

# CS2810 Mathematics of Data Models

Spring 2022

## Course Description

This course teaches the methods and ideas in Linear Algebra and Statistics that are most relevant for the practicing computer scientist doing machine learning, modeling, or hypothesis testing with data. Techniques covered include least squares regression, finding eigenvalues to predict a linear system's steady state behavior and determine whether the population differences suggest a statistically meaningful differences. Includes applications to popular machine learning methods which may vary per semester but have included Bayesian Modeling, Neural Networks and Principal Component Analysis.

## Instructors

Name	Office	Email
Matt Higger (he/him)	319A Meserve	<a href="mailto:mhigger@ccs.neu.edu">mhigger@ccs.neu.edu</a>
Felix Muzny (he/him & they/them)	307A Meserve	<a href="mailto:f.muzny@northeastern.edu">f.muzny@northeastern.edu</a>

## Meeting Time and Location

Meeting Time	Instructor	Location	Index	CRN
MR 11:45 am - 1:25 pm	Muzny F.	Remote through Feb. 5th (physical room: SN 108)	1	33783
TF 1:35 pm - 3:15 pm	Higger M.	BK 010	2	34240
TF 3:25 pm - 5:05 pm	Higger M.	BK 010	3	36145

## Instructional Approach

Our aim is to teach you useful mathematics. In your careers, it's unlikely that you'll need to turn the crank on many homework problems to produce solutions. Instead, you'll be given relevant, real-life problems. A strong mathematician is able to encapsulate much of this messy reality with assumptions which transform the problem into another whose solution is known to them. One needs to be rigorous, creative and collaborative.

To help our students foster these skills, our course includes:

- two days of Mini Projects (see [Mini-Project](#)) where students will obtain some pre-groomed data, apply our tools, and discuss their results. (No prior Python programming experience required, extra TA support provided on these days).
- daily In-Class-Activities (ICAs) which get students sharing and receiving math thinking in a group. The process of sharing your thinking will clarify and critique your own understanding of a math problem
  - At the outset of these ICAs, we encourage students to sit and think for themselves before diving in to work together: math problems, like jokes, aren't as useful once their punch lines have been given away!
  - ICAs will be collected and graded based on completion and effort (we'll often review ICA solutions in class)
  - Be mindful that you encourage all group members to share equally

### Tip

Have patience with yourself as you work on this material. It is often the case that understanding how to approach a problem is the hardest part. (Be sure to start your homework early to allow your brain time to fully marinate the problem before cooking).

## Online Resources

[Canvas Website](#) (containing HWs & solutions)

[Sphinx Website](#) (everything else, including this syllabus)

Textbooks (all online and free, don't buy any):

[Linear Algebra \(Hefferon\)](#)

[Online Statistics Education: A Multimedia Course of Study \(Lane\)](#)

## Grading

The total course average is computed as the weighted average of the following categories:

Assessment	Weight
In-Class Activity	6%
4x Quiz-Tests*	44%
9x Homework	42%
2x Mini-Project	8%

\*Bigger than a quiz, smaller than a test. Each is taken in person and lasts between 40-60 minutes. The final Quiz-Test will be taken during the finals period and will be focused on material not covered on the first 3 quizzes.

Letter grades are assigned according to the highest thresholds met below:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
93	90	87	83	80	77	73	70	67	63	60	0

## Late Work

### ICA

Things come up during the semester (hardware problems, weather, etc ...) and some flexibility is helpful to students to perform their best. As a result, **we will drop the lowest four ICAs from everyone's score at the end of the semester.** However, to keep a consistent grading standard, we cannot waive any individual student's missed ICA due to student error (forgetting to submit, attempting to submit late etc).

### HW

After 48 hours beyond the due date, no HW will be accepted for credit. Some homework will have a shorter threshold where it will not be accepted for credit, this is marked on the make schedule on the site's homepage. (We set this deadline to allow TAs time to grade and release solutions to students who may then prepare for quizzes).

Late HW will incur a penalty of 15% of the total possible points per day it is late. Each student has 3 late day "passes" which are automatically used to neutralize the first late day penalties possible. For example, a student's late HW penalties may be:

- HW 1 is 2 day(s) late (2 late passes used)

- HW 2 is 2 day(s) late (1 late pass used. 15% penalty applied to this HW)
- HW 3 is 1 day(s) late (15% penalty applied to this HW)
- HW 4 is 2 day(s) late (30% penalty applied to this HW)
- HW 5 is 2.0001 day(s) late (no credit is given for this HW)

## Academic Integrity and Conduct

### ⓘ Warning

Under no circumstances may one student view or share their ungraded homework or quiz-test with another student.

Sharing or viewing another students ungraded work will result in a failing course grade. With that said, you are welcome to discuss concepts and ideas with other students so long as TODO

See [OSCCR](#) for further details on consequences

## Disability Resource Center

The office is available to assist students who have a legally documented disability or students who suspect that they may have a disability. If you have a disabling condition that may interfere with your ability to successfully complete this course, please contact the [Disability Resource Center](#)

## Title IX

Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance.

Northeastern's Title IX Policy prohibits Prohibited Offenses, which are defined as sexual harassment, sexual assault, relationship or domestic violence, and stalking. The Title IX Policy applies to the entire community, including male, female, transgender students, faculty and staff.

If you or someone you know has been a survivor of a Prohibited Offense, confidential support and guidance can be found through [University Health and Counseling Services](#) staff and the [Center for Spiritual Dialogue and Service](#) clergy members. By law, those employees are not required to report allegations of sex or gender-based discrimination to the University.

Alleged violations can be reported non-confidentially to the Title IX Coordinator within The Office for Gender Equity and Compliance at [titleix@northeastern.edu](mailto:titleix@northeastern.edu) and/or through NUPD

(Emergency 617.373.3333; Non-Emergency 617.373.2121). Reporting Prohibited Offenses to NUPD does NOT commit the victim/affected party to future legal action.

Faculty members are considered “responsible employees” at Northeastern University, meaning they are required to report all allegations of sex or gender-based discrimination to the Title IX Coordinator.