Problem Set 6

R Programming (Due April 20)

Instructions

1. The following questions should each be answered within an R script. Be sure to provide many comments in the script to facilitate grading. Undocumented code will not be graded.
2. Work on git. Fork the repository found at `https://github.com/jeonghkim/PS6`. As you add your code, commit and push frequently. Use meaningful commit messages – these may affect your grade.
3. You may work in teams, but each student should develop their own R script. To be clear, there should be no copy and paste. Each keystroke in the assignment should be your own.
4. If you have any questions regarding the Problem Set, contact the TA or use her office hours.
5. For students new to programming, this may take a while. Get started.

Numerical Integration

There are multiple algorithms for numerical integration. Sparse grid is one such algorithm. There is an R file in the git repository with a function that uses the library `SparseGrid`, and works with bivariate integration. Your task is as follows:

- Change the function to allow more dimensions. You will have to look at the help files of the package to do so.
- Change the function to allow parallel processing.
- Write unit tests using `testthat`. An example would be to write a test that compares the output of this function to a correct answer (the integral would need to have a solution, e.g., sin). The output will not be exactly correct so allow some leeway. Other tests could ensure appropriate handling of bad input, etc. These do not have to be in a separate file.
- Measure gains in speed when choosing to run the function in parallel. Do so for functions of different dimensionality.
- Integrate these same functions using `adaptIntegrate` from the `cubature` package, and compare the speed and accuracy to the sparse grid algorithm.
- Write comments for the function.