Homework 5*

CS 726, Semester I, 2011–12

October 31, 2011

This assignment should be submitted electronically using the instructions on the course web page. The assignment name is hwk5 and you should hand in exactly 4 files with the following names:

hwk5.txt, LBFGS.m, LRGV_driver.m, output.pdf

1. Implement the limited memory BFGS method outlined in class. Use the stopping criterion of

$$\frac{\|\nabla f(x)\|}{\min\{1000, 1 + |f(x)|\}} < 10^{-4}$$

for this (and subsequent) homeworks.

Test this out on the AMPL problems `brownal`, `watson`, `geodesic`, `cragglvy` and `woods`. Details on running this are in the script file `hwk5.m`.

Experiment on the examples above with memory size m. Use values of $m = 3$, $m = 5$, $m = 17$ and $m = 29$. You should use the approximation given by

$$H_k^0 = \gamma_k I, \quad \text{where } \gamma_k = \frac{s_{k-1}^T y_{k-1}}{y_{k-1}^T y_{k-1}}.$$

Comment in `hwk5.txt` on the output of the runs that you observe, and indicate how you would choose the memory size parameter m for LBFGS in practice.

2. We provide files to evaluate a function of 6 variables `LRGV_Cost.m` (and some other data files). Update the "driver file" `LRGV_driver.m` so that you solve the problem to minimize this function over the given bounds within 100, 200, 500, 1000 and if possible 10,000 function evaluations. You may use the codes fminsearch, direct, anneal, or any other code that you wish to implement.

Comment in the driver file regarding the calling sequence of the code used, and any options that you set to improve performance. Also comment on how the starting point is chosen, and what effect that has on the final solution. Ensure that you provide a summary output of your runs in the form of a plot (pdf file), showing at least the change in function value as a function of number of evaluations. Add comments in the driver file that justify the approach you took over other possible approaches.

The driver file should also include the final values of the variables that you suggest are close to optimal.

*Due in class on November 11, 2011