

Probability Theory 2, Spring 2024 - Final project

For your final project, you will collaborate in trios to explore a selected topic deeply. You have until Friday, April 10, 2024, to choose your subject. This project consists of two main components: a presentation and a report detailing your findings and insights on the chosen topic. In the upcoming sections, we will delve into potential themes for your project and outline the specifics for both the presentation and the report.

Topics

Below is a list of suggested topics for your final project. While you are encouraged to select from these, you have the freedom to propose an alternative subject. Should you opt for a different topic, please communicate your choice to the instructor for approval by no later than April 10, 2024.

- Concentration Inequalities via Martingales (Ref1, Ref2).
- Ergodic Theorems (Chapter 6 of Ref3, Ref4).
- Multidimensional Brownian Motion (Chapter 9 of Ref3).
- Random Walks on Groups (Chapter 3 Ref5).
- Martingale CLT (Chapter 8 of Ref3, Ref6).
- Stochastic Calculus (Ref7, Ref8).
- Mixing times (Chapters 4 and 5 of Ref9, Ref10).
- Harris Chains (Chapter 5.8 of Ref3, Ref11).

Presentation

Each group is tasked with delivering a captivating one-hour presentation during the course's final week. It's imperative that every group member actively participates, contributing approximately 20 minutes each. Your presentation should be engaging and informative, avoiding mere recitation from sources. Focus on elucidating a key result or concept, its relevance, implications, and potential for opening new avenues of research. Aim to include a proof or its outline, ensuring the content is accessible and engaging for your audience.

Report

The final report is due by Friday, May 10, 2024, and should be submitted via Gradescope. Write your report in clear and simple English, and type it using \LaTeX . Incorporate figures to enhance understanding and aim for a narrative that is easy to follow. This document should cover the content discussed in class, enriched with additional details for a more thorough exploration. While it is not necessary to include every proof in detail, strive to provide intuitive explanations and sketches of proofs to convey the essence of the results. The report should span 5 to 10 pages.