

Probability Theory and Statistics

Werner Nutt

Acknowledgments

- The course is based on the book
**“Probability and Statistics
for Engineers and Scientists”**,
by **Sheldon M. Ross**, Elsevier Academic Press.
- We follow the script **“Probability Theory and Statistics”**
by **Rafael Penaloza**, who taught this course until 2018/19.
- We also use teaching material (exercises, tables etc.)
created by Rafael, as well as new exercises and
assignments.

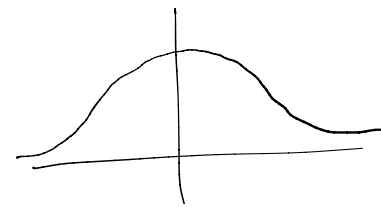
Overview

- Introduction to Probability Theory
- Random Variables
- Special Random Variables
- Sampling
- Parameter Estimation
- Hypothesis Testing

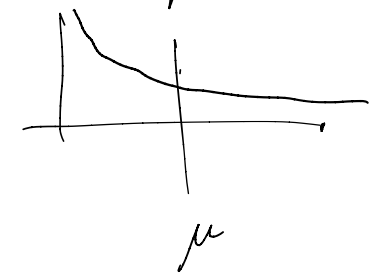
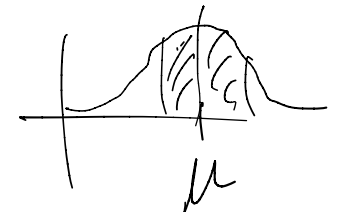
Confidence intervals
p-values

Distribution

Bayesian Reasoning
Bayes' Law



Mean μ
Variance σ^2



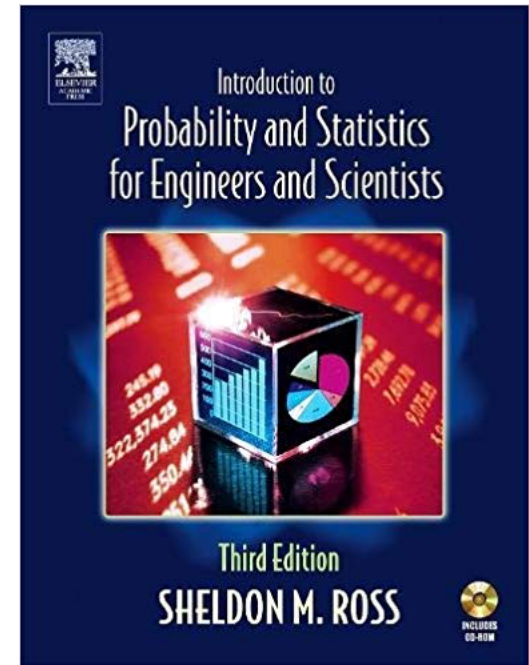
Learning Outcomes

- **Concepts** of probability theory and statistics
(sample space, probability, independence, random variable, distribution density, mean, variance, joint distribution, binomial, normal, exponential, Poisson distribution, confidence interval, p-values, ...)
- **Apply the tools** of probability theory and statistics to simple data analysis tasks
- Use the **R language** to solve answer statistical questions
- **Foundation** for further studies

Literature

Sheldon M. Ross

*Introduction to Probability and
Statistics for Engineers and Scientists*
Elsevier Academic Press, 2004



Course is based on this book

The book is available online via the library.

Other Literature

Script

Probability Theory and Statistics
by Rafael Penaloza

Rafael held the course in 2017/18 and 2018/19

On OLE

Course Organization

- Lectures: Tue 10-12, Thu 10-12
- Labs (starting 13 October): Tue 16-18
by

Pietro Galliani, Werner Nutt, Andy Rivkin

- Office hours
 - Pietro Galliani: Wed 9:00 – 10:00
 - Werner Nutt: Fri 14:00 – 15:30
 - Andy Rivkin: Tue 14:00 – 14:30
(but let us know if you want to talk)

Assignments

There will be 3 assignments

- Assignments will be **marked**. The assignment mark will count towards the course mark.
- Any attempt at **plagiarism** (copying from the web or copying from other students) leads to a **0 mark** for **all assignments**.

Assignments, Final Exam, and Course Mark

- There will be
 - one **written exam** at the end of the course
 - three **assignments**
- To pass the course, one has to pass the written exam.
- Students who do not submit assignments will be marked on the final exam alone.
- For students who submit all assignments the final mark will be a weighted average
$$70\% \text{ exam mark} + 30\% \text{ assignment mark}$$

Assignments, Final Exam and Course Mark

- If students submit fewer assignments, the percentage will be lower.
- Assignments for which the mark is lower than the mark of the written exam will not be considered.
- The assignment marks apply to all future exam sessions.

Lecture Style

- Lectures will generally be by writing on my iPad, without slides (to imitate chalk and blackboard)
- Lectures will be very close to the script
- I will use handwritten notes for my lectures, which I will publish on OLE
- Still, taking handwritten notes is likely to be useful
- (In my on-premise lectures, phones, etc. are not allowed: There is ample evidence that learning in lectures is more effective without them.)

Interaction

In my presence lectures I like to

- answer questions by students
- ask questions to students
- give little exercises, to check understanding

We will have to experiment to see how that works in online teaching.