Time & Place: MW 5:00pm–6:15pm, Ewing Hall 207

Instructor: Vu Dinh, Email: vucdinh@udel.edu, Office: Ewing Hall 312

Office Hours:

- Tuesdays 5pm–6pm, via Zoom
- Wednesdays 3:30pm–4:30pm, Ewing Hall 312
- or by appointments

Web page: http://vucdinh.github.io/m637s23

Please bookmark and visit this page regularly. It will contain homework assignments, lectures, etc. Canvas will be used only for submitting work and for access to graded assignments.

Prerequisites:

- Probability theory and basic statistics (e.g. MATH 350 and MATH450)
- Multivariable calculus (e.g. MATH 243)
- Linear Algebra (e.g. MATH 349)
- Comfortable programming in a high-level language
- Optimization background (e.g. MATH 529) desirable but not necessary

Course description: The course provides an introduction to the fundamental techniques used in data science. The main objective of the course is to develop a good practical knowledge and a mathematical understanding of the common tools that are used to analyze modern datasets. The course also provides hands-on experience in data analysis through practical homework and class projects.

Goals of the course:

- Become familiar with the basic methods used to analyze modern datasets
- Understand the mathematical theory and the standard models used in data science
- Understand how to select a good model for data
- Be able to analyze datasets using Python

List of topics: Analysis of the convergence and complexity of common algorithms, Linear methods for regression (subset selection, ridge, lasso), Logistic regression, Linear Discriminant Analysis, Support Vector Machines, Kernel Smoothing, Principal component analysis, Cross-validation and Bootstrap, Cluster analysis (K-means, spectral clustering), Deep learning

Textbook: *An Introduction to Statistical Learning*, James, Witten, Hastie, and Tibshirani.

The pdf of the book is available at: https://www.statlearning.com

Assessment plan:

- Homework: 60% (5 assignments, theoretical + programming problems)
- Final project: Group project, 40% (10% presentation, 30% final report)
- Grading system: A $\geq 94\%$, A– $\geq 90\%$, B– $\geq 80\%$, C– $\geq 70\%$, D– $\geq 60\%$, F $< 60\%$. Subject to change (to your advantage only)

Plattforms:

- We will use Python during the course (there will be sessions to review the language). Specifically, we will use Google Colab for coding and programming assignments. Please register a Google/Gmail account if you don't have one:

  https://colab.research.google.com

- We will use LaTeX to write the final report. The easiest way to use it collaboratively is to register an Overleaf account:

  https://www.overleaf.com

- If you have never used Python before, a good Python tutorial is available at

  http://www.scipy-lectures.org/

  I also recommend using Anaconda Python

  https://www.continuum.io/

Academic Integrity. Please familiarize yourself with UD policies regarding academic dishonesty. To falsify the results of one's research, to steal the words or ideas of another, to cheat on an assignment, to re-submit the same assignment for different classes, or to allow or assist another to commit these acts corrupts the educational process. Students are expected to do their own work and neither give nor receive unauthorized assistance. Complete details of the university's academic integrity policies and procedures can be found at

https://sites.udel.edu/studentconduct/sgup/
Office of Student Conduct, 218 Hullihen Hall, (302) 831-2117.
E-mail: student-conduct@udel.edu

In particular, note that:

- Copying solutions in whole or in part from other students or **any other source** without acknowledgement constitutes cheating.
- Any student found cheating risks automatically failing the class and will be referred to the Office of Student Conduct.
- You can discuss with other students, but must write up your own solutions/codes.
- Please note your collaborators on your submissions.

The Safety of Our Learning Environment. Student learning can only occur when students and their instructors feel safe, respected, and supported by each other. To ensure that our learning environment is as safe as possible, you are expected to abide by the most up-to-date University of Delaware's COVID-19 Guidelines.

UD Policies:

- **Harassment and Discrimination.** The University of Delaware works to promote an aca-

demic and work environment that is free from all forms of discrimination, including harassment. As a member of the community, your rights, resource and responsibilities are reflected in the non-discrimination and sexual misconduct policies. Please familiarize yourself with these policies at

https://www.udel.edu/oei

You can report any concerns to the University's Office of Equity and Inclusion, at 305 Hullihen Hall, (302) 831-8063 or you can report anonymously through UD Police (302) 831-2222 or the EthicsPoint Compliance Hotline at

https://www1.udel.edu/compliance

You can also report any violation of UD policy on harassment, discrimination, or abuse of any person at this site:

https://sites.udel.edu/sexualmisconduct/how-to-report/

- **Faculty Statement on Disclosures of Instances of Sexual Misconduct.** If, at any time during this course, I happen to be made aware that a student may have been the victim of sexual misconduct (including sexual harassment, sexual violence, domestic/dating violence, or stalking), I am obligated by federal law to inform the university's Title IX Coordinator. The university needs to know information about such incidents to, not only offer resources, but to ensure a safe campus environment. The Title IX Coordinator will decide if the incident should be examined further. If such a situation is disclosed to me in class, in a paper assignment, or in office hours, I promise to protect your privacy–I will not disclose the incident to anyone but the Title IX Coordinator.

  For more information on Sexual Misconduct policies, where to get help, and reporting information, please refer to

  https://www.udel.edu/sexualmisconduct

  At UD, we provide 24/7/365 crisis assistance and victim advocacy and counseling. Contact 302-831-1001 to get in touch with a sexual offense support advocate, as well as confidential and anonymous counseling services for other concerns.

- **Accommodations for Students with Disabilities.** Any student who thinks he/she may need an accommodation based on a disability should contact the Office of Disability Support Services (DSS) office as soon as possible. Students who have documentation of their need for accommodation should register via the SAM platform:

  https://andes.accessiblelearning.com/UDEL/

  Reach DSS in the following ways:

  Phone: 302-831-4643; Email: dssoffice@udel.edu
  or visit at 240 Academy Street, Alison Hall Suite 130.

  Note: During Covid-19 response call ahead to schedule an appointment to come to office.

- **Non-Discrimination.** The University of Delaware does not discriminate against any person on the basis of race, color, national origin, sex, gender identity or expression, sexual orientation, genetic information, marital status, disability, religion, age, veteran status or any other characteristic protected by applicable law in its employment, educational programs and activities, admissions policies, and scholarship and loan programs as required by Title IX of the Educational Amendments of 1972, the Americans with Disabilities Act of 1990, Section 504 of the Rehabilitation Act of 1973, Title VII of the Civil Rights Act of 1964, and other applicable statutes and University policies. The University of Delaware also prohibits unlawful harassment including sexual harassment and sexual violence.

  For inquiries or complaints related to non-discrimination policies, please contact:

  Office of Equity and Inclusion
  Email: oei@udel.edu; Phone: (302) 831-8063
  305 Hullihen Hall Newark, DE 19716

For complaints related to Section 504 of the Rehabilitation Act of 1973 and/or the Americans with Disabilities Act, please contact:

Phone: 302-831-4643; Email: dssoffice@udel.edu
or visit at 240 Academy Street, Alison Hall Suite 130.

or contact the U.S. Department of Education - Office for Civil Rights.