

# R Code for Short Course from *Computational Statistics*

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These files contain R code to accompany short courses based on Chapters 2–7 of *Computational Statistics* by Geof H. Givens and Jennifer A. Hoeting (2005, John Wiley & Sons, Inc). Data sets and additional information are available at <http://www.stat.colostate.edu/computationalstatistics>. R is a freely available language and environment for statistical computing and graphics. For more information about R, see <http://cran.r-project.org/>.

The code is organized according to the corresponding chapters in *Computational Statistics*. The topics covered in the code are listed below. All files can be sourced in R, but you'll get more out of the computer lab time if you open the script in R and run each section of the code in turn. There are exercises following each component of the code to help you learn more about these algorithms.

Note: You are the first group to use this code. Please email us at [jah@lamar.colostate.edu](mailto:jah@lamar.colostate.edu) if you find any problems or have suggestions for improvements.

## Chapter 2: Optimization and solving nonlinear equations

1. Univariate Newton's method  
Example 2.2 on page 25
2. Multivariate Newton's method  
Example 2.4 on page 33
3. Nonlinear Gauss-Seidel iteration  
Example 2.8 on page 43

## Chapter 3: Combinatorial optimization

1. Random starts local search  
Example 3.3 on page 57

2. Simulated annealing

Example 3.6 on page 71

## **Chapter 4: EM Optimization Methods**

1. Basic EM algorithm

Example 4.2 on page 91

2. SEM algorithm

Example 4.6 on page 102

## **Chapter 6: Simulation and Monte Carlo integration**

1. SIR: Sampling importance sampling algorithm

Example 6.3 on page 158

2. Importance sampling

## **Chapter 7: Markov chain Monte Carlo**

1. MCMC: Independence chain

Example 7.2 on page 187

2. MCMC: Random walk

Example 7.3 on page 190

3. MCMC: Gibbs sampler

Fur Seal Pup Capture-Recapture analysis, Chapter 7.4, page 208