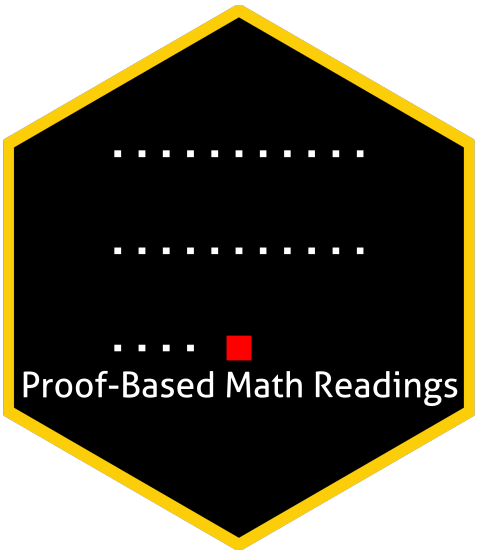
Proof-Based Math Readings
Session: Statistics
2024 Summer

Zeki Akyol*
Department of Economics
Istanbul Technical University
Click here for the most recent versions of the syllabuses

Version: 07 July 2024, 02:54 PM

Table of contents



*zekiakyol.com

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 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)

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** 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