STAT5330: 統計計算 (Statistical Computing)

Lecture: Tuesday 13:20-16:20pm
綜合三館 837

Instructor: 徐南蓉 njhsu@stat.nthu.edu.tw
陳素雲 syhuang@stat.sinica.edu.tw

Website: NTHU iLMS 數位學習平台 https://lms.nthu.edu.tw/

Books:

- The Elements of Statistical Learning (2009), Hastie, Tibshirani and Friedman, Springer.
- Bayesian Data Analysis (2004), Gelman, Carlin, Stern and Rubin, Chapman & Hall.
- Convex Optimization (2004), S. Boyd and L. Vandenberghe, Cambridge University Press.
- Deep Learning with Python (2018). F. Chollet. Manning Publications.

Course Topics:

This course covers modern computationally methods and practice for statistical analysis. The course consists of two parts taught by 2 instructors (徐南蓉: week 1 and week 3-10; 陳素雲: week 2 and week 11-16). Here is the topics and tentative schedule.

week	Date	Topic	Lab
Part I			
1	2/19	Introduction I	R introduction
2	2/26	Introduction II (overview for 2nd part of this course)	Matlab and Python introduction
3	3/5	Random number generation	
4	3/12	MCMC methods: Gibb sampling and Metropolis algorithm	R: data manipulation R markdown
5	3/19	Monte Carlo methods: evaluating expectations and statistical inference	R ggplot
6	3/26	Optimization methods	
7	4/2	EM algorithm and generalizations	
8	4/9	Dimensional reduction	R shiny
9	4/16	Dimensional reduction	
10	4/23	Student presentation	

Part II			
11	4/30	Kernel machines (kernel PCA)	Matlab
12	5/7	Kernel machines (start with a quick review of LDA and logistic regression, then introduce kernel LDA, kernel logistic, and SVM)	Matlab
13	5/14	Kernel machines (more on SVM, primal and dual optimization, a little bit of RKHS)	Matlab
14	5/21	Neural networks (mathematical building blocks of NN, chaining derivatives, back-propagation)	Python
15	5/28	Neural networks (connection with and comparison to LDA, logistic regression, SVM)	Python
16	6/4	Neural networks (a light touch of deep learning)	Python
17	6/11	Final week	

Grading: Part I: 50% (4 homework; each takes 1/4 scores)

Part II: 50% (4 homework; each takes 1/4 scores)