COL775 Homework 2: Optimizing Step Size

Consider a least square regression problem solved using gradient descent. (a) Write down the algorithm for step size computation of the following methods (i) Exact line search (ii) Alpha-Beta backtracking line search (iii) Ternary search (see the following link for a description). For (i) and (ii) read Section 9.2 in the convex optimization book. This part needs to be handwritten or else you will get zero marks.

(b) Implement (i) alpha-beta backtracking line search and ternary search for step size optimization while doing gradient descent. Take any sample data and compare the speed of convergence of these two algorithms using number of iterations and total time. Write very brief description of your data and implementation strategies and show two graphs comparing the two alogrithms for step size computation (objective function vs time and objective function vs number of iterations).

Total submission length < 1.5 pages (there may be a penalty for longer submissions). Max suggested time for the HW if you already know basic concepts: 1.5 hours.