**CS405 Machine Learning**

**Pre Lab #2 SVM**

**Pre Lab (25 points)**

Even though convolutional neural networks have shown the outperformance in object detection and tracking, we should know that before the appearance of CNN, SVM is one of the most popular methods for some detection work, and even now, in most cases, it is used for refining CNN detection results.

**Exercise**

Dataset and Python scripts that can be used to train and test SVM classifier are provided.

1. *Config.py* is to import the configuration variables from config.cfg. You don’t have to modify this script, because it just offer some parameters.
2. In the file *TrainImages,* files start with “neg” are the negative examples, files start with “pos” are the positive examples. A python script *extract-feature.py* is used to extract HOG features of the training images, please carefully adjust the script to extract HOG positive descriptors and negative descriptors.
3. After extracting HOG positive features and negative features, a python script *train-classifier.py* is provides to train the SVM classifier, the trained model would be saved.
4. A python script *test-classifier.py* is used to test the classifier using a test image.
5. Show the detection results before NMS and after NMS.

**Question**

1. HOG method is one of the famous techniques for object recognition and edge detection. Please illustrate characters of HOG and how it can be used for feature descriptors.
2. After making the scripts mentioned above run thoroughly, I assume that all of you know more about python coding and some additional methods to improve detecting result when detecting objects in the image such as sliding-window algorithm and non-Maxima Suppression. Please illustrate how sliding-window algorithm and non-Maxima Suppression works in the task of object detection respectively.