EECS 487 001 FA 2023

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EECS 487: Introduction to Natural Language Processing, Fall 2023

Welcome to 487! We're glad you're here, and we're looking forward to a great semester learning more about NLP.

Canvas course image taken from https://capacity.com/5-reasons-why-advances-in-nlp-can-enhance-a-helpdesk/

Quick Links

- **Class calendar** ⤷ **(https://calendar.google.com/calendar/render?cid=c_47cd81f18dd0bdb1cb0a09a9e74d3a54977e90abd102ea20420c7b47b438497a@gro**
- **EECS OH Queue** ⤷ **(https://eecsoh.eecs.umich.edu/queues/2UIc2lCcinaCsyFxpPOuOgFLuNj)**
- Kai's remote office hours: **zoom link** ⤷ **(https://umich.zoom.us/j/2605239720)**

Basic Information

Lecture time: Tuesday & Thursday 3-4:20pm

Lecture location: 1013 **DOW** ⤷ **(https://maps.studentlife.umich.edu/building/herbert-h-dow-building)**

Faculty Instructor: Laura Burdick, BBB 3824, **lburdick@umich.edu (mailto:lburdick@umich.edu)**

- Dr. Burdick typically responds to most e-mails within a day, though usually doesn't respond during evenings and weekends.

Faculty Office Hours: Tuesday & Thursday 1:45-2:45pm (conference room, BBB 4941)

- Office hours begin Thursday, August 31.
- On September 19, 21, 26, and 28, office hours will be held in BBB 2901, rather than the usual location.
- If these times don't work for you (or you'd prefer to meet remotely), please send an e-mail, and we can find another time to meet, either remotely or in-person.

GSIs:

Jacob Sansom, **jhsansom@umich.edu (mailto:jhsansom@umich.edu)**

- Office hours:
  - Monday 1:30-3:30pm (in-person, Table #1 in the BBB Learning Center)
  - Tuesday 11am-12pm (in-person, Table #2 in the BBB Learning Center)
- Office hours begin Tuesday, September 5.

Kaijian Zou, **zkjzou@umich.edu (mailto:zkjzou@umich.edu)**

- Office hours:
  - Wednesday, 1:30-3pm (in-person, 2901 BBB)
  - Thursday, 4:30 - 6:00pm (remote, **zoom link** ⤴ **(https://umich.zoom.us/j/2605239720)**)
- Office hours begin Thursday, August 31.

IA:

Gordon Lim, **gbtc@umich.edu (mailto:gbtc@umich.edu)**

- Office hours:
  - Friday 2:30-3:30pm (in-person, Table #1 in the BBB Learning Center)
- Office hours begin Friday, September 1.

Lab times and locations:

- Two lab sections will be offered on Fridays: 12:30-2:30pm and 3:30-5:30pm, both in 1010 DOW.
- All staff members will help with both labs.
- Most weeks, labs will only meet for the first hour. Occasionally, however, labs will meet for both hours - on these weeks, the second hour will be optional. We will announce 2-hour labs ahead of time.

Course Description

The purpose of this course is to provide a broad introduction to the fundamental concepts, tasks, and techniques of natural language processing, and its recent advances based on machine learning algorithms (e.g., neural networks) and applications for interdisciplinary subjects. The successful student will finish the course with specific modeling and analytical skills, knowledge of the most important language concepts and machine learning schemes, and a broad understanding of natural language processing models and practice. The course will serve to prepare the student for further study of NLP and AI in general, as well as to inform any work involving the design of computer programs for substantial application domains.

Broadly speaking, this course will contain the following components (more details in the rest of the syllabus):

- **Lectures**. Attendance is not required at lectures, however, you must complete a short lecture assignment within 36 hours of the lecture for 20 out of the 26 lectures this semester. Lectures will be recorded.
- **Labs.** Attendance is not required at labs, however, you will need to turn in a lab assignment each week (with a few exceptions). In general, labs will not be recorded.
- **One Cool Thing.** Students will form groups of around 4 people and will record a short video about one cool thing that's happened in NLP recently. This video will be

presented either in lecture or in lab.

- **Homeworks.** There will be three homework assignments throughout the semester.
- **Project.** There will be a final project in this class, completed in teams of 2-3.
- **Exams.** There will be one in-person exam.

Prerequisites

This course is designed for junior/senior undergraduate students majoring in computer science, information science, linguistics, and other related areas. Students who take this course are expected to be able to write code in some programming languages proficiently (Python is recommended), and have studied algorithms, probability, and statistics. Linear algebra is optional, but recommended. It would be beneficial if the students have prior knowledge of supervised machine learning.

Textbook and Course Materials

Dan Jurafsky and James H. Martin, Speech and Language Processing. We will be using the third edition draft, available online at
https://web.stanford.edu/~jurafsky/slp3/ **(https://web.stanford.edu/~jurafsky/slp3/)** .

Additional course materials will be posted on Canvas.

Lecture

Lectures in this class are interactive, with time for discussion and in-class exercises. Because of this, we highly recommend attending lectures in-person. Attending lectures will allow you to learn the material better and remember it longer after the class has ended. To make sure that you are keeping up with the lectures, you will be required to complete a lecture assignment for a certain number of lectures.

Lectures will be recorded. There will be 25 lectures over the course of the semester (this doesn't include the in-class exam or the final poster session, see the Course Schedule at the end of this document). In order to earn full credit, you will be required to complete the lecture assignment for 19 lectures. In order to complete the lecture assignment, you must watch the lecture (either in-person or the recording) and fill out an assignment with several in-class exercises and questions. Some questions will be graded solely for completion, while some questions will be graded for completeness (this will be noted for each question on the form). ***The form must be submitted by 11:59pm the day after the lecture.*** For Tuesday lectures, the form must be submitted by Wednesday at 11:59pm. For Thursday lectures, the form must be submitted by Friday at 11:59pm.

Because you are only required to submit the lecture assignment for around 75% of the lectures, you have some flexibility for illness, job interviews, travel, etc. Because of this built-in flexibility, ***exceptions to this policy will not be granted except in extenuating circumstances***. If you have extenuating circumstances, please contact Dr. Burdick.

Lecture Topics

We will generally follow the topics given in the textbook, with some exceptions. I have included textbook readings along with each topic. These readings are optional, but helpful, especially if you are struggling to understand the lectures on a particular topic. There may be additional readings posted on Canvas for some topics. I am not sure how long it will take us to get through each topic, which is why I haven't included dates. Because of that, we may not get to some of the topics at the end.

- **Introduction: Why is NLP Hard?**
- **Unit 1: Fundamental Algorithms (or, How did we get to chatGPT?)**

- Text Normalization (Ch. 2.2, 2.3, 2.4)
- N-gram Language Models (Ch. 3)
- Naive Bayes and Sentiment Classification (Ch. 4)
- Logistic Regression (Ch. 5)
- Vector Semantics and Embeddings (Ch. 6)
- Neural Networks and Neural Language Models (Ch. 7)
- Sequence Labeling for POS and NER (Ch. 8)
- RNNs and LSTMs (Ch. 9)
- Transformers and Pretrained LMs (Ch. 10)
- Fine-tuning and Masked LMs (Ch. 11)
- Chatbots and Dialogue Systems (Ch. 15)
- ChatGPT: Putting it all Together, Data, and Societal Implications

- **Unit 2: NLP Applications**
  - Machine Translation (Ch. 13)
  - Question Answering and IR (Ch. 14)
  - ASR and Text-to-speech (Ch. 16)

- **Unit 3: Annotating Linguistic Structure**
  - Constituency and Dependency Parsing (Ch. 17-18)
  - Word Senses and WordNet (Ch. 23)
  - Sentiment, Affect, and Connotation (Ch. 25)
  - Coreference Resolution (Ch. 26) - if time
  - Hidden Markov Models (Appendix A) - if time

Labs

Labs will be hands-on coding practice with the material that we are learning in class. You must turn in an assignment for each lab, ***due Monday at 11:59pm after the lab.*** If you attend lab in-person, you will have the opportunity to complete the assignment with a partner and help from the course staff. If you do not attend the lab in-person, you still must complete the assignment (you may work with a partner who also did not attend the in-person lab). Labs will not be recorded.

There will be a few labs that do not follow this schedule (also see the Course Schedule at the end of this document):

- There will be no lab Friday, October 13, the Friday before Fall Break.
- The lab on Friday, November 10 will be an exam review. It will be recorded, and there will not be any lab assignment to turn in.
- There will be no lab Friday, November 17, the Friday before Thanksgiving Break.

In total, there will be 10 lab assignments that you are required to complete. The lowest lab assignment will be dropped.

One Cool Thing

Students will be divided into groups of around four students, and each group must record a short video about one cool recent thing in NLP. It can be anything that you find interesting - a research paper, a new NLP application in industry, an ethical concern around NLP, a societal implication about NLP, etc. These videos will be played in lectures and labs throughout the semester. More details will be given in the first couple of weeks.

Homeworks

There will be three homework assignments throughout the semester. They will be due September 27, October 20, and November 3(see Course Schedule at the end of the document). These assignments will involve conceptual questions and coding practice. Conceptual questions must be completed individually. Coding questions can be either completed individually or with a partner. It will be clearly marked which questions must be completed individually and which questions can be done with a partner.

Project

Teams of 2 or 3 students will work together on a course project based on their own selection throughout the semester. Sample project ideas will be provided. Each team must meet the following milestones (see Course Schedule at the end of the document):

- October 11 - Submit a proposal
- November 21 - Submit a progress report
- December 5, last day of class - Present a poster at the final project poster session
- December 14 - Submit a final report (this would have been the day of our final exam, but there will be no final exam in this class)

You must attend the last day of class to receive credit for your poster.

Exam

There will be one exam in this class. It will take place on Thursday, November 16 during classtime (please note that this is the Thursday before Thanksgiving break). The exam will take place in-person - there will be *no exceptions* to this policy for Thanksgiving break travel. Please plan your travel accordingly.

Late Policy

The general late policy is laid out below. There are a few exceptions: Lecture assignments will not be accepted if they are turned in late. For the final poster, credit will not be given unless you attend the final poster session (during the last day of class).

For all other assignments (homeworks, labs, One Cool Thing, other project milestones), the policy is as follows:

Assignments must be turned in on the date that it is due, by 11:59PM Ann Arbor time. The homework must be submitted electronically using Canvas and Gradescope and we will use the later timestamp to validate turn-in time. Late homework will be penalized 10% per day (where each day starts at 11:59pm on the due day). Homework turned in after three days will not be accepted. Certain homework assignments may be associated with a single late day, to facilitate exam study. This will be noted when the assignment is released.

If you are unable to complete the homework assignment on time due to illness or a personal emergency, please contact Dr. Burdick.

Note that the only method of submission is Canvas/Gradescope. It is your responsibility to ensure that the homework has been uploaded successfully by the due date. This may include checking a box to verify accordance with the honor code policy. Homework that is incorrectly uploaded will be subject to the associated late penalty. Homework not successfully uploaded by the due date will not be accepted.

Also note that any changes you make to the homework already submitted on Canvas/Gradescope counts as a resubmission. If you make any changes to the assignment after the due date has passed you will be assigned a late penalty based on the number of days that have passed. For example, if you edit an assignment on October 5 and it was due on October 2, you will be assigned a 30% penalty (10% per day) as explained above. This is non-negotiable.

Office Hours

The instructors will have regularly scheduled office hours each week. You are encouraged to make use of these to discuss aspects of the course including lecture material and the homework problems. In cases where you cannot make office hours,

contact the course staff to arrange an appointment; don't wait until the last minute though!

Piazza

We will be using Piazza to host a course forum and asynchronous Q&A. You are encouraged to read this regularly and post technical questions. Please search before posting to avoid re-asking questions that have already been answered.

It is important that you do NOT post your own code or homework solutions to the forum. If you have a question about any of these things, use a **private** post (visible only to instructors).

Course staff will answer questions on Piazza throughout the day, but do not expect an immediate response (particularly on evenings and weekends). We will try to answer questions within 24 hours when possible. Of course, students are encouraged to answer each others' questions!

Email Policy

We do not answer technical questions via email. In order to save everyone time, we want all students to have the benefit of seeing each question and its answer, so please use Piazza instead.

Grading

Lecture Assignments	5%

Lab Assignments	15%
One Cool Thing	5%
Homeworks	25%
Final Project	30%
Exam	20%

Notes:

- To earn full credit, you must complete 20 lecture assignments (out of 26 possible lectures)
- There are 10 lab assignments, the lowest grade is dropped
- There are 3 homework assignments
- The final project grade is broken up as follows:
  - 5% - project proposal
  - 5% - progress report
  - 15% - final report
  - 5% - final poster

The values are subject to slight adjustments based on the discretion of the instructor. If you have a problem with the grading on a particular assignment or exam, submit a regrade request on Gradescope. If the assignment was not submitted using Gradescope, submit a regrade request by e-mailing a brief (one paragraph) description of the problem to Dr. Burdick. **Regrade requests must be submitted within one week of when the graded assignment is made available to the student.** Later regrade requests will not be accepted.

The exam grades will most likely be curved. Final letter grades will be calculated according to the following table:

A+ 98 ≤ % ≤ 100

A 93 ≤ % < 98

A- 90 ≤ % < 93

B+ 87 ≤ % < 90

B 83 ≤ % < 87

B- 80 ≤ % < 83

C+ 77 ≤ % < 80

C 73 ≤ % < 77

C- 70 ≤ % < 73

D+ 67 ≤ % < 70

D 63 ≤ % < 67

D- 60 ≤ % < 63

E % < 60

Honor Code

We encourage collaboration in EECS 487, especially on concepts, tools, specifications, and strategies. In this class, you are expected to follow the College of Engineering **Honor Code** ⤷ **(https://ecas.engin.umich.edu/wp-content/uploads/sites/19/2019/03/Honor-Code-Pamphlet-2018.pdf)**. Suspected violations will be referred to the **Engineering Honor Council** ⤷ **(https://ecas.engin.umich.edu/honor-council/)**.

In particular, here are some ways that the Honor Code applies to this class:

- **Homework assignments - conceptual questions.** Conceptual questions must be completed individually. You are free to discuss high-level ideas with other students, but all solutions must be your own. It is an Honor Code violation to work out the

details of the problems with someone else. It is an Honor Code violation to compare your solutions, whether in scrap paper form or your final work product, to other students (and vice versa).

- **Homework assignments - coding questions.** You may collaborate with one other student for coding questions. It is an Honor Code violation to collaborate with more than one other student.

- **Code publishing.** You may not make your code publicly available in any form, for example in a public GitHub repository or personal website. You are still responsible for following these rules even after finishing the course.

- **Exam.** The exam must be completed individually. It is an Honor Code violation to discuss exams with other students before the exam is completed.

- **Previous semesters.** It is an Honor Code violation to possess, look at, use, or in anyway derive advantage from the existence of solutions prepared in prior years, whether these solutions were former students' work product or copies of solutions that had been made available by instructors.

If you are at all unsure whether your collaboration is allowed, please contact the course staff via Piazza, office hours, or email before you do anything. We will help you determine if what you're thinking of doing is in the spirit of collaboration for this class.

Wellness

If for any reason you are having difficulty in this course, please come talk to Dr. Burdick; we want to help. Any member of our community may experience stressors that can impact both their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, mental health, alcohol or other drugs, finances, etc.

If you are facing challenges, seeking help is a courageous thing to do for yourself and those who care about you. If the source of your stressors is academic, please contact

Dr. Burdick so that we can find solutions together.

Accommodations for Students with Disabilities

The University of Michigan recognizes disability as an integral part of diversity and is committed to creating an inclusive and equitable educational environment for students with disabilities. Students who are experiencing a disability-related barrier should contact Services for Students with Disabilities (**https://ssd.umich.edu/** ⤷ **(https://ssd.umich.edu/)** ; 734-763-3000 or ssdoffice@umich.edu). For students who are connected with SSD, accommodation requests can be made in Accommodate. If you have any questions or concerns please contact your SSD Coordinator or visit SSD's Current Student webpage. SSD considers aspects of the course design, course learning objects and the individual academic and course barriers experienced by the student. Further conversation with SSD, instructors, and the student may be warranted to ensure an accessible course experience.

Recordings

Course lectures may be audio/video recorded and made available to other students in this course. As part of your participation in this course, you may be recorded. If you do not wish to be recorded, please contact Dr. Burdick the first week of class to discuss alternative arrangements.

Students may not record or distribute any class activity without written permission from the instructor, except as necessary as part of approved accommodations for students with disabilities. Any approved recordings may only be used for the student's own private use.

Course Schedule

Week	Date	Lecture	Lab	Assignments
1	Tues, Aug 29	Lecture 1		
	Thurs, Aug 31	Lecture 2		
	Fri, Sept 1		Lab 1	
2	Tues, Sept 5	Lecture 3		
	Thurs, Sept 7	Lecture 4		
	Fri, Sept 8		Lab 2	
3	Tues, Sept 12	Lecture 5		
	Thurs, Sept 14	Lecture 6		
	Fri, Sept 15		Lab 3	

4	Tues, Sept 19	Lecture 7		
	Thurs, Sept 21	Lecture 8		
	Fri, Sept 22		Lab 4	
5	Tues, Sept 26	Lecture 9		
	Wed, Sept 27			Homework 1 due
	Thurs, Sept 28	Lecture 10		
	Fri, Sept 29		Lab 5	
6	Tues, Oct 3	Lecture 11		
	Thurs, Oct 5	Lecture 12		

	Fri, Oct 6		Lab 6	
7	Tues, Oct 10	Lecture 13		
	Wed, Oct 11			Project proposal due
	Thurs, Oct 12	Lecture 14		
	Fri, Oct 13		No lab this week!	
8	Tues, Oct 17	Fall break: no lecture		
	Thurs, Oct 19	Lecture 15		
	Fri, Oct 20		Lab 7	Homework 2 due
9	Tues, Oct 24	Lecture 16		
	Thurs, Oct 26	Lecture 17		
	Fri, Oct 27		Lab 8	

10	Tues, Oct 31	Lecture 18		
	Thurs, Nov 2	Lecture 19		
	Fri, Nov 3		Lab 9	Homework 3 due
11	Tues, Nov 7	Lecture 20		
	Thurs, Nov 9	Lecture 21		
	Fri, Nov 10		Lab 10: exam review (recorded, no assignment to complete)	
12	Tues, Nov 14	Lecture 22		
	Thurs, Nov 16	In-person exam (everything through Nov 9's lecture)		
	Fri, Nov 17		No lab this week!	

13	Tues, Nov 21	Lecture 23		Project progress report due
	Thurs, Nov 23	Thanksgiving break: no lecture		
	Fri, Nov 24		Thanksgiving break: no lab	
14	Tues, Nov 28	Lecture 24		
	Thurs, Nov 30	Lecture 25		
	Fri, Dec 1		Lab 11	
15	Tues, Dec 5	Project poster session		Project poster due
	Thurs, Dec 14			Project report due

Course Summary:

Date	Details	Due
Tue Aug 29, 2023	📝 **Lecture 1** (https://umich.instructure.com/courses/624730/assignments/214086)	due by 4:20pm
Fri Sep 1, 2023	🚀 **Lecture 2** (https://umich.instructure.com/courses/624730/assignments/213138)	due by 11:59pm
Mon Sep 4, 2023	📝 **Lab 1** (https://umich.instructure.com/courses/624730/assignments/209456)	due by 11:59pm
Wed Sep 6, 2023	🚀 **Lecture 3** (https://umich.instructure.com/courses/624730/assignments/213138)	due by 11:59pm
Fri Sep 8, 2023	🚀 **Lecture 4** (https://umich.instructure.com/courses/624730/assignments/213138)	due by 11:59pm
Wed Sep 13, 2023	📝 **Lab 2** (https://umich.instructure.com/courses/624730/assignments/209456)	due by 11:59pm
	🚀 **Lecture 5** (https://umich.instructure.com/courses/624730/assignments/213138)	due by 11:59pm
Fri Sep 15, 2023	🚀 **Lecture 6** (https://umich.instructure.com/courses/624730/assignments/213138)	due by 11:59pm
Mon Sep 18, 2023	📝 **Lab 3** (https://umich.instructure.com/courses/624730/assignments/209456)	due by 11:59pm
Fri Sep 22, 2023	🚀 **Lecture 8** (https://umich.instructure.com/courses/624730/assignments/213139)	due by 11:59pm
Mon Sep 25, 2023	🚀 **Lecture 7** (https://umich.instructure.com/courses/624730/assignments/213139)	due by 11:59pm
	📝 **Lab 4** (https://umich.instructure.com/courses/624730/assignments/209456)	due by 11:59pm
Wed Sep 27, 2023	🚀 **Lecture 2** (https://umich.instructure.com/courses/624730/assignments/213138)	due by 11:59pm

Date	Details	Due
	(1 student)	
	🚀 **Lecture 3** (https://umich.instructure.com/courses/624730/assignments/21...82 (1 student)	due by 11:59pm
	🚀 **Lecture 4** (https://umich.instructure.com/courses/624730/assignments/21...84 (1 student)	due by 11:59pm
	🚀 **Lecture 5** (https://umich.instructure.com/courses/624730/assignments/21...87 (1 student)	due by 11:59pm
	🚀 **Lecture 9** (https://umich.instructure.com/courses/624730/assignments/2131393	due by 11:59pm
	📝 **Homework 1** (https://umich.instructure.com/courses/624730/assignments/2094559	due by 11:59pm
Fri Sep 29, 2023	🚀 **Lecture 10** (https://umich.instructure.com/courses/624730/assignments/2131397	due by 11:59pm
Mon Oct 2, 2023	📝 **Lab 5** (https://umich.instructure.com/courses/624730/assignments/2094569	due by 11:59pm
Wed Oct 4, 2023	🚀 **Lecture 11** (https://umich.instructure.com/courses/624730/assignments/2131442	due by 11:59pm
Fri Oct 6, 2023	🚀 **Lecture 12** (https://umich.instructure.com/courses/624730/assignments/2131444	due by 11:59pm
Mon Oct 9, 2023	📝 **Lab 6** (https://umich.instructure.com/courses/624730/assignments/2094570	due by 11:59pm
Wed Oct 11, 2023	🚀 **Lecture 13** (https://umich.instructure.com/courses/624730/assignments/2131446	due by 11:59pm

Date	Details	Due
	📝 **Project Proposal (https://umich.instructure.com/courses/624730/assignments/209455**	due by 11:59pm
Fri Oct 13, 2023	🚀 **Lecture 14 (https://umich.instructure.com/courses/624730/assignments/213144**	due by 11:59pm
Fri Oct 20, 2023	📝 **Homework 2 (https://umich.instructure.com/courses/624730/assignments/209456**	due by 11:59pm
	🚀 **Lecture 15 (https://umich.instructure.com/courses/624730/assignments/213145**	due by 11:59pm
Mon Oct 23, 2023	📝 **Lab 7 (https://umich.instructure.com/courses/624730/assignments/209457**	due by 11:59pm
Wed Oct 25, 2023	🚀 **Lecture 16 (https://umich.instructure.com/courses/624730/assignments/213145**	due by 11:59pm
Fri Oct 27, 2023	🚀 **Lecture 17 (https://umich.instructure.com/courses/624730/assignments/213145**	due by 11:59pm
Mon Oct 30, 2023	📝 **Lab 8 (https://umich.instructure.com/courses/624730/assignments/209457**	due by 11:59pm
Wed Nov 1, 2023	🚀 **Lecture 18 (https://umich.instructure.com/courses/624730/assignments/213145**	due by 11:59pm
Fri Nov 3, 2023	🚀 **Lecture 19 (https://umich.instructure.com/courses/624730/assignments/213145**	due by 11:59pm
	📝 **Homework 3 (https://umich.instructure.com/courses/624730/assignments/209456**	due by 11:59pm
Mon Nov 6, 2023	📝 **Lab 9 (https://umich.instructure.com/courses/624730/assignments/209457**	due by 11:59pm
Wed Nov 8, 2023	🚀 **Lecture 20**	due by 11:59pm

Date	Details	Due
	[(https://umich.instructure.com/courses/624730/assignments/2131462](https://umich.instructure.com/courses/624730/assignments/2131462)	
Fri Nov 10, 2023	🚀 **Lecture 21** [(https://umich.instructure.com/courses/624730/assignments/2131463](https://umich.instructure.com/courses/624730/assignments/2131463)	due by 11:59pm
Wed Nov 15, 2023	🚀 **Lecture 22** [(https://umich.instructure.com/courses/624730/assignments/2131464](https://umich.instructure.com/courses/624730/assignments/2131464)	due by 11:59pm
Thu Nov 16, 2023	📝 **Exam** [(https://umich.instructure.com/courses/624730/assignments/2094551](https://umich.instructure.com/courses/624730/assignments/2094551)	due by 11:59pm
Tue Nov 21, 2023	📝 **Progress Report** [(https://umich.instructure.com/courses/624730/assignments/2094553](https://umich.instructure.com/courses/624730/assignments/2094553)	due by 11:59pm
Wed Nov 22, 2023	🚀 **Lecture 23** [(https://umich.instructure.com/courses/624730/assignments/2131468](https://umich.instructure.com/courses/624730/assignments/2131468)	due by 11:59pm
Wed Nov 29, 2023	🚀 **Lecture 24** [(https://umich.instructure.com/courses/624730/assignments/2131469](https://umich.instructure.com/courses/624730/assignments/2131469)	due by 11:59pm
Fri Dec 1, 2023	🚀 **Lecture 25** [(https://umich.instructure.com/courses/624730/assignments/2131504](https://umich.instructure.com/courses/624730/assignments/2131504)	due by 11:59pm
Mon Dec 4, 2023	📝 **Lab 11** [(https://umich.instructure.com/courses/624730/assignments/2094574](https://umich.instructure.com/courses/624730/assignments/2094574)	due by 11:59pm
Tue Dec 5, 2023	📝 **One Cool Thing** [(https://umich.instructure.com/courses/624730/assignments/2094550](https://umich.instructure.com/courses/624730/assignments/2094550)	due by 11:59pm
Thu Dec 14, 2023	📝 **Final Poster** [(https://umich.instructure.com/courses/624730/assignments/2094554](https://umich.instructure.com/courses/624730/assignments/2094554)	due by 11:59pm
	📝 **Final Report** [(https://umich.instructure.com/courses/624730/assignments/2094558](https://umich.instructure.com/courses/624730/assignments/2094558)	due by 11:59pm