- Lectures will be synchronous (live), via zoom. The zoom link can be found for enrolled students on Blackboard under the Zoom Meeting tab on the left.
  Please do not distribute the zoom link and please do not cause any disruption on the zoom lectures. Any such incidents will be reported to the Office of Judicial Affairs.
- All lectures will be automatically recorded by the Blackboard zoom account and will be available on the Zoom Meeting tab on Blackboard (usually a couple hours after the lecture).
- All lecture slides and code used in the class will be made available on this website (under the syllabus section) after class.

- Office hours will be via zoom. Information on this will be provided early in the semester once office hours are finalized.

- All offline communication will be via piazza; please sign up. You are responsible for monitoring piazza to ensure you do not miss important class announcements.

- Exams will be held remotely in an online manner via Blackboard.
- Assignments will be released via Blackboard (under the Assignments tab) and will need to be submitted online via the link that Blackboard provides.
- Assignment, exam, and project grades will be uploaded on Blackboard by the TAs along with summary comments on the grading scheme. Any regrading issues must be directed to the TAs.

Please email the instructor if you have any problems with remote instruction, such as a poor network connection, unaccommodating environment, or time zone issues.

Syllabus & Schedule

Date	Topic	Readings	Notes
Jan 24 (Mon) [Lec 01]	Course introduction, class logistics		
Jan 26 (Wed) [Lec 02]	Probability review - 1 • Basics: sample space, outcomes, probability • Events: mutually exclusive, independent • Calculating probability: sets, counting, tree diagram	AoS 1.1 - 1.5 MHB 3.1 - 3.4	

Jan 31 (Mon) [Lec 03]	Probability review - 2 • Conditional probability • Law of total probability • Bayes' theorem	AoS 1.6, 1.7 MHB 3.3 - 3.6	**assignment 1 out**, due Feb 9
Feb 02 (Wed) [Lec 04]	Random variables - 1: Overview and Discrete RVs • Discrete and Continuous RVs • Mean, Moments, Variance • pmf, pdf, cdf • Discrete RVs: Bernoulli, Binomial, Geometric, Indicator	AoS 2.1 - 2.3, 3.1 - 3.4 MHB 3.7 - 3.9	
Feb 07 (Mon) [Lec 05]	Random variables - 2: Continuous RVs • Uniform(a, b) • Exponential(λ) • Normal(μ, σ^2), and its several properties	AoS 2.4, 3.1 - 3.4 MHB 3.7 - 3.9, 3.14.1	Python scripts: draw_Bernoulli, draw_Binomial, draw_Geometric, draw_Uniform, draw_Exponential, draw_Normal
Feb 09 (Wed) [Lec 06]	Random variables - 3: Joint distributions & conditioning • Joint probability distribution • Linearity of expectation	AoS 2.5 - 2.8 MHB 3.10 - 3.13, 3.15	assignment 2 out, due Feb 23 **assignment 1 due**
Feb 14 (Mon) [Lec 07]	Random variables - 4: Joint distributions & conditioning • Independent random variables • Product of expectation • Conditional expectation	AoS 2.5 - 2.8 MHB 3.10 - 3.13, 3.15	
Feb 16 (Wed) [Lec 08]	Probability Inequalities • Weak Law of Large Numbers • Central Limit Theorem	AoS 5.3, 5.4 MHB 3.14.2, 5.2	
Feb 21	Markov chains • Stochastic processes	AoS 23.1 - 23.3	

(Mon) [Lec 09]	• Setting up Markov chains • Balance equations	MHB 8.1 - 8.7	
Feb 23 (Wed) [Lec 10]	Non-parametric inference - 1 • Basics of inference • Simple examples • Empirical PMF • Sample mean • bias, se, MSE	AoS 6.1 - 6.2, 6.3.1	assignment 3 out, due March 4 Required data: a3_q2.csv, a3_q4.csv, a3_q8.csv **assignment 2 due**
Feb 28 (Mon) [Lec 11]	Non-parametric inference - 2 • Empirical Distribution Function (or eCDF) • Kernel Density Estimation (KDE) • Statistical Functionals • Plug-in estimator	AoS 7.1 - 7.2	Python scripts: sample_Bernoulli, sample_Binomial, sample_Geometric, sample_Uniform, sample_Exponential, sample_Normal, draw_eCDF
Mar 02 (Wed) [Lec 12]	Confidence intervals • Percentiles, quantiles • Normal-based confidence intervals • DKW inequality	AoS 6.3.2, 7.1	
Mar 07 (Mon) [Lec 13]	Parametric inference - 1 • Consistency, Asymptotic Normality • Basics of parametric inference • Method of Moments Estimator (MME)	AoS 6.3.1 - 6.3.2, 9.1 - 9.2	
Mar 09 (Wed)	Mid-term 1		Via Blackboard
Mar 14 (Mon)	No class		Spring Break
Mar 16 (Wed)	No class		Spring Break

Mar 21 (Mon) [Lec 14]	Parametric inference - 2 • Properties of MME • Basics of MLE • Maximum Likelihood Estimator (MLE) • Properties of MLE	AoS 9.3, 9.4, 9.6	assignment 4 out
Mar 23 (Wed) [Lec 15]	Hypothesis testing - 1 • Basics of hypothesis testing • Wald test	AoS 10 - 10.1 DSD 5.3.1	
Mar 28 (Mon) [Lec 16]	Hypothesis testing - 2 • Type I and Type II errors • Wald test	AoS 10 - 10.1 DSD 5.3.1	
Mar 30 (Wed) [Lec 17]	Hypothesis testing - 3 • Z-test • t-test	AoS 10.10.2 DSD 5.3.2	
Apr 04 (Mon) [Lec 18]	Hypothesis testing - 4 • Kolmogorov-Smirnov test (KS test) • p-values	AoS 15.4, 10.2 DSD 5.3.3, 5.5	assignment 5 out **assignment 4 due**
Apr 06 (Wed) [Lec 19]	Hypothesis testing - 5 • p-values • Permutation test	AoS 10.2, 10.5 DSD 5.5	
Apr 11 (Mon) [Lec 20]	Hypothesis testing - 6 • Pearson correlation coefficient • Chi-square test for independence	AoS 3.3, 10.3 - 10.4 DSD 2.3	
Apr 13	Bayesian inference - 1 • Bayesian reasoning	AoS 11.1 - 11.2, 11.6	

(Wed) [Lec 21]	• Bayesian inference	DSD 5.6	
Apr 18 (Mon) [Lec 22]	Bayesian inference - 2 • Priors • Conjugate priors	AoS 11.1 - 11.2, 11.6 DSD 5.6	assignment 6 out **assignment 5 due**
Apr 20 (Wed) [Lec 23]	Regression - 1 • Basics of Regression • Simple Linear Regression	AoS 13.1, 13.3 - 13.4 DSD 9.1	
Apr 25 (Mon) [Lec 24]	Regression - 2 • Multiple Linear Regression	AoS 13.5 DSD 9.1	
Apr 27 (Wed) [Lec 25]	Time Series Analysis • EWMA Time Series modeling • AR Time Series modeling		**assignment 6 due**
May 02 (Mon) [Lec 26]	Project discussion		
May 04 (Wed)	Mid-term 2		Via Blackboard

Resources

- **Required text: (AoS) "All of Statistics : A Concise Course in Statistical Inference" by Larry Wasserman (Springer publication)**.
  - Students are strongly suggested to purchase a copy of this book.