Project Deliverable2

1. Problem statement

The goal of this project is to build a classification model to recognize flowers of 4 species: daisy, rose, tulip and sunflower, based on images.

2. Data Preprocessing

We use the "flower recognition" dataset from Kaggle. It has 4 separate folders for each class and each folder' name is its corresponding label.

Daisy: 768

Rose: 784

Tulip: 984

Sunflower: 734

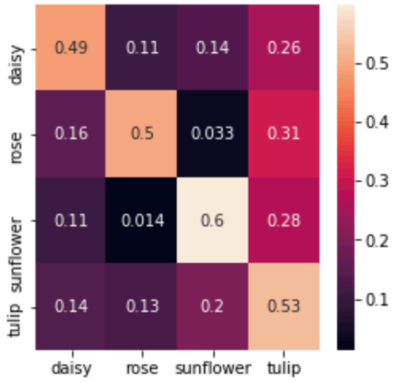
3. Machine learning model

- Since it is an image classification problem, we choose to use Neural Network. It could handle complex nonlinear situation and give relatively accurate prediction.
    - We tried several different number of hidden layers, but it turned out that adding more layers didn't improve accuracy. So we only use one hidden layer now.
- Randomly split the data set into train set(70%), validation set(20%) and test set (10%).
- Normalize the data to get the data within [-1,1] to make training faster.
- However, the accuracy for our validation set seems to remain stable after epoch 13/50. Therefore, the model might overfit.

4. Preliminary results

The result is not too bad for the beginning! About half of time our model makes correct classification. However, 31 % roses are predicated to be tulips, which makes sense since roses and tulips look similar. But the rates of other flowers being misclassified as tulips are also high (near 30%). Therefore, I suspect there might be some problems with tulips' training set.

```
Test accuracy: 0.5190746753246753
```



5. Next steps

- Down load more images from Google (Goal: at least 1000 images per class) and see if a larger dataset will solve the problem of overfitting
- To get all images in an uniform and appropriate size, I use center crop. However, some flowers are not located in the center of the image. As a result, I sometimes cut off the flower and keep the background in my training set(or valset & testset), which lower my accuracy.
- Similarly, one possible improvement can be made by distinguishing the flowers from the background. [1]

[1] Yuning CHAI, Victor LEMPITSKY, Andrew ZISSERMAN. *BiCoS: A Bi-level Co-Segmentation Method for Image Classification*. ICCV, 2011.