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Stat 310, Part II, Optimization. Homework 2.

Problem 1: (computation; dogleg's method, also Problem 4.2 in textbook)

Write a program that implements the dogleg method,(first, write a pseudocode of the entire method, this will help in your implementation. Report the pseudocode in your homework). Choose *Bk* to be the exact Hessian. Apply it to solve Fenton's function (from preceding homework) starting at both [3 2] and [3 4]. Experiment with the update rule for the trust region by changing the constants in Algorithm 4.1, or by designing your own rules. Report the total number of linear systems solved and the total number of function evaluations.

Problem 2: (computation; line search method, also version of Problem 3.1 in textbook)

Write a program that implements the backtracking (Armijo) line search with modified LDL' factorization ,(first, write a pseudocode of the entire method, this will help in your implementation. Report the pseudocode in your homework). Choose *Bk* to be the exact Hessian. Apply it to solve Fenton's function (from preceding homework) starting at both [3 2] and [3 4]. Experiment with the parameters or by designing your own rules. Report the total number of linear systems solved and the total number of function evaluations.

Problem 3: (computation; comparison).

Apply both the algorithms above to the problem "cute" which is posted on my website. Be sure both implementations support sparse linear algebra. Solve versions of the problem of increasing size, initialized at a vector of all ones, to a point which seems reasonable (on my laptop, evaluations of Hessian with INTVAL is very fast up to n=10000, on UNIX, n=1000 should be fast enough). Plot the number of function evaluations and number of linear systems solved as a function of the problem size.

Calling sequences for my function are (for example)

```
[f,g,H]=cute_wrap(ones(10000,1),2);
[f,g,H]=cute_wrap(x,2);
```