

CS 3190: Foundations of Data Analysis

Instructor Information

Name: El Kindi Rezig

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Office Hours: Every Tuesday from 1pm to 3pm

Teaching assistants

- Peter Jacobs (u1266560@utah.edu) Office hours: Tuesday 8:30am-10:30am 3115 MEB
- Ananya Smirti (ananyazone@gmail.com) Office hours: Thursday 2pm-4pm 3115 MEB
- Emin Ozturk (emin.ozturk@utah.edu) Office hours: Friday 3pm-5pm 3115 MEB
- Chandan Narayanappa (chandan.narayanappa@gmail.com) Office hours: Friday 11am-1pm 3115 MEB
- Kutay Eken (u1322888@utah.edu) Office hours: Thursday 2pm-4pm 3147 MEB
- Fnu Harshit (harshitpal0844@gmail.com) Office hours: Monday 1pm-3pm 3115 MEB

Class Information

Class meetings: Tuesday & Thursday 10:45am to 12:05pm WEB L101

Piazza: <https://piazza.com/utah/fall2023/cs3190>

Final exam date and location

December 12th, 2023 10.30am-12.30pm in WEB L101

Course Description

Today's smart applications are powered by various machine learning and AI models that make careful decisions to learn from data and infer insights from it. In this course, we will learn about the mathematical foundations that underpin modern AI/ML applications. Understanding those concepts is crucial to building effective AI/ML tools and to extract insights from large and often messy datasets. This course is a gateway to more advanced ML classes. The course will review probability, statistics, Baye's theorem and its applications, linear algebra, high-dimensional data clustering, classification, and regression.

Course Objectives

Upon the completion of this course, students should be able to:

- Understand how to use mathematical operations to manipulate data points in the vector space.

- Write simple Python functions using libraries like *numpy* and *scikit-learn* to train regression and classification models.
- Understand the intuition behind Baye’s theorem and how to apply Bayesian inference.
- Understand how to use dimensionality reduction techniques to an input dataset.
- Implement popular data clustering methods.
- Optimize models’ parameters using the Gradient Descent algorithm.
- Understand how to fit a model to a data distribution.
- Evaluate models on their ability to generalize to new data.

Textbook

Mathematical Foundations for Data Analysis by Jeff M. Phillips: <http://mathfordata.github.io>, PDF link: <https://mathfordata.github.io/versions/M4D-v0.6.pdf>

Getting help

Students are encouraged to take advantage of the office hours provided by the instructor and TAs. Students are also encouraged to form discussion groups to study the material with their peers, but not share answers to problems. Lastly, students can post questions on the Piazza discussion group of this class. Such questions can relate to the course material, homework, class logistics, etc.

Pre-requisites

CS 2100 (Discrete Structures), CS 2420 (Intro. Alg. & Data Struct), and MATH 2270 (Linear Algebra). We will go over a review of key concepts in probabilities and linear algebra. However, students are expected to have taken the pre-requisite classes and possess basic mathematical knowl- edge.

Grading

The course grade is determined by the following components:

Final exam	20%
Homework	60%
Quizzes	18%
In-class participation	2%

There will be 6 or 7 quizzes, in total worth 20% of the grade. We will be using Canvas to conduct those quizzes at the end of select classes.

Grade Scale

Final grades will be assigned according to the following scale:

- 90-100 : A- to A
- 80-90 : B- to B+
- 70-80 : C- to C+
- 60-70 : D- to D+
- below 60 : E

The instructor reserves the right to adjust those intervals.

Late Policy

To get full credit for an assignment, it must be turned in through Canvas by the 10 minutes before the end of the day it is due, specifically 11:50pm. Once the 11:50pm deadline is missed, those turned in late will lose 10%. Every subsequent 24 hours until it is turned another 10% is deducted. Assignments will not be accepted more than 72 hours late, and will be given a 0. This will consistently be enforced if Canvas marks the assignment late (Canvas has a small buffer on the timing). If you believe there is an error in grading (homeworks or quizzes), you may request a regrading within one week of receiving your grade. Requests must be made by email to instructor, explaining clearly why you think your solution is correct. You may consult with the instructor/TA first, but the formal request must always be made by email.

Collaboration Policy

Students may discuss homework problems with each other and possible solutions in general terms. However, you may not share/get any details of the solutions with/from other students. Sharing/copying solution details is considered a violation of the University of Utah Student Code.

Students may post homework discussions on the Piazza discussion group without sharing solutions to these problems. The goal of those discussions is to improve the student's understanding of the problems so they can solve them themselves.

Academic Honesty, Plagiarism and Cheating

It is assumed that all work submitted to your instructor is your own work. When you have used the ideas of others, you must properly indicate that you have done so.

It is expected that students adhere to University of Utah policies regarding academic honesty, including but not limited to refraining from cheating, plagiarizing, misrepresenting one's work, and/or inappropriately collaborating. This includes the use of generative artificial intelligence (AI) tools without citation, documentation, or authorization. Students are expected to adhere to the prescribed professional and ethical standards of the profession/discipline for which they are preparing. Any student who engages in academic dishonesty or who violates the professional and ethical standards for their profession/discipline may be subject to academic sanctions as per the University of Utah's Student Code: <https://regulations.utah.edu/academics/6-410.php>

Plagiarism and cheating are serious offenses and may be punished by failure on an individual assignment, and/or failure in the course. Academic misconduct, according to the University of Utah Student Code,

"...Includes, but is not limited to, cheating, misrepresenting one's work, inappropriately collaborating, plagiarism, and fabrication or falsification of information. . . It also includes facilitating academic misconduct by intentionally helping or attempting to help another to commit an act of academic misconduct."

For details on plagiarism and other important course conduct issues, see the U's Code of Stu-

dent Rights and Responsibilities <http://www.regulations.utah.edu/academics/6-400.html>. Additionally, refer to the School of Computing cheating policy here: https://www.cs.utah.edu/docs/misc/cheating_policy.pdf

Accommodations

Accommodations will be considered on an individual basis and may require documentation.

Please contact your instructor and/or teaching assistant as soon as possible to request accommodations of any kind.

All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services (CDS). CDS will work with you and the instructor to make arrangements for accommodations. Prior notice is appreciated. To read the full accommodations policy for the University of Utah, please see Section Q of the Instruction & Evaluation regulations <http://regulations.utah.edu/academics/6-100.php>

If you will need accommodations in this class, contact the Center for Disability Services (801-581-5020) disability.utah.edu. Address: 162 Union Building, 200 S. Central Campus Dr., Salt Lake City, UT 84112

Safety

The University of Utah values the safety of all campus community members. You will receive important emergency alerts and safety messages regarding campus safety via text message.

For more safety information and to view available training resources, including helpful videos, visit safeu.utah.edu

To report suspicious activity or to request a courtesy escort, contact: Campus Police & Department of Public Safety: 801-585-COPS (801-585-2677) dps.utah.edu. Address: 1735 E. S. Campus Dr., Salt Lake City, UT 84112.

Sexual misconduct

Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status, or genetic information.

If you or someone you know has been harassed or assaulted, you are encouraged to report it to university officials:

Title IX Coordinator & Office of Equal Opportunity and Affirmative Action

801-581-8365

oeo.utah.edu

135 Park Building

201 Presidents' Cir.

Salt Lake City, UT 84112

Office of the Dean of Students

801-581-7066

deanofstudents.utah.edu

270 Union Building

200 S. Central Campus Dr.
Salt Lake City, UT 84112

To file a police report, contact:
Campus Police & Department of Public Safety
801-585-COPS (801-585-2677)
dps.utah.edu
1735 E. S. Campus Dr.
Salt Lake City, UT 84112

If you do not feel comfortable reporting to authorities, the U's Victim-Survivor Advocates provide free, confidential, and trauma-informed support services to students, faculty, and staff who have experienced interpersonal violence.

To privately explore options and resources available to you with an advocate, contact:
Center for Student Wellness
801-581-7776
wellness.utah.edu
328 Student Services Building
201 S. 1460 E.
Salt Lake City, UT 84112