

Proof-Based Math Readings

Session: Statistics

2024 Summer

Zeki Akyol*

Department of Economics

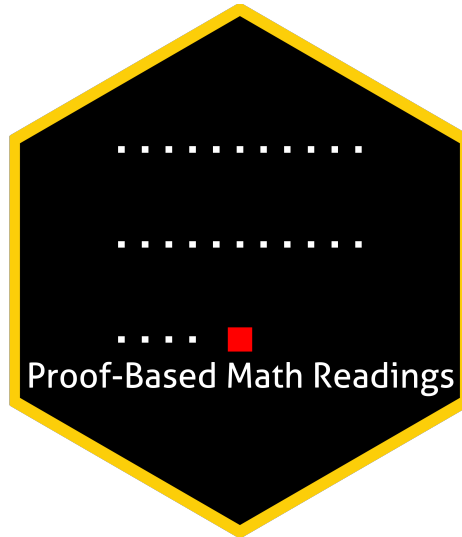
Istanbul Technical University

[Click here for the most recent versions of the syllabuses](#)

Version: 04 January 2025, 09:38 AM

Table of contents

0	Motivation	2
1	Prerequisites	2
2	Format	2
3	Resources	2
3.1	Main Book and Main Book's Playlist	2
3.2	Supplementary	2
3.2.1	Statistics	2
3.2.2	Proof Techniques	2
3.2.3	Real Analysis	2
4	Reading Schedule	3



*zekiakyol.com


0 Motivation

- *Proof-Based Math Readings* is a free, independent online reading group where we study the mathematics required for economics master's and PhD programs through an intuitive approach. Active since May 2023.
- This session of the reading group is on *Statistics*.

1 Prerequisites

- [Introduction to Probability - Dimitri Bertsekas, John Tsitsiklis \(2nd Edition, 2008, Summary Material\)](#)
- [Introduction to Probability - Dimitri Bertsekas, John Tsitsiklis \(2nd Edition, 2008, Playlist\)](#)
- [Introduction to Probability - Dimitri Bertsekas, John Tsitsiklis \(2nd Edition, 2008, Solutions & Errata\)](#)
- Please use the [🔗 Application Form](#) to join our reading group; you will receive a response within a week.

2 Format

- This session takes 12 weeks. We do not have face-to-face/online meetings due to the size of the group.
- Members read the main book and discuss the topics/exercises in the Proof-Based Math Readings Discord .

3 Resources

3.1 Main Book and Main Book's Playlist

Statistical Inference - George Casella, Roger Berger (2nd Edition, 2001 or 2024) is our main book because it is well-written and well-structured. The 2024 version is an 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 \(2024\)](#)
- 📖 [The Epic Story of Maximum Likelihood Stephen - M. Stigler \(2008\)](#)

3.2.2 Proof Techniques

- 📖 [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 \(Version 6.1, 2024\)](#)
- ▶ [Basic Analysis I: Introduction to Real Analysis - Jiri Lebl \(Version 6.1, 2024, Playlist by Casey Rodriguez\)](#)
- ▶ [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 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