Syllabus for Penn State STAT 540, Fall 2016
Computationally Intensive Statistical Inference

Instructor: Murali Haran, Professor, Department of Statistics, Penn State University, University Park, Pennsylvania.
Office: 421D Thomas Building
Office Hours: Monday 3-4pm, Tuesday 1:30-2:30pm

Teaching Assistant: Gregory Bopp, PhD Student
Office: 330A Thomas
Office Hours: Tuesday 2:30-3:30pm, Thursday 1:30-2:30pm

Email communication: You can reach me and the TA through email via Canvas.

Class Times: MWF 11:15-12:05pm in Osmond Lab 202.

Textbook: Lecture notes, posted periodically on Canvas *(please do not distribute).*
Reference: Computational Statistics by G.H. Givens and J.A. Hoeting, Wiley.

Coverage: The main topics covered in the course are:

- Some basic computing ideas; numerical linear algebra
- Monte Carlo methods: foundations, importance sampling, Markov chain Monte Carlo, sequential Monte Carlo, bootstrap
- Numerical integration, Laplace approximations
- Optimization: unconstrained, constrained; gradient methods, EM/MM
- Probability and statistical inference topics motivating the above methods
- Advanced topics (time permitting)
- Practice with: (a) programming in **R**, (b) **python**, (c) using **Sweave** for literate programming

Course Website: Main: `http://www.stat.psu.edu/~mharan/540/540.html` Course schedule: `http://sites.stat.psu.edu/~mharan/540/schedule540.2016.html` Please bookmark these website. I will update the course website and occasionally provide help with `R` etc. I will use the course website in tandem with Canvas `cms.psu.edu` for course related communications.

Course Requirements:

- Homework (50%). You may discuss them but they *must be written up independently.* The homework assignments may vary in length and difficulty, and hence may differ in the number of points they are worth.
- Course project (10% proposal + 40% reports/presentation). I expect this to be a substantial project. Possibilities include: original research, review of existing methods, extensive simulation studies, or some combination of all of the above. I will determine whether the scope of your project is appropriate for this course.

Course Rules:

1. Homework will be due **in class**, typically on Wednesdays. Unless you inform me ahead of time (*at least 1 day in advance*), the following late policies hold: submit your homework in my mailbox in Thomas 326 by 3:30pm on the same day with a 20% reduction or 3:30pm the next day with a 50% reduction in your score. No late homework will be accepted after that time under any circumstance. *You have 1 week to appeal any grade. No grade changes will be made 1 week after a graded homework is returned.*
2. All students are expected to use `R`. Other software/languages like `Matlab` may be allowed, but you must talk to me for permission.
3. Homework submissions: All students are required to hand in *typed* computing assignments. Statistics graduate students are required to use `LaTeX` to write up assignments. I encourage using `Sweave` for assignments.
4. Academic Integrity and Mutual Respect: All Penn State University, College of Science, and Department of Statistics policies regarding ethics, honorable behavior, and mutual respect apply in this course.
    - Penn State's Policies `http://www.psu.edu/ufs/policies/`
    - College of Science's Academic Integrity Policy `http://science.psu.edu/current-students/Integrity/Policy.html`
    - College of Science's Code of Mutual Respect and Cooperation `http://science.psu.edu/climate/code-of-mutual-respect-and-cooperation`
5. If you have a disability-related need for reasonable academic adjustments in this course, contact the Student Disability Resources (SDR) at 814-863-1807 or visit their website `http://equity.psu.edu/student-disability-resources`