General Description:

1. There are two problem sets.
2. If your score is below 70:
   - To boost your score to 70, please do the first problem set.
   - To boost your score to 80, please do both problem sets.
3. If your score is at least 70 but below 80:
   - To boost your score to 80, please do the first problem set.
4. For these questions, you can use existing packages that sample from a specific distribution (ex. rnorm), but do NOT use existing MCMC, EM, simulated annealing packages or so (you are expected to code them by yourself.)
5. You would have to submit your homework along with your code to E3.
6. The due time is June 28th, 18:00 PM

Problem Set 1: EM Algorithm

Consider the binomial/Poison mixture problem in the slide of Week 12-1, page 26-38. The data is given in page 38.

a) Write an EM algorithm for this problem.

b) Reconstruct the table in page 38 by setting the initial as $\xi^0 = 0.75$ and $\lambda^0 = 0.4$.

c) Repeat b), but with $\xi^0 = 0.5$ and $\lambda^0 = 0.6$.

Problem Set 2: Simulated Annealing

The following is Exercise 15 in our textbook, Chapter 12:

Generate 100 *random numbers* $U_{0,k}, k = 1, \cdots, 10, U_{i,j}, i \neq j, i, j = 1, \cdots, 10$. *Now, consider a traveling salesman problem in which the salesman starts at city* 0 *and must travel in turn to each of the* 10 *cities* $1, \cdots, 10$ *according to some permutation of* $1, \cdots, 10$. *Let* $U_{i,j}$ *be the reward earned by the salesman when he goes directly from city* i *to city* j. *Use simulated annealing to approximate the maximal possible return of the salesman.*

a) Write the simulated annealing for this problem.

b) Report a table, in which shows the current state (the permutation) and the current total return of each iteration.

c) Report your final estimation of the maximal possible return of the salesman.