PUBH 526

Topic 1, Part 1: Introduction and Review

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Introductions

- Your name
- What degree(s) are you working on?
- What is one application of statistics that you've found especially cool?

About This Course

- This is a statistics course
- Please make sure to read the syllabus completely, and ask any questions
- Additional details can be found on Brightspace
- We will rely on Brightspace a lot for communication, assignments, etc. … please check site often

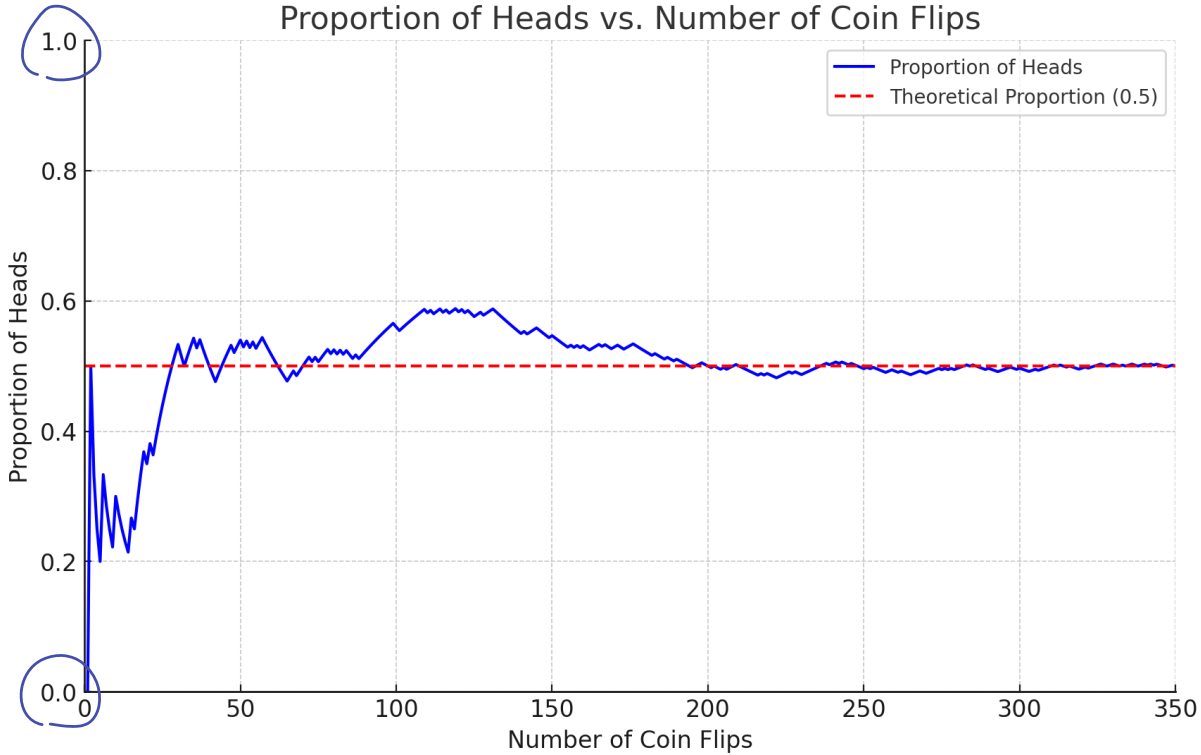
Probability

- Randomness … uncertainty, but with known (or assumed) structure
- Long-run or limiting frequency Approaching theoretical ex): 0.5
- What are some properties of probabilities?

① $[0, 1]$ → $0 < P(E) < 1$ ↓ Impossible → certain

② Entire set of possible outcomes = Always 1.

③ Prob of Event + No Event (Complement) = Also 1.



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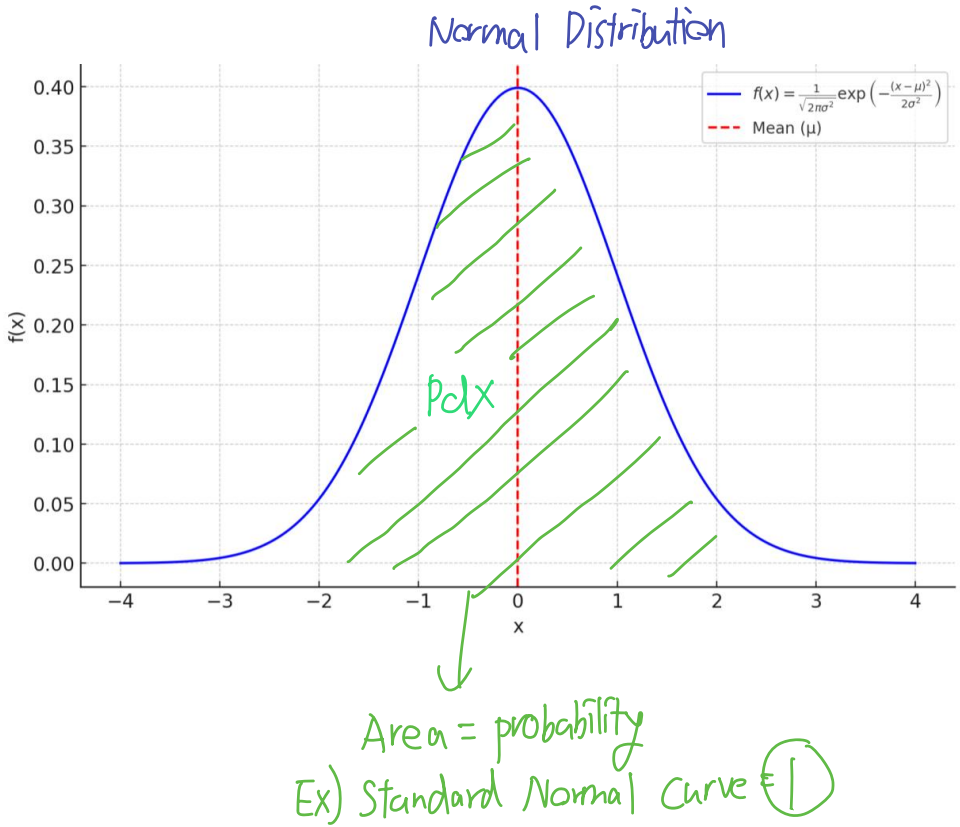
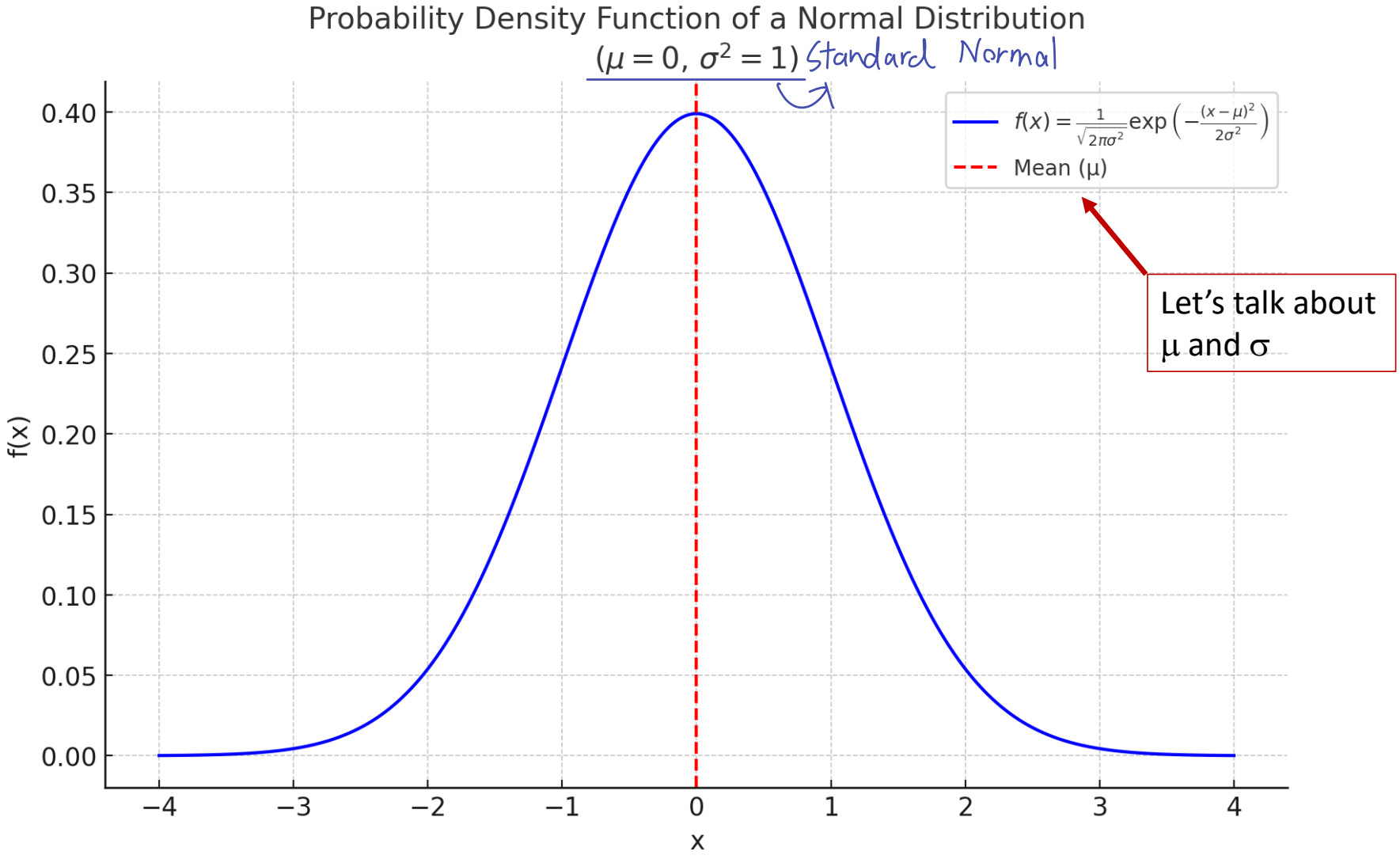
Random Variable

- The outcome of a process involving chance
  - Often denoted with a capital letter, e.g., X
- Before this process happens, there are different possible values, with different probabilities
- Once the process happens, you have one realized value
  - Often denoted with a lower-case letter: X = *x*
- This is all in contrast to a **constant**





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"Distributed As..."

Normal Distribution

$X \sim N(\mu, \sigma^2)$ (Mean, Variance)

↓ Random Variable

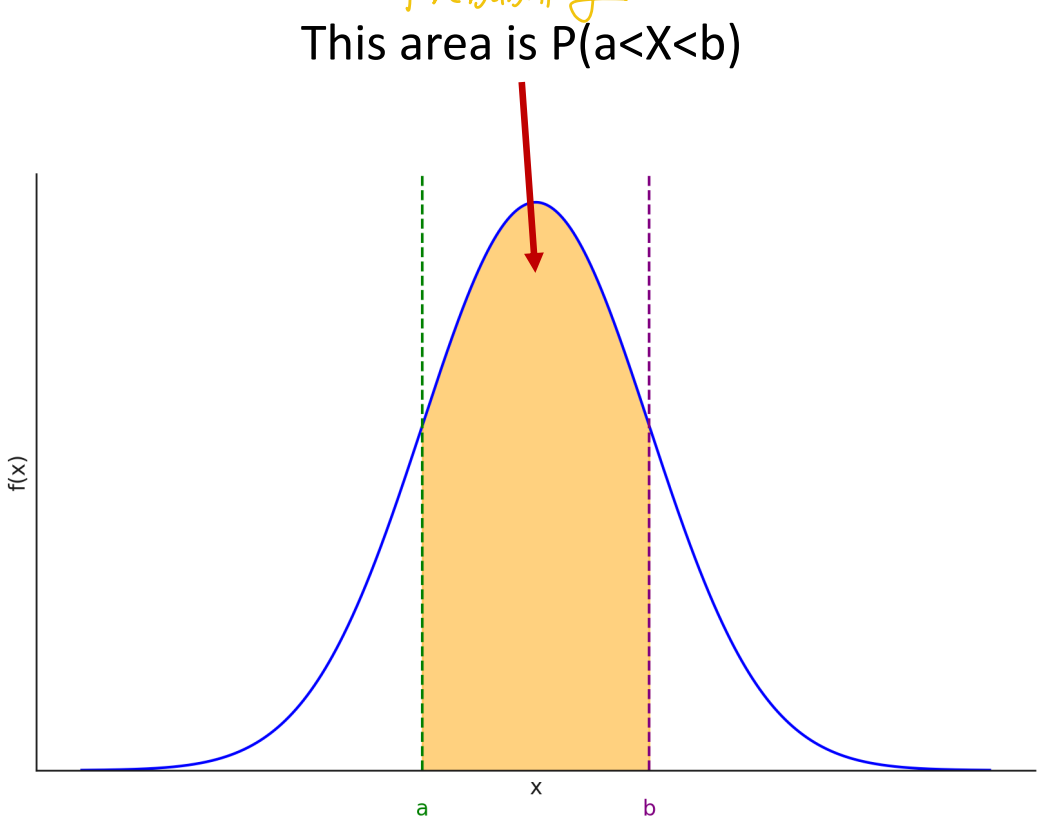
What are the possible *x* for a normally distributed random variable?

What is the total area under the curve of this PDF? Sum = 1

Probability [0,1]

Area

Probability



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Expected Value

- The expected value of a random variable, X, is its average, denoted E(X)
- Some random variables do not have an expected value!
- If $X \sim N(\mu,\sigma^2)$, then what is E(X)?

Depends on whether the mean exists

Average

$E(X) = \mu$

parameter: unknown constant

statistic: unknown estimate of parameter

sampling distribution: distribution of statistic Ex: $\bar{X}$

what's a bad estimate?

↳ outliers

↳ random noise

↳ bias ... etc.