Lecture 10: Bernoulli and Geometric Random Variables

Chapter 3.3-3.5

Goals for Today

Define

- Bernoulli random variables
- Geometric random variables

Mathematical Definition of a Bernoulli Random Variable

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A random variable X is a random process or variable with a numerical outcome.

Random variables are described in terms of their distribution.

Bernoulli Distribution

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Bernoulli Distribution

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- Coin flips: heads vs tails
- Medical test (for a disease): positive vs negative
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Bernoulli Distribution

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- Coin flips: heads vs tails
- Medical test (for a disease): positive vs negative
- Rolling a die and getting a 6 vs not getting a 6

In each case we can define the outcomes to be success vs failure. No moral judgement; just labels.

Bernoulli Distribution

Definition of a Bernoulli Random Variable

Intuition Behind σ

Sample Proportion

Example of Bernoulli Distribution

Back to Lecture 3.1: Population vs Sample Values

	True Population Value	Sample Value
Mean	μ	$\overline{x}$
Variance	σ^2	s^2
Standard Deviation	σ	s
Proportion	p	$\widehat{p}$

Back to Lecture 3.1: Population vs Sample Values

	True Population Value	Sample Value
Mean	μ	$\overline{x}$
Variance	σ^2	s^2
Standard Deviation	σ	s
Proportion	p	$\widehat{p}$

The sample proportion $\widehat{p}$ is a specific kind of sample mean for Bernoulli random variables, which estimates p, a specific kind of population mean.

Scenario

Geometric Random Variables

Intuition Behind μ

Yesterday's Quiz: Placebos

Question 1: Is Dr. Irving Kirsch arguing that anti-depressants are no better than placebos for everyone with depression?

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Question 1: Is Dr. Irving Kirsch arguing that anti-depressants are no better than placebos for everyone with depression?

Solution: No, while he argued that anti-depressants were no better than placebo for those with mild to moderate depression, he is of the opinion that there is clinical benefit for those who are severely depressed.

Yesterday's Quiz: Placebos

Question 2: What is Dr. Walter Brown's (bald guy from Yale) criticism of the way the FDA approves anti-depressants?

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Question 2: What is Dr. Walter Brown's (bald guy from Yale) criticism of the way the FDA approves anti-depressants?

Solution: That all that is required are two clinical trials where the drug performs better than placebo, regardless of the number of trials with "negative results." Ex: say a drug performs better than placebo in 2 trials, but fails in 998 trials, it will still be approved by the FDA.