Course Syllabus

Course title: Statistics
Course number: MA-GY 6963
Semester: Spring 2021

Lecture: Wed 11:00am – 1:30pm

Instructor: Mike O'Neil
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Prerequisites: Undergraduate-level proficiency in linear algebra and multivariable calculus; graduate-level proficiency in probability, at the level of MATH-GA 2901, MA-GY 6813, or ECE-GY 6303.

Description: Topics to be covered in this course include various statistical models (sampling model, randomization methods), estimation and margins of error (MLE, confidence intervals, asymptotic theory, efficiency and sufficiency, robustness), likelihood theory (score functions and ratio tests), Bayes theory, decision theory (hypothesis testing, goodness of fit, shrinkage), and finally, an introduction to some common computational methods (bootstrap, Markov Chain-Monte Carlo).

Materials: There will be three textbooks for the course, two of which are available via NYU on SpringerLink. The texts are:
  ● Wasserman, *All of Statistics*, Springer, 2004
  ● Wasserman, *All of Nonparametric Statistics*, Springer, 2006
  ● Casella and Berger, *Statistical Inference*, 2nd Ed., Cengage, 2001

Participation: Since the course will be administered remotely, there will be a participation component to the overall grade based on student engagement via the platform Campuswire.

Asynchronous learning: Lectures via Zoom will be recorded, however, students will be encouraged to participate synchronously.

Homework: Homework problems will be suggested roughly every week, but will not be collected.

Quizzes: There will be quizzes roughly every other week administered via Gradescope.

Exams: There will be 3 exams during the semester: two preliminary exams and one final exam. The exams will be remotely proctored.

Grading: The overall course letter grade will be determined based on a final numerical weighted average. The following breakdown will be used to compute an overall numerical grade:

15%	Participation
20%	Quizzes
20%	Exam 1
20%	Exam 2
25%	Final exam

NYU's academic integrity policies will be strictly enforced for quizzes and exams, especially since they will be proctored online.

Weekly schedule:
1. Probability and random variables review
2. Convergence of random variables (types of convergence, limit theorems)
3. Empirical distributions, method of moments
4. Maximum likelihood estimators
5. Exam 1
6. Hypothesis testing, p-values
7. Bayesian inference
8. Linear and logistic regression
9. Principal component analysis
10. Exam 2
11. Independence and causal inference
12. Density estimation
13. The bootstrap and the jackknife, Markov chain Monte Carlo
14. Nonparametric regression
15. Final exam