

Assignment - 1

(Advanced Image Processing)

Author : Rohan Shah

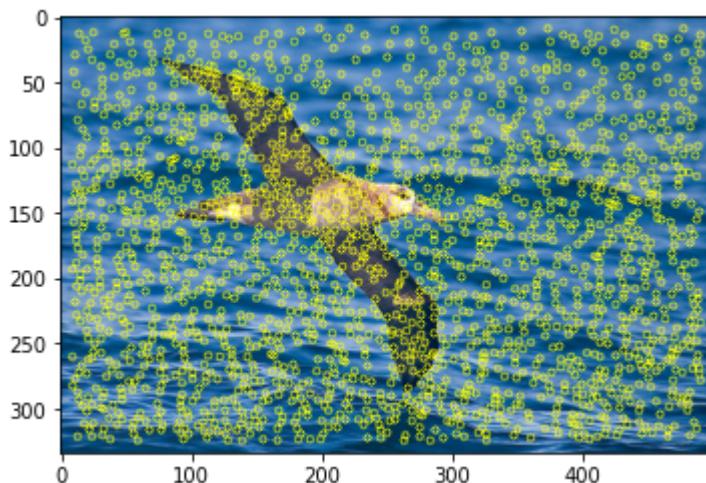
SR no. : 19243

MTech AI

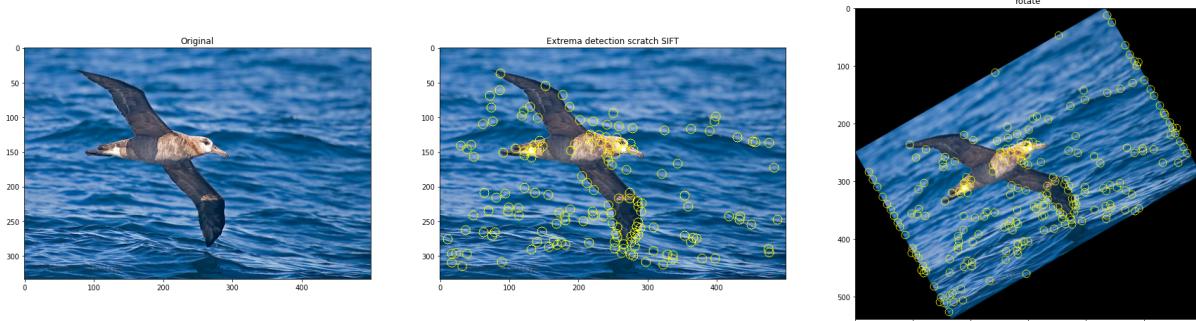
- 1) Here First step of SIFT implemented from scratch and I got the results below. Due to lots of keypoints which are not essential I have also localized them to throw out keypoints which are below threshold, and hessian is used for removing keypoints which are on edges.

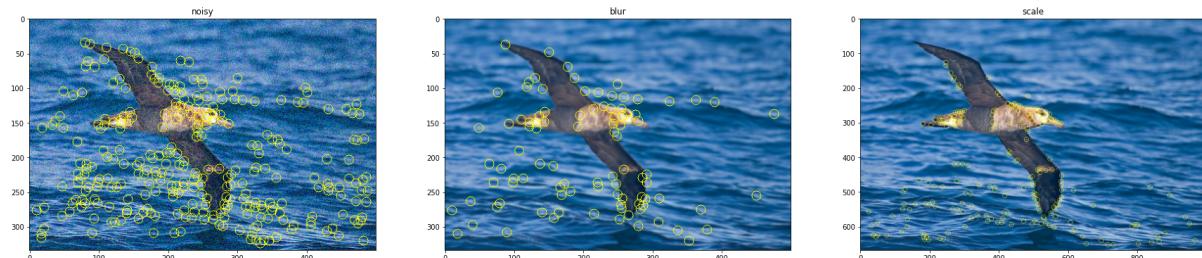
On images I have performed rotation, scaling , blurring and added noise , and then applied Scale-space extrema detection and I observe almost the same keypoints after operation, So it is invariant to above operation, except in noisy image keypoints are more compared to original one. I understood sift steps better after implementing this.

Without localize keypoints

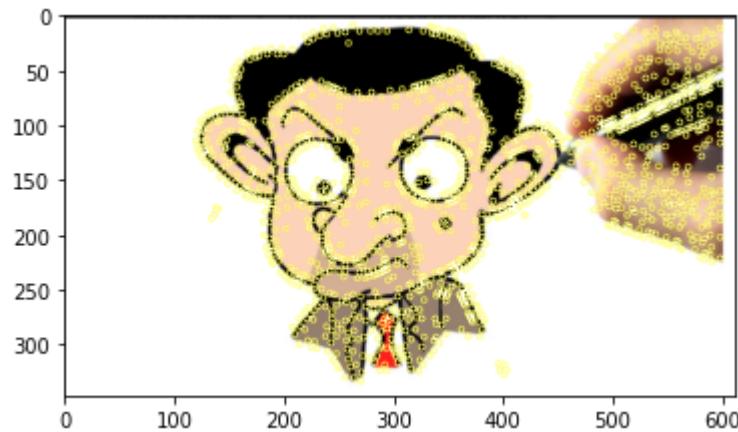


After Localization

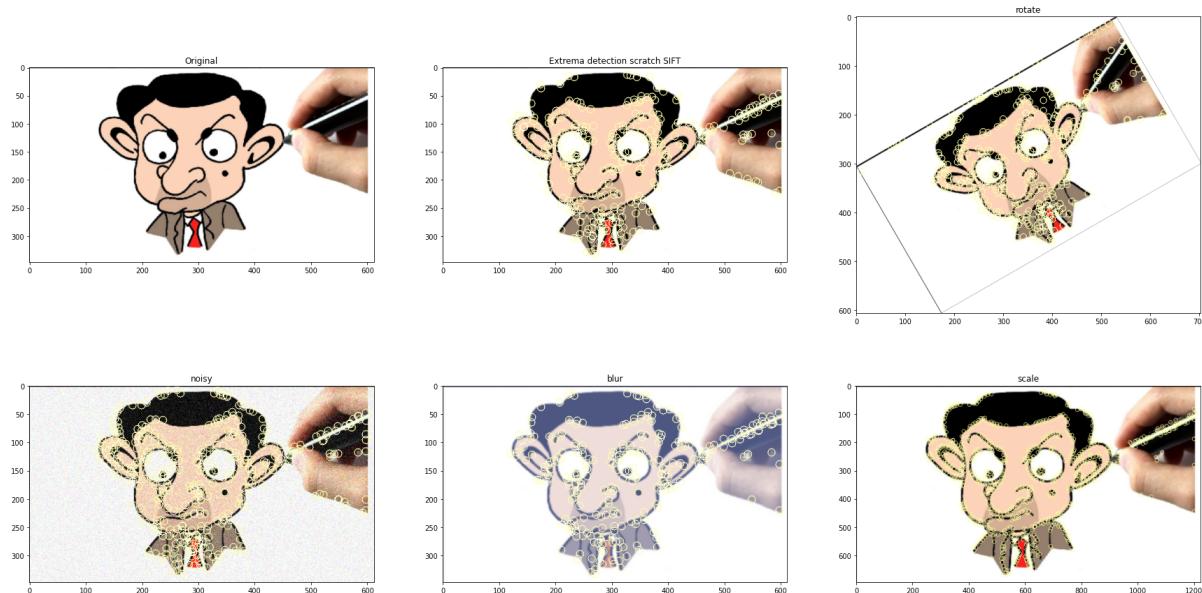




Without localize keypoints



After Localization



2) (A) I have used VGG16 as a pretrained model and extracted features for our train and test images from the last fc layer. Then I have implemented KNN as a classifier.

Accuracy Of Model : 0.7917

Accuracy in Class 0 (American_Goldfinch) : 0.9

Accuracy in Class 1 (Red_headed_Woodpecker) : 0.75

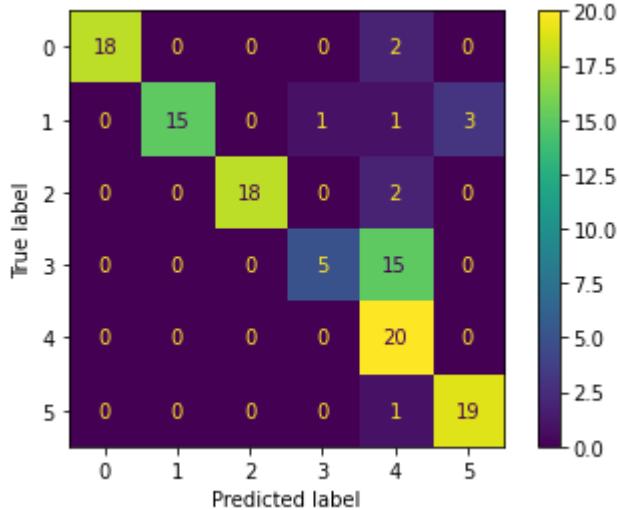
Accuracy in Class 2 (Marigold) : 0.9

Accuracy in Class 3 (anthurium) : 0.25

Accuracy in Class 4 (frangipani) : 1.0

Accuracy in Class 5 (Albatross) : 0.95

I am getting low accuracy on Class 3 which is anthurium and mostly it is wrong classified as frangipani and also whichever images wrongly classified are classified as frangipani because of KNN algorithm.



(B) Here also I have used VGG16 as a pretrained model and after removing the last fc layer I have added a new softmax layer of 6 neurons which is our six class and gives the probability of image belonging to each class. This give 5% better classification then KNN classifier because we are using a softmax classification layer.

Accuracy Of Model : 0.8417

Accuracy in Class 0 (American_Goldfinch_train) : 0.8

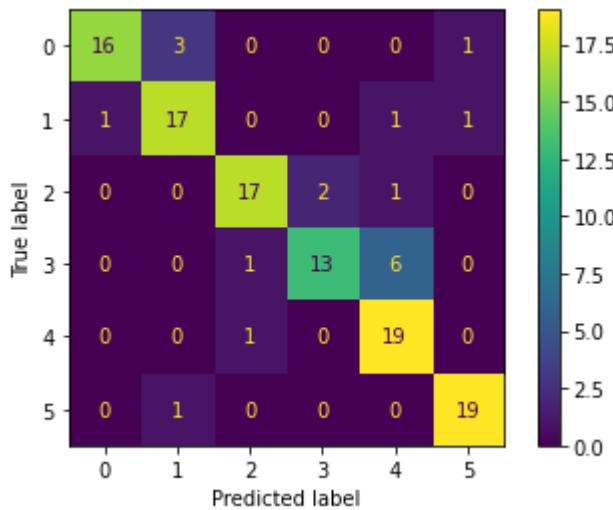
Accuracy in Class 1 (Red_headed_Woodpecker_train) : 0.85

Accuracy in Class 2 (Marigold_train) : 0.85

Accuracy in Class 3 (anthuriam_train) : 0.65

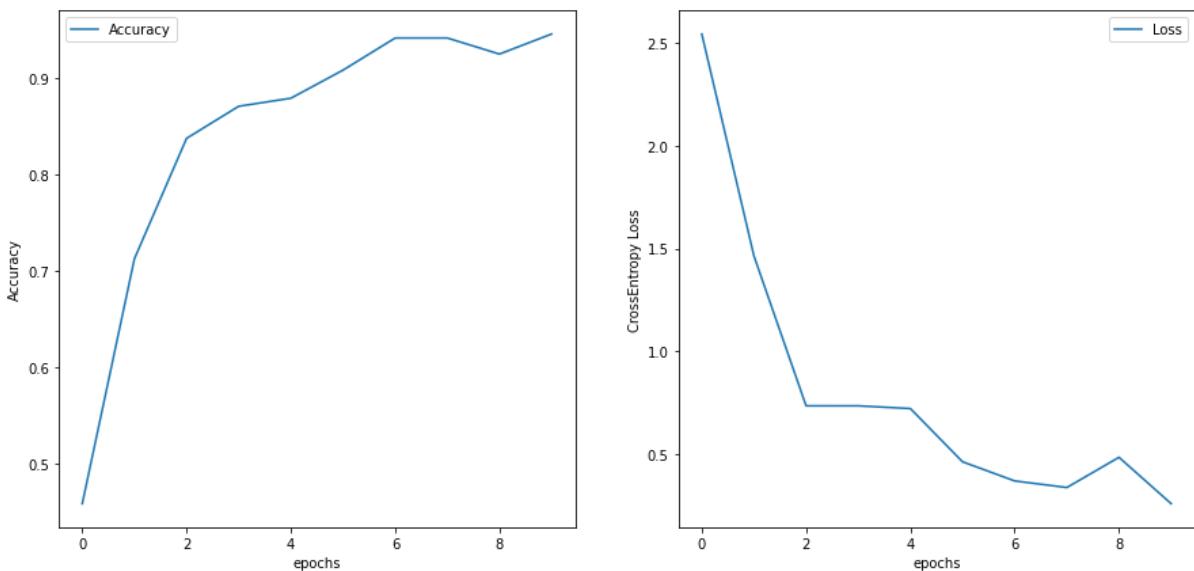
Accuracy in Class 4 (frangipani_train) : 0.95

Accuracy in Class 5 (Albatross_train) : 0.95



EXTRA :

Here I have made my own NN from scratch. I have used 2 convolution layers then Max-pooling layer 3 times sequentially and then used a flatten layer and then Dense layers. I have used RELU as an activation function and softmax as a classification layer. Trained on training data for 5 epochs, with learning_rate=0.001. Here are plots on training.



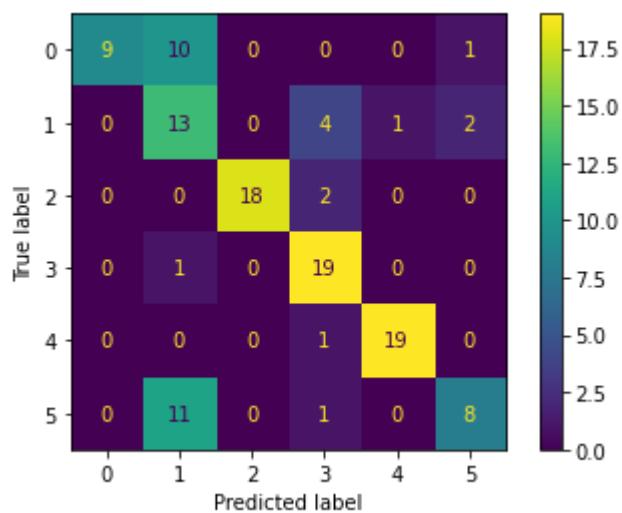
On Testing Data below is the performance.

Accuracy Of Model : 0.717

Accuracy Class 0 (American_Goldfinch_train) : 0.45
 Accuracy in Class 1 (Red_headed_Woodpecker_train) : 0.65
 Accuracy in Class 2 (Marigold_train) : 0.9
 Accuracy in Class 3 (anthuriam_train) : 0.95

Accuracy in Class 4 (frangipani_train) : 0.95

Accuracy in Class 5 (Albatross_train) : 0.4



Learnings From Q2:

1. Learn how to build CNN or use pre trained model.
2. In this question , initially I am not getting good accuracy but after a lot of hyperparameter tuning I am able to get this output.
3. For making good CNN we need more data , from small data we may not get best generalize output.
4. We can use our own NN,pretrained model and classifier based on our data size.For small data pretrained work better with classifier, while medium data pretrained model with fine-tuning works well and large data it is good to build our own NN.