Bootstrap Methods
Assignment 2 - Due March 30^{th} at 1:10pm

Marking Scheme: Each question has equal weight.

Instructions: Submit your code (all algorithms and functions defined) and only relevant output.

Policy: Assignments that are submitted within 24 hours after they are due have the grade reduced by twenty per cent and a further twenty percent for each day thereafter.

1. For the spatial data of Table 14.1 compare the two methods for computing bootstrap estimates of bias for $\hat{\theta}$ where $\theta = \sigma_A/\sigma_B$. Use a figure similar to Figure 10.2.

2. For the test score data compute BCa confidence intervals and compare them to the respective bootstrap-T and percentile confidence intervals.

3. On the course webpage you'll find a dataset giving the time of infection with the HIV virus for a group of ninety six hemophiliacs. Here the time of infection X_i is interval censored and the data consist of intervals $I_i = [L_i, R_i]$ such that $X_i \in I_i$, $\forall i$. Suppose the parameter of interest is $\theta = E[X_i]$. How would you estimate θ, i.e. what's $\hat{\theta}$? Using $\hat{\theta}$, and the methods of the course, conduct inference for θ.

4. For hemophiliac data data consider computing a kernel density estimate and using it to determine if the true density for the time of infection is unimodal, bimodal, or has more than two modes. Here you may assume $X_i \sim Unif[I_i]$ and compute the kernel weight as $\frac{1}{h}K\left(\frac{E[X_i|I_i]-x}{h}\right)$, $\forall i$, where the kernel is assumed to be Gaussian. Have fun!