

Fall 2024

## **MATH 462-001: Statistics Capstone I**

J.M. Loh

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### **Recommended Citation**

Loh, J.M., "MATH 462-001: Statistics Capstone I" (2024). *Mathematical Sciences Syllabi*. 421.  
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## MATH 462: Statistics Capstone I

### *Fall 2024 Course Syllabus*

**NJIT Academic Integrity Code:** All Students should be aware that the Department of Mathematical Sciences takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

### COURSE INFORMATION

**Course Description:** This is the first semester of a two-semester undergraduate-level statistical learning capstone course. The course provides an opportunity for students to synthesize knowledge gained during their undergraduate study by applying modern statistical tools to solve real-world projects. In this first semester course, basic statistical learning methods such as the following will be reviewed: statistical decision theory, linear/logistic regression, discriminant analysis, principal component analysis, high-dimensional data analysis, nearest neighbor methods, multiclass classification, and neural networks. Students will read relevant journal papers, work on data projects in groups, write up reports and deliver presentations. Capstone research topics will be selected approaching the end of the semester.

**Number of Credits:** 3

**Prerequisites:** Math 461, Math 478

**Course-Section and Instructors:**

Course-Section	Instructor
Math 462-001	Professor J. M. Loh

**Office Hours for All Math Instructors:** [Fall 2024 Office Hours and Emails](#)

**Required Textbook:**

Title	<i>No required textbook</i>
Author	-
Edition	-
Publisher	-
ISBN #	-

**University-wide Withdrawal Date:** The last day to withdraw with a W is **Monday, November 11, 2024**. It will be strictly enforced.

## POLICIES

**DMS Course Policies:** All DMS students must familiarize themselves with, and adhere to, the **Department of Mathematical Sciences Course Policies**, in addition to official **university-wide policies**. DMS takes these policies very seriously and enforces them strictly.

**Grading Policy:** The final grade in this course will be determined as follows:

<b>Homework/Projects</b>	100%

Your final letter grade will be based on the following tentative curve.

<b>A</b>	90 - 100	<b>C</b>	65 - 74
<b>B+</b>	85 - 89	<b>D</b>	55 - 64
<b>B</b>	80 - 84	<b>F</b>	0 - 54
<b>C+</b>	75 - 79		

**Attendance Policy:** Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and fully understand the **Math Department's Attendance Policy**. This policy will be strictly enforced.

**Homework/Project/Quiz Policy:** There will be regular homework assignments from the text and computing assignments using MATLAB. Students are advised to do as many homework problems in the textbook as possible. It is advisable that students familiarize themselves with MATLAB as early as possible. Several MATLAB resources are listed on p. 78 of the text. There will be MATLAB TAs who can assist with assignments.

**Exams:** There will be one midterm exam held in class during the semester and one comprehensive final exam.

Midterm Exam	TBA
Final Exam Period	December 15 to December 21, 2024

The final exam will test your knowledge of all the course material taught in the entire course. Make sure you read and fully understand the **Math Department's Examination Policy**. This policy will be strictly enforced.

**Makeup Exam Policy:** There will be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event an exam is not taken under rare circumstances where the student has a legitimate reason for missing the exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the Math Department Office/Instructor that the exam will be missed.

**Cellular Phones:** All cellular phones and other electronic devices must be switched off during all class times.

**Generative AI usage:** This course expects students to work without artificial intelligence (AI) assistance in order to better develop their skills in this content area. As such, AI usage is not permitted throughout this course under any circumstance.

## ADDITIONAL RESOURCES

**Math Tutoring Center:** Located in the Central King Building, Lower Level, Rm. G11 (See: [Fall 2024 Hours](#))

**Further Assistance:** For further questions, students should contact their instructor. All instructors have regular office hours during the week. These office hours are listed on the Math Department's webpage for [Instructor Office Hours and Emails](#).

**Accommodation of Disabilities:** The Office of Accessibility Resources and Services (OARS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you need an accommodation due to a disability, please contact the Office of Accessibility Resources and Services at [oars@njit.edu](mailto:oars@njit.edu), or visit Kupfrian Hall 201 to discuss your specific needs. A Letter of Accommodation Eligibility from the office authorizing student accommodations is required.

For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the Office of Accessibility Resources and Services (OARS) website at:

<https://www.njit.edu/accessibility/>

**Important Dates** (See: [Fall 2024 Academic Calendar, Registrar](#))

Date	Day	Event
September 2, 2024	Monday	Labor Day
September 3, 2024	Tuesday	First Day of Classes
September 9, 2024	Monday	Last Day to Add/Drop Classes
November 11, 2024	Monday	Last Day to Withdraw
November 26, 2024	Tuesday	Thursday Classes Meet
November 27, 2024	Wednesday	Friday Classes Meet
November 28 to December 1, 2024	Thursday and Sunday	Thanksgiving Recess - Closed
December 11, 2024	Wednesday	Last Day of Classes
December 12, 2024	Thursday	Reading Day 1
December 13, 2024	Friday	Reading Day 2
December 15 to December 21, 2024	Sunday to Saturday	Final Exam Period

## Course Outline (tentative)

Week	Topic
1	<i>Introduction and overview of statistical topics; regression project</i>
2	<i>Regression project; Brain blood barrier project</i>
3	<i>Brain blood barrier project; SIR infection model project</i>
4	<i>SIR infection model project</i>
5-6	<i>Survival analysis project; Amphibian data project</i>
7-8	<i>Phylogenetic trees project; GWAS data project</i>
9-10	<i>Spatial analysis: mapping, intensity estimation, modeling, and Gaussian Processes; spatial data project</i>
11-12	<i>Neural networks using Torch; Mortality data project</i>
13-14	<i>Neural networks; Material Science project</i>

*Updated by Professor J. M. Loh - 8/2024  
Department of Mathematical Sciences Course Syllabus, Fall 2024*