Mathematical Statistics I

Chapter 3: Joint Distributions

Jesse Wheeler

Outline

Introduction

Introduction

- This material is based on the textbook by Rice (2007, Chapter 3).
- Our goal is to better understand the joint probability structure of more than one random variable, defined on the same sample space.
- One reason that studying joint probabilities is an important topic is that it enables us to use what we know about one variable to study another.

Joint cdf

- Just like the univariate case, the joint behavior of two random variables, X and Y, is determined by the cumulative distribution function

$$F(x, y) = P(X \leq x, Y \leq y).$$

- This is true for both discrete and continuous random variables.

References and Acknowledgements

- Compiled on August 15, 2025 using R version 4.5.1.
- Licensed under the Creative Commons Attribution-NonCommercial license. Please share and remix non-commercially, mentioning its origin.
- We acknowledge students and instructors for previous versions of this course / slides.

References and Acknowledgements II

Rice JA (2007). *Mathematical statistics and data analysis*, volume 371. 3 edition. Thomson/Brooks/Cole Belmont, CA.