Proof-Based Math Readings
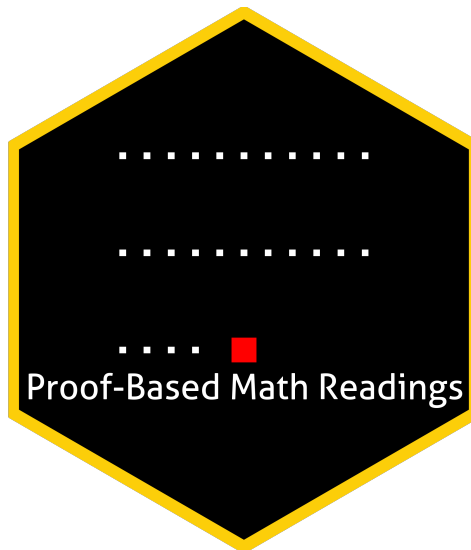# Session: Statistics
2024 Summer

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Click here for the most recent versions of the syllabuses

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0 Motivation

- *Proof-Based Math Readings* is a free and independent online reading group where we study mathematics required in economics master's/PhD programs using an intuitive approach.
- This session of the reading group is on *Statistics.*

1 Prerequisites

- CGPA: 3.00/4.00.
- Introduction to Probability - Dimitri P. Bertsekas, John N. Tsitsiklis (2nd Edition, 2008, Summary Material)
- Introduction to Probability - Dimitri P. Bertsekas, John N. Tsitsiklis (2nd Edition, 2008, Playlist)
- Introduction to Probability - Dimitri P. Bertsekas, John N. Tsitsiklis (2nd Edition, 2008, Solutions & Errata)
- Please use the 🔗 Application Form to join our reading group.
- Applicants are informed about their application results within a week via email.

2 Format

- This session takes 12 weeks.
- We discuss the topics/exercises that we struggle with at 💬 Proof-Based Math Readings [Discord].
- We do not have face-to-face/online meetings due to the size of the group.
- Members are expected to read the chapters, and watch the chapter videos from the book's playlist.

3 Resources

3.1 Main Book and Main Book's Playlist

Statistical Inference (2nd Edition, 2001 or 2024) by George Casella and Roger Berger is our main book because it is well-written and well-structured. The 2024 version of the book is just errata-free reprint of the 2001 version.

- Statistical Inference - George Casella, Roger Berger (2nd Edition, 2001 or 2024)
- Statistical Inference - George Casella, Roger Berger (2nd Edition, 2001, Errata)
- Statistical Inference - George Casella, Roger Berger (2nd Edition, 2001 or 2024, Solutions)
- Statistical Inference - George Casella, Roger Berger (2nd Edition, 2001 or 2024, Playlist for Chapter 1-5)
- Statistical Inference - George Casella, Roger Berger (2nd Edition, 2001 or 2024, Playlist for Chapter 5-9)

3.2 Supplementary

3.2.1 Statistics

- Introduction to Mathematical Statistics - Jingyi Jessica Li (2022)
- Mathematical Statistics - Jem N. Corcoran (2024)
- The Book of Statistical Proofs - Joram Soch (2024)

3.2.2 Proof

- Book of Proof - Richard Hammack (3.3 Edition, 2022)
- Book of Proof - Richard Hammack (3.3 Edition, 2022, Playlist by Jeremy Teitelbaum)
- Book of Proof - Richard Hammack (3.3 Edition, 2022, Playlist by Michael Penn)

3.2.3 Real Analysis

- Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.0, 2023)
- Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.0, 2023, Playlist by Casey Rodriguez)
- Introduction To Metric Spaces - Paige Bright (2023)

4 Reading Schedule

- **SI** is the abbreviation of Statistical Inference - George Casella, Roger Berger (2nd Edition, 2001 or 2024).

📕 SI, Chapter 1: Probability Theory   **Week 01** 📅

> **1.1** Set Theory, **1.2** Basics of Probability Theory, **1.3** Conditional Probability and Independence,
> **1.4** Random Variables, **1.5** Distribution Functions, **1.6** Density and Mass Functions

📕 SI, Chapter 2: Transformations and Expectations   **Week 02** 📅

> **2.1** Distributions of a Random Variable
> **2.2** Expected Values
> **2.3** Moments and Moment Generating Functions

📕 SI, Chapter 3: Common Families of Distributions   **Week 03-04** 📅

> **3.1** Introduction
> **3.2** Discrete Distributions
> **3.3** Continuous Distributions
> **3.4** Exponential Families
> **3.5** Location and Scale Families
> **3.6** Inequality and Identities

📕 SI, Chapter 4: Multiple Random Variables   **Week 05-06** 📅

> **4.1** Joint and Marginal Distributions
> **4.2** Conditional Distributions and Independence
> **4.3** Bivariate Transformations
> **4.4** Hierarchical Models and Mixture Distributions
> **4.5** Covariance and Correlation
> **4.6** Multivariate Distributions
> **4.7** Inequalities

📕 SI, Chapter 5: Properties of a Random Sample   **Week 07-08** 📅

> **5.1** Basic Concepts of Random Samples
> **5.2** Sums of Random Variables from a Random Sample
> **5.3** Sampling from the Normal Distribution
> **5.4** Order Statistics
> **5.5** Convergence Concepts
> **5.6** Generating a Random Sample

📕 SI, Chapter 6: Principles of Data Reduction   **Week 09-10** 📅

> **6.1** Introduction
> **6.2** The Sufficiency Principle
> **6.3** The Likelihood Principle

📕 SI, Chapter 7: Point Estimation   **Week 11-12** 📅

> **7.1** Introduction
> **7.2** Methods of Finding Estimators
> **7.3** Methods of Evaluating Estimators