

Syllabus for Penn State STAT 540, Spring 2018

Computationally Intensive Statistical Inference

Instructor: Murali Haran, Professor, Department of Statistics, Penn State University, University Park, Pennsylvania.

Office: 421D Thomas Building

Office Hours: Tuesday, Wednesday 1:30-2:30 pm

Teaching Assistant: Jiayu Peng, PhD Student

Office: 331B Thomas

Office Hours: Tuesday 3:30-4:30pm, Wednesday 2:30-3:30pm

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

Class Times: Tu Thu 9:05-10:20 am in Thomas 217.

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:

- Basic computing concepts; 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): inference with expensive likelihoods, large data sets
- Practice with implementing algorithms, typically in **R**.

Course interaction: I will use Canvas for course communications and to post data, links, notes. The course schedule is <http://personal.psu.edu/muh10/540/schedule540.2018.html>

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 (50%: proposal + report + 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. **You must discuss your planned project with me.**

Course Rules:

1. Homework will be due **in class**, typically on Thursday. 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>