Stats 102B Computation and Optimization for Statistics

CCLE site: `https://ccle.ucla.edu/course/view/17W-STATS102B-3`.
Instructor: Qing Zhou (zhou@stat.ucla.edu), OH: Wed 12:30-1:30pm, MS 8979.
Prerequisite: Stats 100B (Mathematical Statistics) and Math 33A (Linear Algebra). Programming skills (R or Matlab or C).

Grading

Your final grade of this course will be composed of three parts:

1. Homework assignments (20%), some problems need computer programming.

2. Midterm exam (40%, in-class): Friday (Feb 10).

3. Final exam (40%, in-class): Friday (March 17).

Letter grades: top 30% (A range), 30% – 70% (B range), below 70% (C range or below C).

Topics

Introduction to computational methods and optimization useful for statisticians. Use of computer programming to solve statistical problems. The topics are grouped into five chapters:

1. Introduction and Examples: motivations of the course with examples, relation to other statistics courses.

2. Matrix Algebra: vector and matrix computation, connections to statistics, eigenvalue decomposition.

3. Principal Component Analysis (PCA): multivariate normal distribution, principal components, dimension reduction, PC regression.

4. Differentiation and Optimization: gradient and Hessian, Newton's method, constrained optimization and KKT theory, applications in linear regression and penalized least squares.

5. EM and MM Algorithms: missing data, the EM algorithm, Majorization, MM algorithm.

References

- Lecture notes: Will be posted on CCLE weekly.

- (Optional) Lange K, Optimization, Springer: for chapters 4 and 5.

Academic Integrity

As a student and member of the University community, you are here to get an education and are, therefore, expected to demonstrate integrity in your academic endeavors. All students must uphold University of California Standards of Student Conduct as administered by the Office of the Dean of Students. Students are subject to disciplinary action for several types of misconduct, including but not limited to: cheating, multiple submissions, plagiarism, prohibited

collaboration, facilitating academic dishonesty, or knowingly furnishing false information. You must finish homework assignments and exams independently.

For more information about academic integrity, please see `www.deanofstudents.ucla.edu`.