Actuarial Science & Risk Management 499/552: Predictive Analytics

Instructor: Xiaochen Jing

Office: 261 Computing Applications Building

Office Hours (CST): (On Zoom) Thursday 4:00-5:00 pm or by appointments.

Zoom link: https://illinois.zoom.us/j/84991963655?pwd=L0pteU5uVmlaWFhHMENLUWY3VzhQdz09

Email: xjing4@illinois.edu

For easy reference, please use [ASRM 499/552] as the starting of the email subject.

Teaching Assistant: Yuxuan Li

Email: yuxuanl9@illinois.edu

Class time and location: TR 2:00-3:20 pm, 245 Altgeld Hall

Canvas Course webpage: https://canvas.illinois.edu/courses/17190

Please log on to the course website and check your e-mail regularly for updates.

Course Description:

This course focuses on financial and insurance applications of statistical learning techniques to build predictive models, with training on computational software packages and effective communication of statistical results. Topics include the model building process, data preparation, model selection, refinement and validation. This course will give an overview of the different statistical learning methods and algorithms that can be employed to discover useful information from datasets, to explain how to build a predictive model, and to communicate the results in a scientific report. The intuitive examples and theoretical components in this course will help actuarial science students develop the programming skills for the Exam PA: Predictive Analytics offered by the Society of Actuaries (SOA).

Textbook

[1] Regression Modeling with Actuarial and Financial Applications, Edward W. Frees, 2010, New York: Cambridge. ISBN: 978-0-521-13596-2.

[2] An Introduction to Statistical Learning, with Applications in R, James, Witten, Hastie, Tibshirani, 2013, New York: Springer. A PDF of the text can be downloaded at https://www.statlearning.com.

Prerequisite: ASRM 401 or STAT 410. Preliminary knowledge about R is required.

Learning Objectives

Topic 1: Predictive Analytics Problems and Tools

- Problem definition and Data visualization
- Data cleaning and exploration

Topic 2: Supervise Learning

- Linear model
- Regularization
- Validation measures and Hyperparameters tuning
- Generalized linear models
- Tree-based models

Topic 3: Unsupervised Learning

- K-means
- Hierarchical clustering
- Principal component analysis

Grading & Assessment

Homework (40%)

Midterm Examination (30%)

Individual Projects (30%)

Please submit projects and homework before the deadlines. Assignments submitted online after the due date will be automatically penalized from the total possible points.

You are encouraged to form study groups to learn the materials in class or discuss about the project. However, you should not share your solutions/codes to other students. All submitted results must be your own work.

Grade	Score
A-, A, A+	90 - 100
B-, B, B+	80 - 90
C-, C, C+	65 - 80
D-, D, D+	50 - 65
F	0 - 50

Academic Integrity Statement

The University of Illinois at Urbana-Champaign Student Code should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: http://studentcode.illinois.edu/.

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: http://studentcode.illinois.edu/. Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

Accommodations Statement

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 333-4603, e-mail disability@illinois.edu or go to the DRES website.

Emergency Response Statement

Emergency response recommendations can be found at the following website: https:// police.illinois.edu/emergency-preparedness/. I encourage you to review this web- site and the campus building floor plans website within the first 10 days of class. https: //police.illinois.edu/emergency-preparedness/building-emergency-action-plans/

Family Educational Rights and Privacy Act (FERPA) Statement

Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See https://registrar.illinois.edu/ academic-records/ferpa/ for more information on FERPA.

Sexual Misconduct Policy and Reporting Statement

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX and Disability Office. In turn, an individual with the Title IX and Disability Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: https://wecare.illinois.edu/resources/students/ #confidential. Other information about resources and reporting is available here: https: //wecare.illinois.edu/.