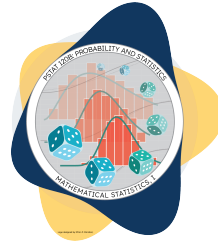

Topic 00: Introduction to the Course

Ethan P. Marzban University of California, Santa Barbara PSTAT 120B

Outline

1. Why Statistics?

2. Alright, enough waffling - Let’s Get Started!

Welcome!

- Welcome to PSTAT 120B!

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and Applied Probability

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- **OH:** Wednesdays 3 - 4:30pm in GIRV 2123
  TBD via Zoom

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  - Due to capacity constraints on the rooms, we cannot allow overenrollment of sections. To unofficially switch Sections, please see the instructions on the Course Website.

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  - Thank you so much for your understanding!

Why Statistics?

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Rent Burden

More Renters Than Ever Before Are Burdened by the Rent They Pay

A new Harvard report says 22.4 million households in the United States now spend more than 30 percent of their income in rent, with 12.1 million spending more than 50 percent.

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- Do we trust this statistic? Would small changes to the overall experiment result in drastically different results?
- If we collected data, how likely would it be for our own findings to match the New York Times's?

World Record: Holding Breath

https://www.guinnessworldrecords.com/news/2021/5/freediver-holds-breath-for-almost-25-minutes-breaking-record-660285

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- What is the true longest time a person can hold their breath?
- If we collected data on the times various people held their breaths, how could we construct a "good" estimate of the true longest time a person can hold their breath?

Data Science

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- But, Data Science didn't come out of nothing - it is predicated on a strong, formal way of handling uncertainty.

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  - But, I hope you don't loose sight of the bigger picture!

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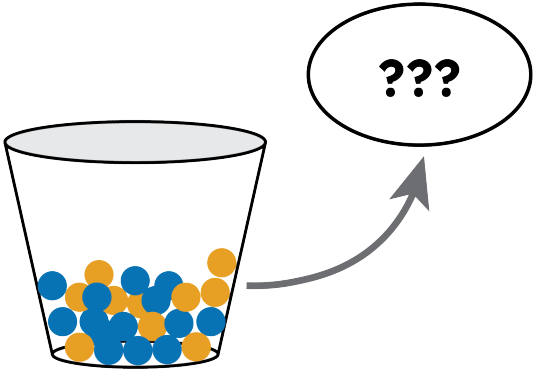
- But, probability and statistics exist as two separate (but overlapping) fields.
- To highlight the distinction between probability and statistics, allow me to use a metaphor that my own statsitics professor used when I was taking my first mathematical statistics course.

Scenario 1



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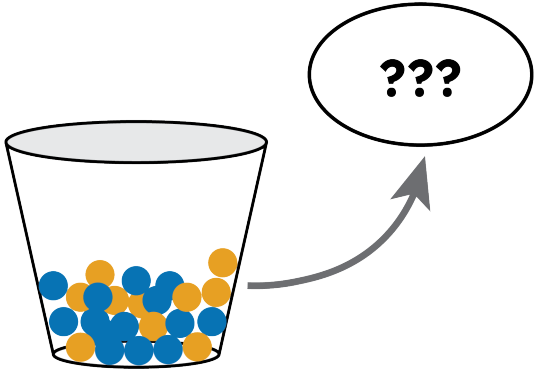

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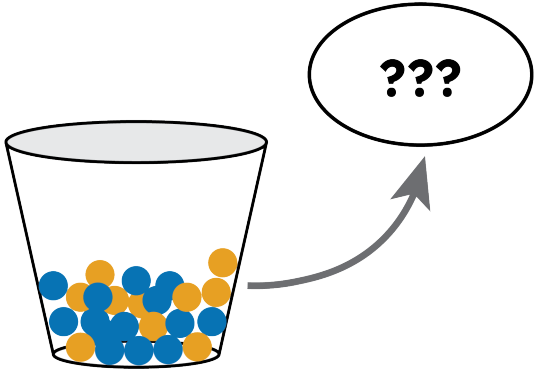
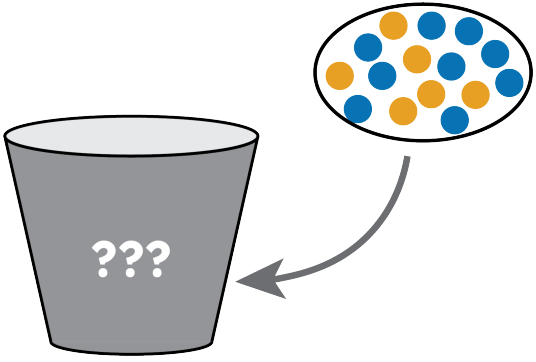


- We know that a bucket contains some (known) number of blue and gold marbles. From this bucket we take a sample.
- Given our knowledge of what's in the bucket, we want to inform what's in our hand (e.g. number of gold marbles, probability of having more than 3 blue marbles, etc.)

Scenario 2



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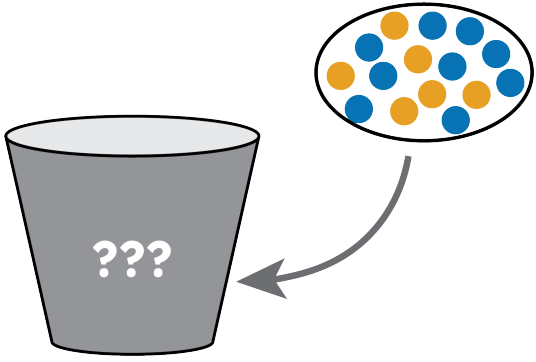

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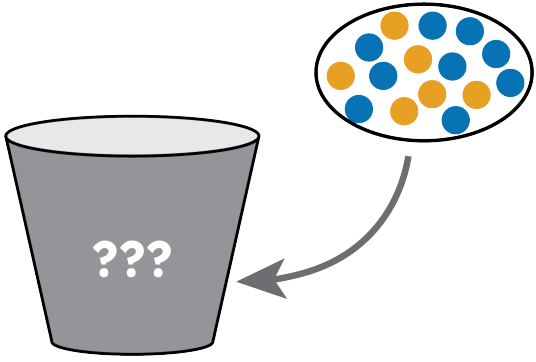

- We have a sample of blue and gold marbles (and we know how many of each are in our sample), that we know came from a bucket.
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- Scenario 2 is statistics (specifically, inferential statistics).
  - Typically, the goal of inferential statistics is to use a sample to make *inferences* (we'll talk more about these later in the course) about a larger population.

PSTAT 120B

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- Finally, we'll finish off by comparing across samples and seeing what that tells us about potential differences across populations.

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