STA6934: Monte Carlo Statistical Methods **Spring 2010**
Prof. Casella

Assignment	Chapter	Due Date	Problems
1	1	Friday 1/29	1.1, 1.4, 1.7, 1.13, 1.22,1.23ab, 1.24 (Details are in Casella and Berger), 1.28

Assignment	Chapter	Due Date	Problems
2	2-3	Friday 2/12	2.6cd, 2.17abc,2.19, 2.25a - also- write an R program to generate the noncentral χ^2 using both representations 2.31,3.1, 3.3b, 3.14 (just use g_1 and g_4), 3.21ab

Note: In Problem 3.14, g_4 should be the normal density.

Assignment	Chapter	Due Date	Problems
3	5 and 6	Fri 2/26	5.1, 5.9ab, 5.10, 5.17, 5.24, 5.29 6.7, 6.12a, 6.21, 6.22

Note: I have never assigned Problem 5.24 before, so I don't know how hard it is. I suggest that you *do not* leave it to the end!

Assignment	Chapter	Due Date	Problems
4	6 and 7	Friday 3/19	6.22, 6.35ab, 6.40a, 6.67 7.2, 7.9, 7.21abc, 7.27, 7.30a, 7.39, 7.44

Hints:

1. 6.40a: Use the notation that we discussed in class, and show that

$$\sup_A |F_1(A) - F_2(A)| = \int |f_1(x) - f_2(x)|dx.$$

First show that

$$0 = \int_A (f_1(x) - f_2(x))dx + \int_{A^c} (f_1(x) - f_2(x))dx,$$

and that this implies $|\int_A f_1(x) - f_2(x)dx| = |\int_{A^c} f_1(x) - f_2(x)dx|$. The rest follows.

2. 7.39: You might want to look at problems 6.47 and 6.50 - you can assume the the results in those problems are true. In particular, writing the result of Problem 6.50 in matrix form shows that

$$\lim_{N\to\infty} \frac{1}{N}\text{var}\left(\sum_{i=1}^{N} h(X_i)\right) = h'B[2Z - I - A]h,$$

where A and Z are defined in Problem 6.47 and B is a diagonal matrix whose entries are π_i, the stationary distribution.

Assignment	Chapter	Due Date	Problems
5	7 and 8	Friday 4/9	8.1(a), 8.4, 8.5, 9.2, 9.4, 9.8(a), 9.14(a), 9.17(1)(2), 9.26(a)(b)

Notes:

1. 9.8 is a difficult problem. You do not have to use the ARS algorithm if you can find another way. You also do not have to compare to the answer in Example 9.7.

2. After you do 9.14(a), give the details of a Gibbs sampler to generate the θs. Write an `R` (or other) program to get a histogram of the posterior distribution of the θs.

3. For 9.26, fit the model to the data of Table 11.1 (see also Figure 11.1) for k=3 and k=4. You will have to choose values of the hyperparameters. The data are in a .txt file that you can download.

Assignment	Chapter	Due Date	Problems
6	10 and 12	Friday 4/23	10.10cd,10.12, 10.13, (consider only the case $p = 2$) 10.14, 10.19ab, 10.28

Additional Problems

1. Problem 5.18: Solve the problem as stated and, in addition, write a Gibbs sampler to estimate the parameters. Compare the answers from EM and Gibbs. → **Next Page**

2. This is based on the material in Chapter 12, but you have the tools to solve it. For the model and data of Problem 10.28, derive three estimators of the α_i. Monitor convergence of the chain with the three estimators, by plotting their cumulative means.