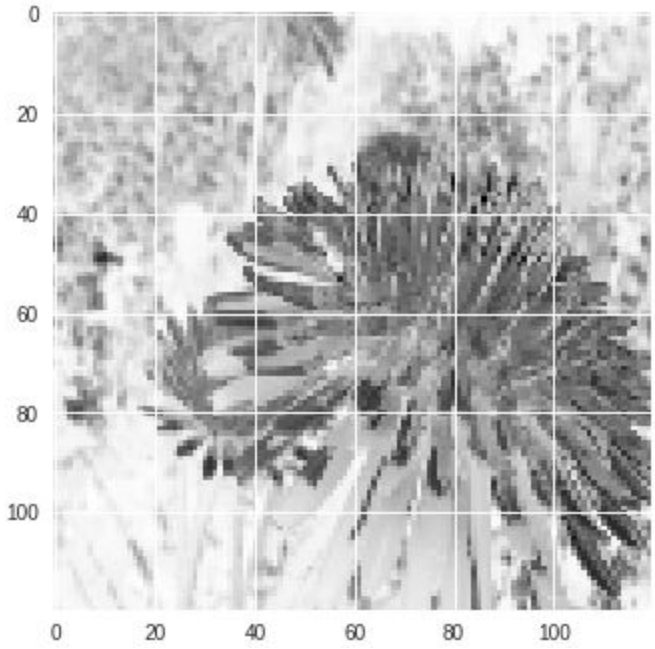
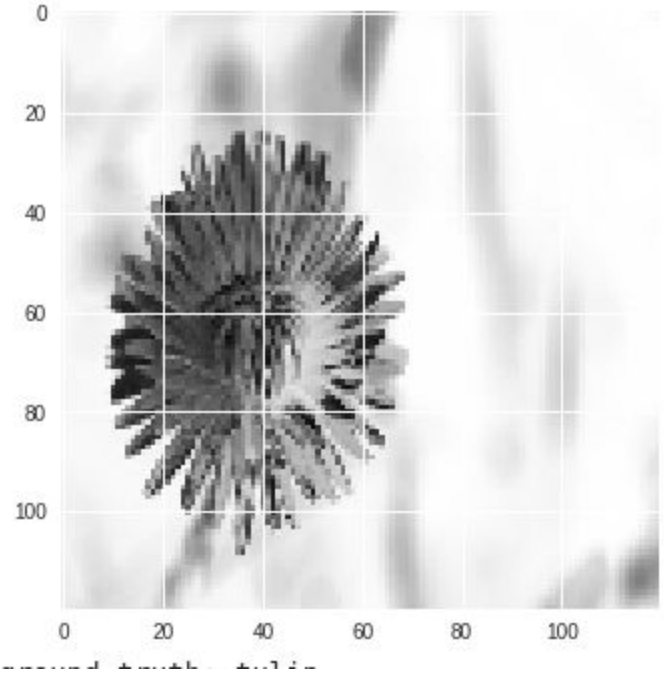


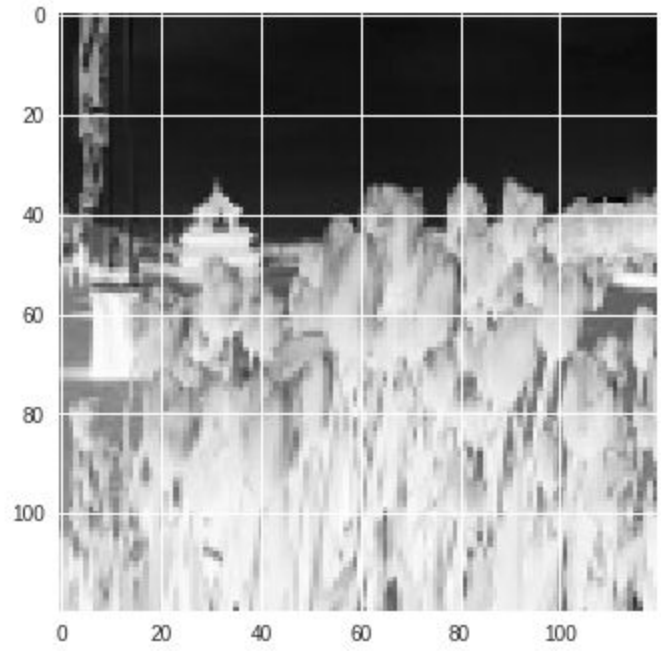

```
ground truth: dandelion
prediction: tulip
```



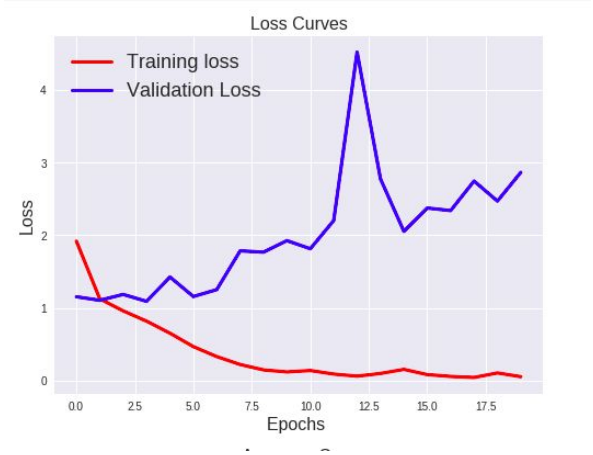
ground truth: dandelion
prediction: tulip



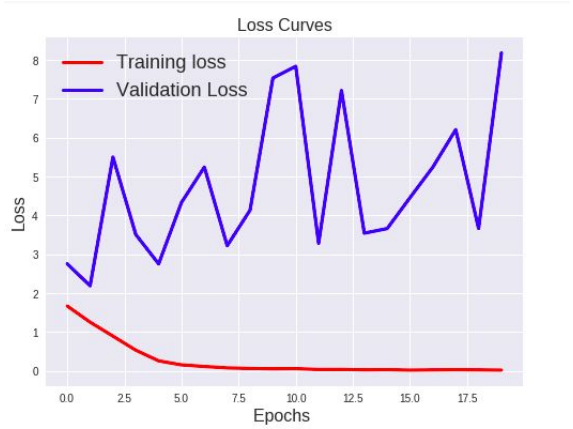
ground truth: tulip
prediction: tulip



4. Loss curves

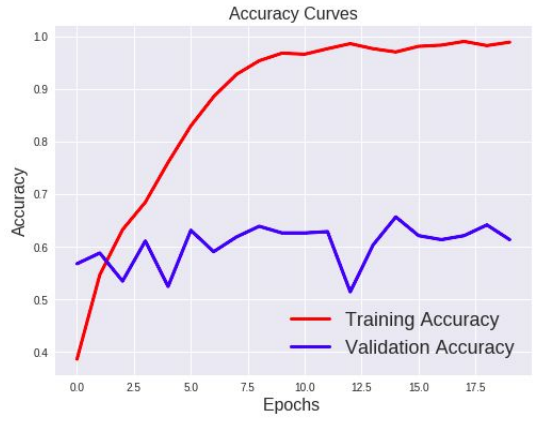


a. aFor color images

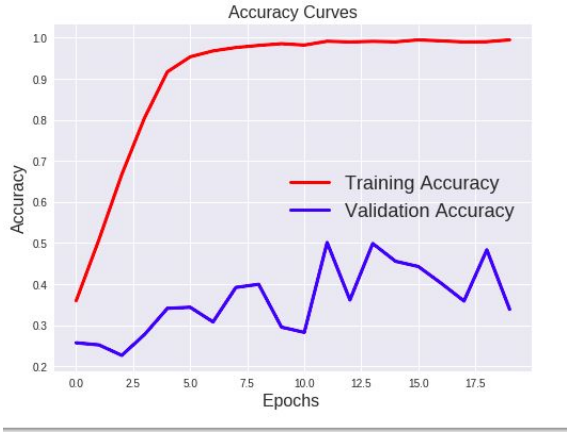


b. For grayscale images

5. Accuracy curves



a. For color images



b. For grayscale images