

Stanford University, Dept of Management Science and Engineering
MS&E 318 (CME 338) Large-Scale Numerical Optimization

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Homework 1, Due Wednesday April 8

The aim here is to become familiar with the broad range of optimization software now available. Most packages are licensed, but there are open source solvers in some categories, and NEOS is freely accessible.

There are two main solution methods for continuous optimization.

Active-set methods tend to need many “cheap” iterations (because certain sparse-matrix factorizations can be updated). They can be restarted easily if the problem is modified.

Interior methods (also called *interior-point methods*) need relatively few iterations involving more expensive linear algebra. So far, there is little progress toward warm-starting them.

1. Review the GAMS website: <http://www.gams.com>.
 - (a) Try to find all the solvers that can solve LP problems. (This may include nonlinear solvers.)
 - (b) Find the solvers that can handle general NLP problems (with nonlinear objective and/or nonlinear constraints).
 - (c) Is there a solver that can solve LP and QP problems but not general NLPs?
2. Review the AMPL website: <http://www.ampl.com>.
 - (a) Find the solvers that can solve MILP problems (linear programs with some integer variables).
 - (b) Find as many solvers as you can that solve general NLP problems using an *interior method*.
3. Review the NEOS Server for Optimization: <http://www-neos.mcs.anl.gov>. In particular, study the FAQ page.
 - (a) For an LP model, is it easy or hard to determine if a feasible solution exists (compared to finding an optimal solution)?
 - (b) In the context of LP and NLP, what does “Programming” really mean?
4. If you need to solve some optimization problems from within MATLAB, which systems could you consider? (One or two will do.)