

Math 4686/6686 Statistical Learning II

Course Description: Math 4686/6686 is the second course in a two-course sequence designed to introduce students to the statistical foundations of tools used in the modeling and understanding of big data in the context of developments in computer science. Emphasis is on application to real data sets. Topics include cross-validation, Bayesian inference and computation and non-parametric methods. **Prerequisite:** Math 4685/6685 or permission of the instructor.

Learning Outcomes: Upon completion of this course, students will be able to select, apply, and evaluate appropriate techniques from statistical and computational methods to typical data sets using Bayesian and non-parametric techniques.

Textbook: *An Introduction to Statistical Learning with Applications in R* by Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani, Springer, 2013. Available at <http://www.springer.com/us/book/9781461471370>.

Grading:	Math 4685	Math 6685
Homework	25%	20%
In-class work	25%	20%
Exams	40%	40%
Project	10%	20%

Grading scale:

90-100%	A
80-89%	B
70-79%	C
60-69%	D
Below 60%	F

Tentative Schedule:

Week 1:	Statistical techniques of model validation
Week 2:	Cross-validation
Week 3:	Leave-one-out Cross-validation
Week 4:	k fold cross-validation
Week 5:	Bayesian inference
Week 6:	Posterior distributions
Week 7:	The mathematics of conjugacy
Week 8:	Techniques of Bayesian computation
Week 9:	Mathematics of MCMC
Week 10:	Mathematics of Gibbs sampling
Week 11:	Statistical application of MCMC and Gibbs sampling
Week 12:	Non-parametric methods
Week 13:	smoothing splines

Week 14: Statistical foundations of decision trees
Week 15: Statistical foundation of random forests

Academic Misconduct:

The University of Memphis defines cheating and plagiarism as:

Plagiarism - The adoption or reproduction of ideas, words, statements, images, or works of another person as one's own without proper attribution.

Cheating - Using or attempting to use unauthorized materials, information, or aids in any academic exercise or test/examination. The term academic exercise includes all forms of work submitted for credit or hours.

If plagiarism or cheating occurs, the student will receive a failing grade on the assignment and (at the instructor's discretion) a failing grade in the course. The course instructor may also elect to forward the incident to the Office of Student Conduct for further disciplinary action. More information is available at <http://www.memphis.edu/studentconduct/pdfs/csrr.pdf>.

Special accommodation:

If you need special accommodation, please let the instructor know immediately.