**Artificial Intelligence**

**Mid-Term**

**20066193**

1. For a non-linearly-separable data the pocket algorithm will never converge and so we introduce a new variable "iteration" in the code to stop the algorithm forcefully after a certain desired number(which can be assumed), or we can also stop the algorithm when there are updates in the w value. Only by defining this term "iteration" we can use the pocket algorithm for non-linearly separable data else the it would loop continuously resulting in an infinite loop.

In general, The out of sample error is given by

Eout=

This can be done in two ways

(1)Mean Squared Error which is given by

Eout = (^2

(2)Mean Absolute Error which is given by

Eout = (

(b) The classification method is used to distinguish data points depending on which side of the hyperplane they belong i.e., as +1 or -1. This is done by using this command in the code.

np.sign(vec.T.dot(x))

Linear regression and classification can be combined together because the data we provide is non-linear and the weights are linear.

(c) By solving the linear regression applied as a classification method, we obtain the best value for linRegw value.

The main aim of pocket algorithm is to determine the best perceptron (in the sense that gives minimum number of errors) that divides the given dataset. In order to do this, we generate a Perceptron Learning Algorithm on a set of non-linearly seperable data and determine the best vector weight that occurred and then input this weight to the pocket algorithm which finally gives the least out-of-sample error.

According to me for the first problem, the out-of-sample error rate for Pocket Algorithm will be lesser than the out-of-sample error for the linear regression as a classification method, and the number of iterations are assumed in pocket which is lesser when compared to the linear regression model. Also I observed that the computation time required for linear regression if higher than the computation time taken for pocket algorithm. The classification error I got for linear regression was 0.86 for 1000 iterations and after considering the best LinRegw value I got the error as 0.108.