

Module 1.1: Overview

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Fun Fact: *Gauss can recite all of π , backwards.*

1.1 Logistics

1.1.1 Materials Covered

We will strictly follow the book:

Dimitri P. Bertsekas, & John N. Tsitsiklis. *Introduction to Probability*. 2nd Edition. Athena Scientific, Belmont, Massachusetts. 2008. (We will refer the book as “BT” hereafter.)

We will cover Chapter 1, Chapter 2, Chapter 3, and selected topics in Chapters 4, 5, 6, 7.

1.1.2 Overview

Chapter 1

- definition of probability models
- probabilities, conditional probabilities
 - “probability that a person lives past 80?”
 - “probability that a person lives past 80 *given that he/she is in Hawaii?*”
- Bayes’ rule
 - “if a person lives past 80, what is the probability that he/she is in Hawaii?”
- independence
 - “a person lives past 80” vs “a person drives a white car”

Chapter 2 and Chapter 3

- random variable for more versatile description of uncertainty
 - “age distribution” vs “mean age, median age, variance of age”
 - “ticket price as a *function* of age”
- multiple random variables

- “age” and “income”
 - “ mean age given that income is in the 90 percentile”
- independence
 - “age” and “gender”

Selected topics in Chapter 4 and Chapter 5

- limit theorems
 - “average age of a large population”

1.1.3 Tips

- We will go over *a lot of* example and exercise problems in the book. Homeworks and exams are *very similar* to these problems. Please make sure to attend the lecture and understand these problems.
- Lecture notes will be posted before lectures. Please feel free to look at them before the lectures.
- Please ask questions during the lectures!
- Please ask questions more than last time!
- Please ask questions harder than last time!

Read BT Chapter 1.1.

1.2 What is “Probability”?

Probability is a tool to discuss **uncertainty**.

Different views of probability:

- Frequency of occurrence (Frequentist statistician)
- Subjective beliefs (Bayesian statistician)

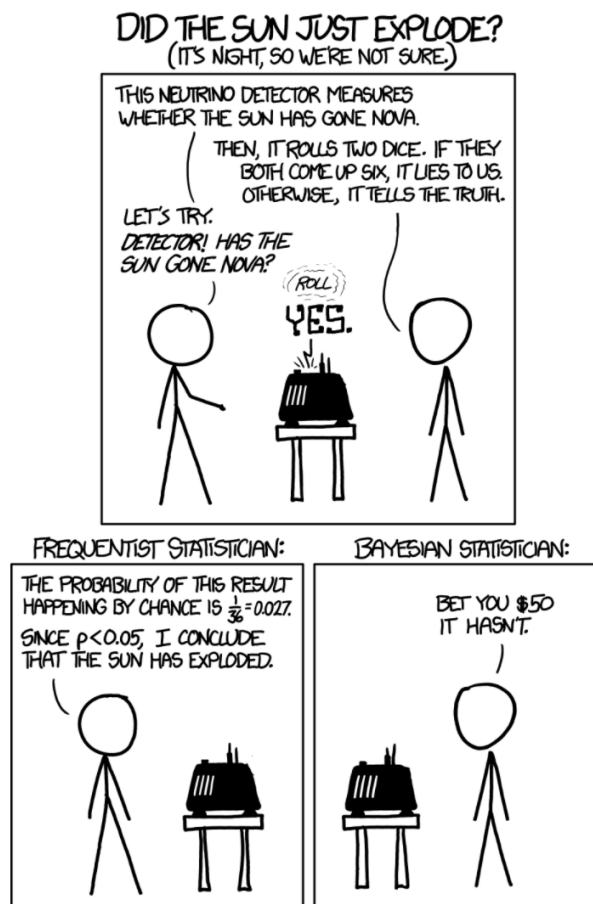


Figure 1.1: A comic from xkcd.com (probably designed by someone in favor of Bayesian statisticians...). This is not accurate, but roughly illustrates the differences between the two viewpoints of probability.

We need a unified framework for rigorous discussion of uncertainty and probabilistic models.