IDENTIFICATION OF HARE, BEAR OR PUMA IN AN IMAGE

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OBJECTIVE

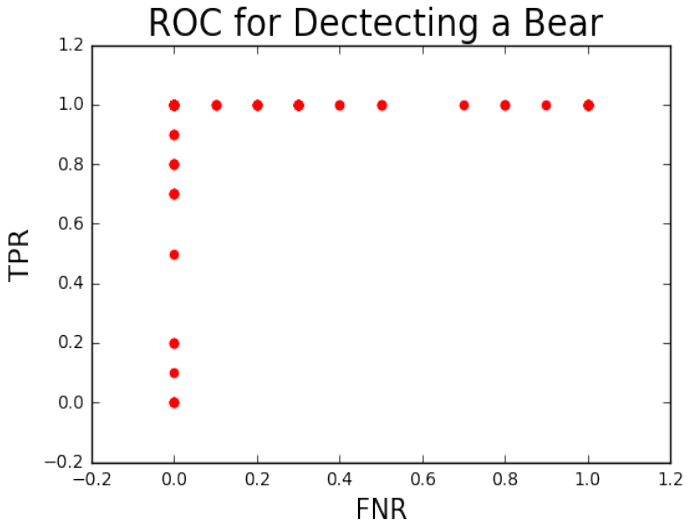
The goal of the project is to identify a hare or a bear or Puma in a given Image. To achieve the goal we need to design a classifier using the concepts of Computer Vision which can classify the images and can identify the desired animals. Also to test the classifier based on random images and evaluate the performance of the algorithm based on the score distributions, ROC and confidence intervals.

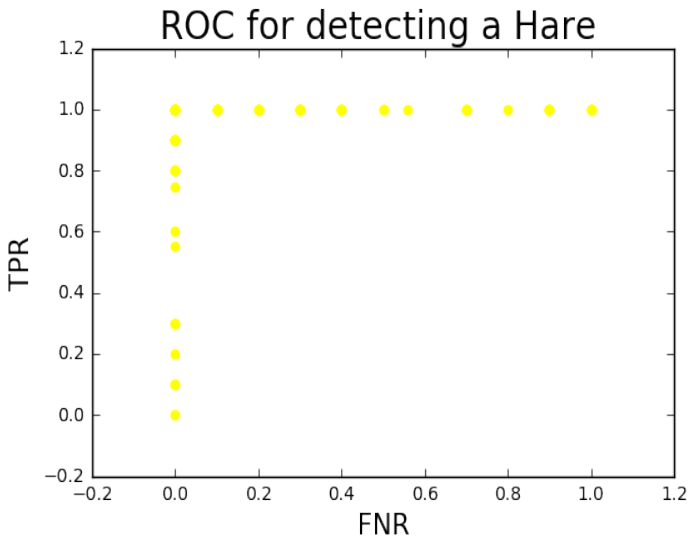
DATASET

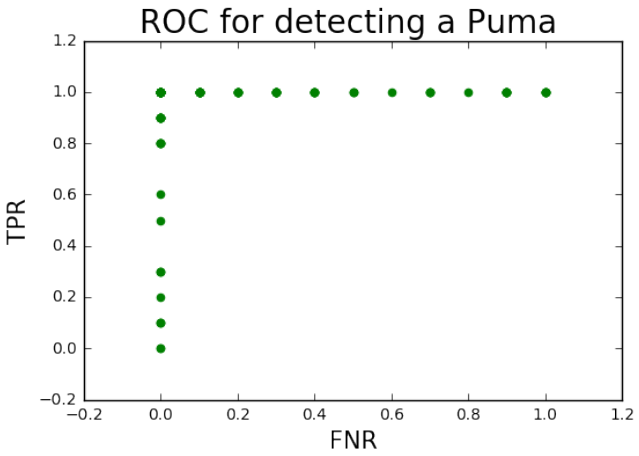
The Data set contains 500 images of Hare (Jack Rabbit), Puma (Felis concolor) and Brown Alaskan Bear (Ursus arctos middendorffi). The dataset is collected from ImageNet. 20% of each dataset is used for testing the classifier. The images are chosen randomly to have a better testing variables. The remaining 80% of the images are used to train a classifier that can properly identify the animals. The undesirable images were removed either because they had the wrong animals in them or they were irrelevant. The images which had a clear image but in different positions and angles were selected to improve the efficiency of the classifier.

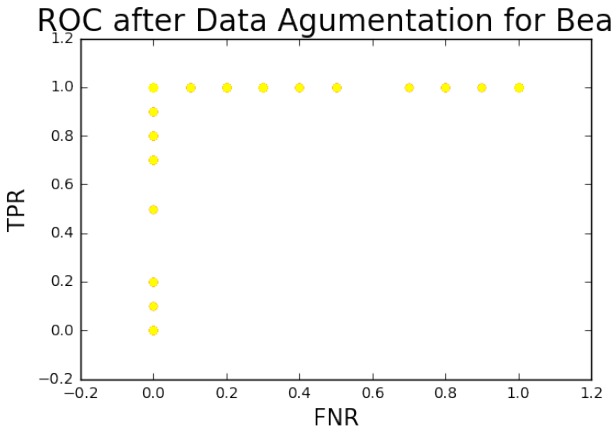
ROC

Once the dataset has been collected and divided a classifier class has been trained to identify the animals. Then the classifier is used to test 10 random positive images and 10 negative images. The scores from these are used to plot a ROC for the animal. A receiver operating characteristic or ROC curve, is a graphical plot that illustrates the performance of a binary classifier system as its discrimination threshold is varied. The curve is created by plotting the true positive rate (TPR) against the false positive rate (FPR) at various threshold settings. The TPR values are calculated by using the imposter scores and then FNR values are calculated by using the positive scores. Then using the opencv package of python library we draw the scatter plot with FNR on X axis and TPR on Y axis. The results are shown in the graphs below.









CONFIDENCE INTERVALS

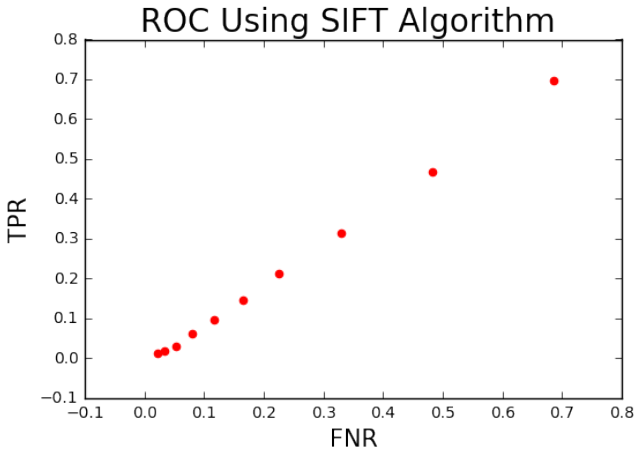
After plotting the ROC for the bear we run the same test for 50 times every time with 10 images from positive set and 10 images from negative set. Now we have 5,000 TPR AND FNR values (with increments of 0.01 threshold). These values are sorted to identify the 80% confidence intervals. A confidence interval (CI) is a type of interval estimate of a population parameter. It is an observed interval (i.e., it is calculated from the observations), in principle different from sample to sample, that frequently includes the value of an unobservable parameter of interest if the experiment is repeated. The confidence interval for bear classifier is [0.8, 1.0] for the TPR and [0.1, 0.8] for FNR and for the puma classifier is [0.8, 1.0] for TPR and [0.2, 0.7] for FNR and for the hare CI's are [0.7, 1.0] for TPR and [0.2, 0.7] for FNR.

TUNING AKA DATA AUGMENTATION

After plotting the ROC for the bear, a new classifier is created for the class Bear which has training images that have been augmented by 72°, 144°, 216°, 288°.Randomly images are selected from both positive and negative data set. Then the same test images are used for testing and the results are used for plotting a new ROC.

SIFT DESCRIPTORS

Using SIFT descriptors we took 20 Bear positive images and 20 Negative images from our training set. Then we used SIFT function from OpenCv to extract features which will help us to match. I calculated the faction of images that are less than the distance ratio which are true positives and the fraction of features that matched with negative images are taken as false positive. An ROC is plotted using these values.



COMAPRISION OF SIFT AND IBM BLUEMIX

Once we have tried to detect the animals hare, bear and puma using IBM Bluemix classifier we have use SIFT Descriptors to identify the animals. Although SIFT gave some good results but compared to the Bluemix classifier its performance is low which can be understood from the ROC's plotted for both the

classifiers. The IBM classifier has a perfect ROC but the SIFT works relatively bad.

CONCLUSION

To achieve our objective we have implemented two methods i.e. using IBM Bluemix and SIFT Algorithm and have plotted ROC's to compare the performance of the algorithms. We have conclude that IBM classifier performs better than SIFT algorithm.