CIS6930/CIS4930 – Probability for Computer Systems and Machine Learning

Spring, 2021

Syllabus

General Information

Course Title:	Probability for Computer Systems and Machine Learning
Credits:	3
Instructor:	Ye Xia
Office:	CSE E538
Office Hours:	Thursdays, 2:00 – 3:00 pm, via Zoom
Email:	yx1@ufl.edu
Course URL:	All course material will be on Canvas.
Classroom:	N/A
Class Hours:	M,W,F, Period 7 (1:55 PM - 2:45 PM)

(**Recorded lectures are available on Canvas for asynchronous viewing.**)

TA:	Mahajan, Dhruv
Email :	dhruvmhjn@ufl.edu
Office Hours :	via Zoom. (**TBA**)

Textbook

No required textbook. I will draw materials from the following books.

1. Sheldon Ross, *Introduction to Probability Models*.
2. Sheldon Ross, *Stochastic Processes*.
3. G. R. Grimmett and D. R. Stirzaker, *Probability and Random Processes*.
4. Richard Durrett, *Probability: Theory and Examples*.
5. Trevor Hastie, Robert Tibshirani and Jerome Friedman, *The Elements of Statistical Learning*.
6. Kevin Murphy, Machine Learning – A Probabilistic Perspective
7. George Casella and Roger Berger, *Statistical Inference*.

Slides: The lecture slides are on Canvas.

Objectives

The course covers probability theory tailored to computer science students who need to work with probability, especially those who work on algorithm design or performance evaluation for computer and network systems, and those who work on machine learning and AI. Part of the course will focus on the methods and tricks to compute probabilities so that students will gain usable skills of probability calculation. The course will cover the measure-theoretical foundation

of probability, with the goal that students can later read or learn material that involves more advanced probability theory. Examples will be drawn from the computer systems area and machine learning area. In particular, we will cover the basics of statistical learning.

Topics: probability and random variables; conditional probability and conditional expectation; basic convergence theorems; inequalities; basics of renewal process, Poisson process and Markov chain; Gaussian random variables; basics of statistical inference and statistical learning; measure theory.

Prerequisites

Calculus at the level of MAC 2313, linear algebra at the level of MAS 3114, and basic probability and statistics at the level of STA 3032.

Grading

Project 25%
Homework.... .....75%

The letter grades for the course will be assigned based on a curve.

Exams: No exams

Homework

There will be around 5 homework assignments. Students will work individually on the homework. The due date for each assignment will be given at the time it is posted. Homework will be submitted on Canvas before the midnight of the due date. Late submissions will face 30-point reduction (out of 100) and will be accepted until one week after the original due date or until the solutions are posted, whichever is sooner.

Project

Midpoint Check Due: March 10

Final Submission Due: April 20

There is an assigned project, which is to implement a discrete event simulator for a cache system. You will run the simulator to evaluate the performance of several cache replacement schemes.

You can code in any major languages, Java, C/C++ or Python. However, I will only distribute the C code that implements the priority queue. If you use another language, you can search for the priority-queue code in your language of choice, or implement your own priority queue code.

It will be an individual project. Late submissions will NOT be accepted. Details will be posted.

There will be a midpoint check. You are asked to submit at least 300 lines of code (excluding the priority queue code), which should pass compilation. The midpoint check is worth 5% of your course grade. The final submission and report are worth 20%.

Canvas Use

All course material and submissions will be through Canvas. All due dates are on Canvas.

Course Schedule

The lecture schedule and reading schedule are given on Canvas.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students 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.” The Honor Code (https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Privacy Statement

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.