STAT 598Z: Bonus Project

Due: 23rd April 2013

1 Bonus Project

1. This bonus project will contribute 2 extra points towards your final score.
2. Hand in your Project (including print outs of your source code) at the beginning of the class on 23rd April 2013. Additionally your source code should be emailed to `stat598z@gmail.com` **before** the project is submitted in the class. No late submissions will be accepted!

2 Optimizing the Square Hinge Loss

- Download the `a1a` and `a1a.t` files from the LibSVM repository.
- Consider the following objective function:

$$J(w) = \frac{\lambda}{2}\|w\|^2 + \sum_i \max(0, 1 - y_i w^\top x_i)^2. \tag{1}$$

  Prove that is convex in w.

- Optimize the above objective function with $\lambda = 0.001$ on the `a1a` dataset. Use the gradient descent solver you wrote as part of your main project.
- Using the w returned by your solver, predict the labels on the test set (`a1a.t`) by using $sign(w^\top x)$. Compute the classification accuracy. Comment on what happens to the classification accuracy as your vary λ. Write a neat half page write up explaining and summarizing your observations.