1) If possible find the VC dimension (or bounds on the VC dimension) of the following concept classes

a) Hyperspheres that are positively labeled in $\mathcal{R}^n$.
b) Triangles that are positively labeled in $\mathcal{R}^2$.
c) Boolean disjunctions on boolean $n$ space.
d) Polynomial (up to third order) threshold functions in $\mathcal{R}^n$.
e) The union of closed intervals that are positively labeled in [0,1].

2) Consider learning from examples. In this problem we want to come up with the number of examples, $m$ that we need to draw such that we can produce a hypothesis concept $\hat{c}$ that has error probability $\epsilon$ with confidence interval $\delta$.

a) The concept space has finite cardinality.
b) The observation space is boolean $n$ space and the concept class are boolean conjunctions.

3) Use the data set from problem set 1 (ps1train) to train the adaboost algorithm. Assume initially that all training samples are drawn equally likely and use the perceptron learning algorithm with linear threshold functions to train the data. When resampling choose optimal values for $\alpha$ and observe training and test errors (from ps1test) as a function of the number of times resampling is performed.

4) From discussions that I had with you about potential projects write a one to two page report addressing the following items.

a) Summarize your readings and what you learned.
b) What algorithms are you going to work with and how you are going to code algorithms (e.g. use existing software from internet, matlab, C).
c) What applications you are going to address.
d) Why the problems are of interest.
e) Discuss any approaches that you are going to use that may be different from literature.
f) References.