PHC 6937 Introduction to Statistical Learning (3 credits)

Semester: Fall 2021
Delivery Format: On-Campus

Instructor Name: Qing Lu
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Class Meets: Mondays (9:35am-11:30am) and Wednesdays (10:40am-11:30am)
CTRB

Office hours: Monday and Wednesday (11:30am-12:30pm)

Preferred Course Communications: e-mail (lucienq@ufl.edu)

Prerequisites: PHC 6068 or the permission of the instructor.

Purpose and Outcome

Course Overview This course gives a brief introduction to commonly used methods (e.g., trees and deep learning) in statistical/machine learning. These methods have been increasingly used in modern data analysis to address various problems (e.g., biomedical problems) we encounter in real-world situations.

Relation to Program Outcomes The knowledge and skills learned from this course can enhance students' ability in data analysis and professional advancement. Successful completion of this course fulfills one of the core course requirements for the Health Data Science concentration and one of the elective requirements for the Biostatistical Methods and Practice Concentration in the MS program in Biostatistics.

Course Objectives and/or Goals
- Understand key concepts and essential topics in statistical/machine learning, such as regularization and bias–variance tradeoff
- Be able to use these methods in R
- Apply methods to health science and other areas

Description of Course Content

Topical Outline/Course Schedule
The course will cover major concepts and a variety of methods in the field of statistical/machine learning.

Week	Date(s)	Topic(s)
1	8/23-8/25	Introduction to Statistical Learning
2	8/30-9/1	Linear Regression
3	9/6-9/8	Labor Day
4	9/13-9/15	Classification
5	9/20-9/22	Resampling Methods
6	9/27-9/29	Linear Model Selection and Regularization
7	10/4-10/6	Moving Beyond Linearity
8	10/11-10/13	Kernel Smoothing
9	10/18-10/20	Midterm Exam
10	10/25-10/27	Tree-Based Methods
11	11/1-11/3	Veterans Day
12	11/8-11/10	Random forests and Ensemble learning
13	11/15-11/17	Support Vector Machines
14	11/22-11/24	Deep Learning
15	11/29-12/1	Unsupervised Learning
16	12/6-12/8	Final Projects

Course Materials and Technology

The course is developed based on two textbooks, both of which are freely available online
  1. An Introduction to Statistical Learning with Applications in R (main textbook)

  2. The Elements of Statistical Learning: Data Mining, Inference, and Prediction

Statistical Software:
We will mainly use R in this course. R is free, and you can download R from http://www.r-project.org/. Rstudio is a recommended interface for the R software. It is also free and can be downloaded from http://www.rstudio.org. R packages related to this course can be found under http://cran.rproject.org/web/packages/ISLR/index.html

For technical support for this class, please contact the UF Help Desk at:
  ● Learning-support@ufl.edu
  ● (352) 392-HELP - select option 2
  ● https://lss.at.ufl.edu/help.shtml

Additional Academic Resources

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources.
Teaching Center**:** Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420.
General study skills and tutoring.
Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: Visit the Student Honor Code and Student Conduct Code webpage for more information.
On-Line Students Complaints: View the Distance Learning Student Complaint Process.

Academic Requirements and Grading

Grading The course will be evaluated based on in-class projects (30%), a midterm exam (30%), and a final project (30%). Professionalism (e.g., attendance and being involved in discussions) will account for 10% of the final grade.

In-class projects Students will work individually or as a group on data analysis problems. Discussion on problems is encouraged, but plagiarism is prohibited. Full credit will be given for assignments turned in on the due date (by 11:59pm). Reduced credit will be given for assignments turned in after the due date.

Midterm exam There will be one midterm exam. The midterm exam will be a take-home exam. Students will prepare neatly typed exams in Word or LaTeX that can be submitted online in Canvas or by email to the instructor. Students are not allowed to work together on the midterm exam. Questions about the midterm exam should be directed to the instructor as early as possible, at least 24 hours before the exam is due.

Final Project For the final project, each student will work on and present a project based on 1) the analysis of a real dataset using existing methods/software, or 2) comparing existing methods by simulations. The grade is given based on the quality of the project (e.g., an innovative way of using an existing method or comprehensively compare several methods), and the presentation of the project (i.e., delivering an easy-to-follow and informative talk).

Professionalism Students are required to attend the class on time. Cell phones should be silenced, and laptops should be turned off during class unless needed. Students are also encouraged to be actively engaged in classes, asking questions and being involved in discussions.

Requirement	Due date	Points or % of final grade (% must sum to 100%)
In-class projects	The assignment day	30%
Midterm Exam	10/22	30%
Final project	12/6-12/8	30%
Attendance	8/23-12/8	10%

The numerical final score will be converted to the letter grades according to the following scale and cutoffs:

Points Earned	Letter Grade
93-100	A
90-92	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-

More information on UF grading policy may be found at:
http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades
https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Policy Related to Make up Work and Professionalism

Policy Related to Make up Work

Please note: Any requests for make-ups due to technical issues MUST be accompanied by the UF Computing help desk (http://helpdesk.ufl.edu/) correspondence. You MUST e-mail me within 24 hours of the technical difficulty if you wish to request a make-up.

Policy Related to Professionalism

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Excused absences must be consistent with university policies in the Graduate Catalog (http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance). Additional information can be found here: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Student Expectations, Roles, and Opportunities for Input

Expectations Regarding Course Behavior

Students are expected to show up for class prepared and on time. Cell phones are to be silenced during class unless there is an emergency, in which case please inform the instructor.

Communication Guidelines

The preferred methods of communication for the course are messages in e-learning or e-mail.

Academic Integrity

Students are expected to act in accordance with the University of Florida policy on academic integrity. As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge:

 "**We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity**."

You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied:

 "On my honor, I have neither given nor received unauthorized aid in doing this assignment."

It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For

additional information regarding Academic Integrity, please see Student Conduct and Honor Code or the Graduate Student Website for additional details:
https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/
http://gradschool.ufl.edu/students/introduction.html

Please remember cheating, lying, misrepresentation, or plagiarism in any form is unacceptable and inexcusable behavior.

Professionalism and COVID

As students pursuing a path in the health professions or public health, it is crucial to demonstrate professional behaviors that reflect integrity and commitment to the health of patients, fellow health professionals, and to populations we serve. To accomplish this, a strong responsibility for the well-being of others must be evident in our decisions, along with accountability for our actions. Professionalism in the health disciplines requires adherence to high standards of conduct that begin long before graduation. This is particularly true during times of health emergencies such as the COVID pandemic, given our professional habits can have a direct impact upon the health of persons entrusted to us.

If you are not vaccinated, get vaccinated. Vaccines are readily available at no cost and have been demonstrated to be safe and effective against the COVID-19 virus. Visit this link for details on where to get your shot, including options that do not require an appointment: https://coronavirus.ufhealth.org/vaccinations/vaccine-availability/. Students who receive the first dose of the vaccine somewhere off-campus and/or outside of Gainesville can still receive their second dose on campus.

In response to COVID-19, the following professional practices are in place to maintain your learning environment, to enhance the safety of our in-classroom interactions, and to protect the health and safety of ourselves, our patients, our neighbors, and our loved ones.

- You are required to wear approved face coverings at all times while in Health Science Center classrooms and within Health Science Center buildings even if you are vaccinated.
- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions about returning to campus. UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the UF Health Screen, Test & Protect website for more information.
- Continue to follow healthy habits, including best practices like frequent hand washing.
- Avoid crowded places (including gatherings/parties with more than 10 people)

Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class. Hand sanitizing stations will be located in every classroom.

Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. If you are withheld from campus by the Department of Health through Screen, Test & Protect you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.

Continue to regularly visit coronavirus.UFHealth.org and coronavirus.ufl.edu for up-to-date information about COVID-19 and vaccination.

COVID-19 Symptoms

See https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html for information about COVID-19 symptoms, which may include fever, cough, shortness of breath or difficulty breathing, fatigue, chills, muscle or body aches, headache, sore throat, congestion or runny nose, nausea or vomiting, diarrhea, and loss of taste or smell.

Online Faculty Course Evaluation Process

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/ . Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

Policy Related to Guests Attending Class

Only registered students are permitted to attend class. However, we recognize that students who are caretakers may face occasional unexpected challenges creating attendance barriers. Therefore, by exception, a department chair or his or her designee (e.g., instructors) may grant a student permission to bring a guest(s) for a total of two class sessions per semester. This is two sessions total across all courses. No further extensions will be granted. Please note that guests are **not** permitted to attend either cadaver or wet labs. Students are responsible for course material regardless of attendance. For additional information, please review the Classroom Guests of Students policy in its entirety. Link to full policy: http://facstaff.phhp.ufl.edu/services/resourceguide/getstarted.htm

SUPPORT SERVICES

Accommodations for Students with Disabilities

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center by visiting https://disability.ufl.edu/students/get-started/ . It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester. The College is committed to providing reasonable accommodations to assist students in their coursework.

Counseling and Student Health

Students sometimes experience stress from academic expectations and/or personal and interpersonal issues that may interfere with their academic performance. If you find yourself facing issues that have the potential to or are already negatively affecting your coursework, you are encouraged to talk with an instructor and/or seek help through University resources available to you.

- The Counseling and Wellness Center 352-392-1575 offers a variety of support services such as psychological assessment and intervention and assistance for math and test anxiety. Visit their web site for more information: http://www.counseling.ufl.edu. On line and in person assistance is available.

- You Matter We Care website: http://www.umatter.ufl.edu/. If you are feeling overwhelmed or stressed, you can reach out for help through the You Matter We Care website, which is staffed by Dean of Students and Counseling Center personnel.

- The Student Health Care Center at Shands is a satellite clinic of the main Student Health Care Center located on Fletcher Drive on campus. Student Health at Shands offers a variety of clinical services. The clinic is located on the second floor of the Dental Tower in the Health Science Center. For more information, contact the clinic at 392-0627 or check out the web site at: https://shcc.ufl.edu/

- Crisis intervention is always available 24/7 from:
  Alachua County Crisis Center:
  (352) 264-6789
  http://www.alachuacounty.us/DEPTS/CSS/CRISISCENTER/Pages/CrisisCenter.aspx

Do not wait until you reach a crisis to come in and talk with us. We have helped many students through stressful situations impacting their academic performance. You are not alone so do not be afraid to ask for assistance.

Inclusive Learning Environment

Public health and health professions are based on the belief in human dignity and on respect for the individual. As we share our personal beliefs inside or outside of the classroom, it is always with the understanding that we value and respect diversity of background, experience, and opinion, where every individual feels valued. We believe in, and promote, openness and tolerance of differences in ethnicity and culture, and we respect differing personal, spiritual, religious and political values. We further believe that celebrating such diversity enriches the quality of the educational experiences we provide our students and enhances our own personal and professional relationships. We embrace The University of Florida's Non-Discrimination Policy, which reads, "The University shall actively promote equal opportunity policies and practices conforming to laws against discrimination. The University is committed to non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information and veteran status as protected under the Vietnam Era Veterans' Readjustment Assistance Act." If you have questions or concerns about your rights and responsibilities for inclusive learning environment, please see your instructor or refer to the Office of Multicultural & Diversity Affairs website: www.multicultural.ufl.edu