Elementary Statistics – Welcome!

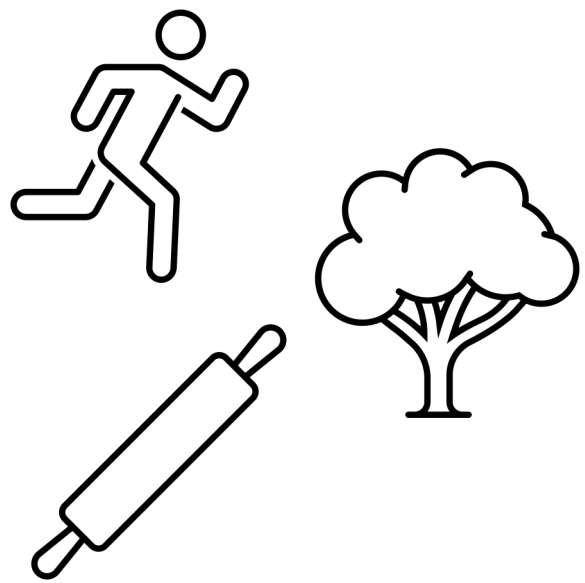
Dr. Ab Mosca (they/them)

Slides based off slides courtesy of OpenIntro and John McGreedy of Johns Hopkins University

Plan for Today

- Who am I?
- Who are you?
- What will we do in this class?
- What is statistics?
- Research questions

Who Am I?



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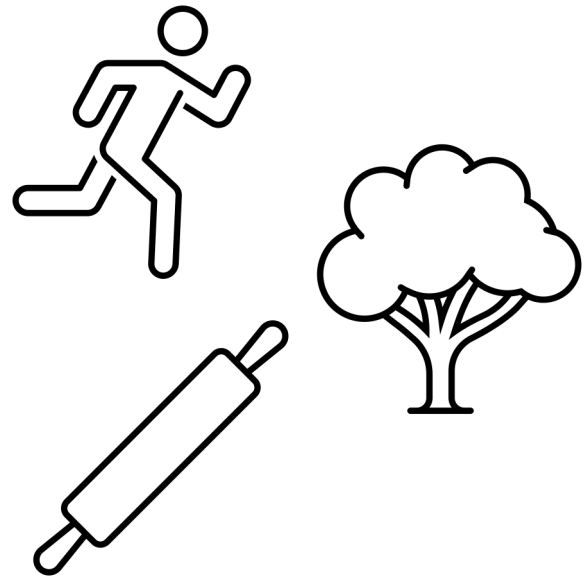

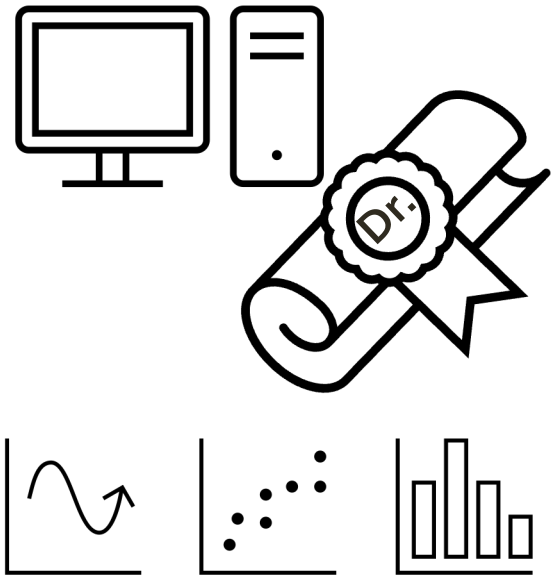

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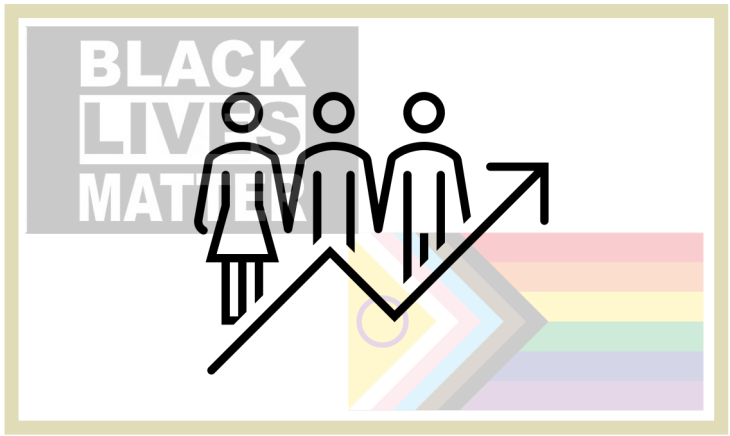

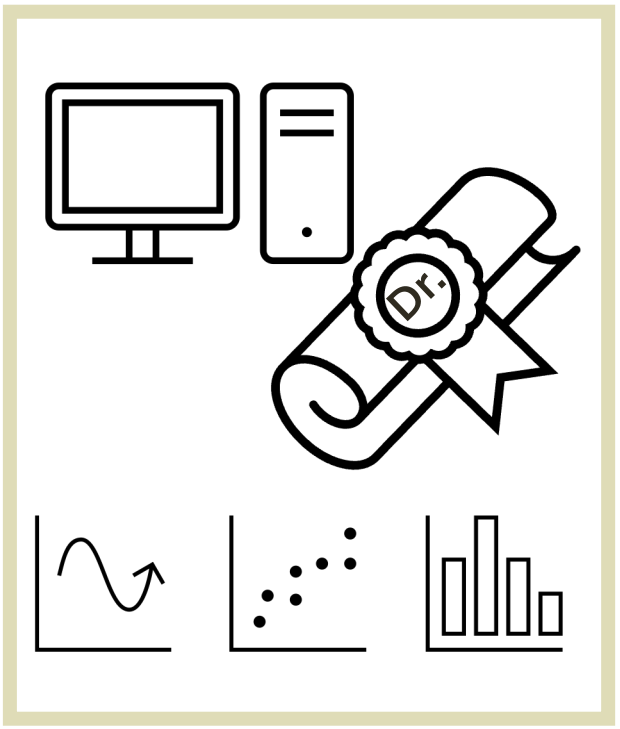

Who Are You?

- Form groups of 3
- Introduce yourselves (name, pronouns)
- Share:
  - A highlight of your hometown
- Find 1 thing that your entire group has in common (favorite color? hometown? left-handed? Be creative!)
- After about 5 minutes we will go around, introduce ourselves, and share what each group has in common

Who Are You?

- Form **new groups** of 3 (move around!)
- Introduce yourselves (name, pronouns)
- Share:
  - Would you rather have a cat or a dog?
- Find 1 thing that your entire group has in common (favorite color? hometown? left-handed? Be creative!)
- After about 5 minutes we will go around, introduce ourselves, and share what each group has in common

Who Are You?

- Form **new new groups** of 3 (move around!)
- Introduce yourselves (name, pronouns)
- Share:
  - Would you rather have a self-driving car but always hit red lights OR drive yourself and never hit red lights?
- Find 1 thing that your entire group has in common (favorite color? hometown? left-handed? Be creative!)
- After about 5 minutes we will go around, introduce ourselves, and share what each group has in common

What You Will Learn & Logistics

What Is This Class?

- An introduction to statistics
- You will learn…
  - How to collect sample data from a population
  - How to appropriately summarize data
  - How to make inferences from data
  - How to communicate the outcome of a statistical analysis

Important Info

- Course website (**write this down**!): https://amosca01.github.io/MATH108-F23/
- PLATO: please use for all course related communication
- OH's: T/R 11:30 – 13:30 (stop by and say hi!) **starting NEXT week**

Important Info

- Textbook: *OpenIntro Statistics*, Fourth Edition
  - Available for free here: https://www.openintro.org/
- Assignments:
  - Turn in on PLATO
  - Homeworks – largely effort based
  - Mini-Projects – review and application of skills
  - Final Project – group based, application of skills
- Due Dates: As listed on course schedule.
  - 24hr grace period; no late submissions
  - Lowest homework dropped
  - No regrades; see syllabus for revise and resubmit instructions

Important Info

- I’m here to help you succeed
- Please come to office hours or reach out on PLATO if you need any additional support

Now the good stuff

What is Statistics?

- Work with whoever is sitting next to you to brainstorm what you think statistics is
- Add your definition to the board

What is Statistics?

Definition: Statistics is the study of how best to collect, analyze, and draw conclusions from data

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Data

data noun

da·ta ˈdā-tə ˈda- *also* ˈdä-

plural in form but singular or plural in construction

often attributive

Synonyms of *data* ›

1 : factual information (such as measurements or statistics) used as a basis for reasoning, discussion, or calculation

> the *data* is plentiful and easily available
> – H. A. Gleason, Jr.

> comprehensive *data* on economic growth have been published
> – N. H. Jacoby

2 : information in digital form that can be transmitted or processed

3 : information output by a sensing device or organ that includes both useful and irrelevant or redundant information and must be processed to be meaningful

https://www.merriam-webster.com/dictionary/data

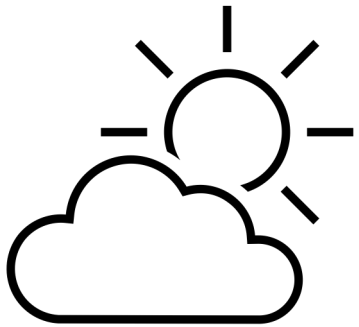
Data

- What examples of data can you come up with?
- Brainstorm with whoever is next to you

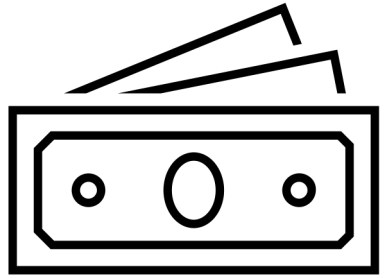
Data + Analysis

- What if we add analysis to the mix? What can we learn or do from analyzing data?
- Brainstorm with whoever is next to you

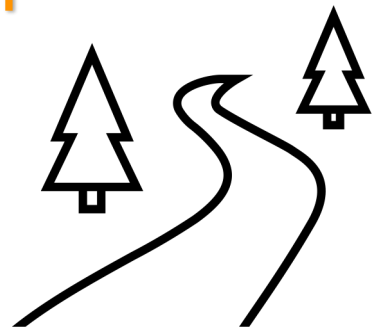
Data + Analysis



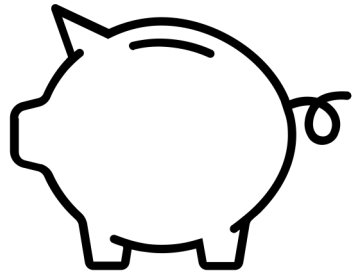
weather



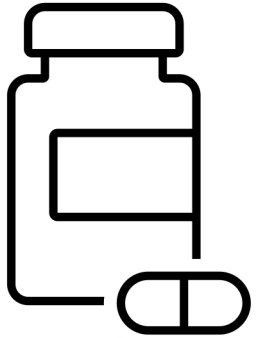
sales



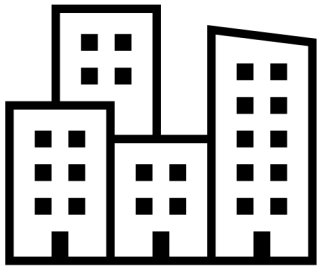
roadways



investing



medicine

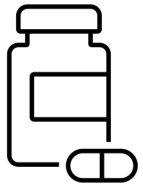


urban planning

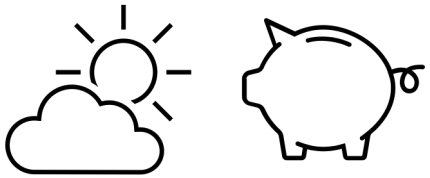
Analysis

- Different techniques for different needs
  - Summarizing

  - Inference



  - Prediction



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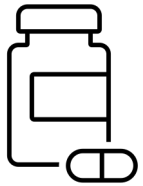

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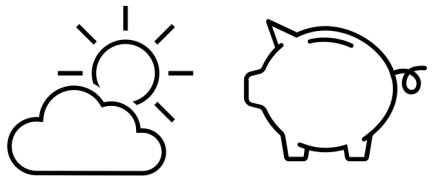

- Regression
- AI / ML

What is Statistics?

Definition: Statistics is the study of how best to collect, analyze, and draw conclusions from data

Why?

Research Questions

What is a research question?

- A **research question (RQ)** is a question that a research project sets out to answer

Formulation of Research Question – Stepwise Approach. Ratan et al. (2019).

What is a research question?

- A **research question (RQ)** is a question that a research project sets out to answer
- Good RQs are FINER:
  - Feasible
  - Interesting
  - Novel
  - Ethical
  - Relevant

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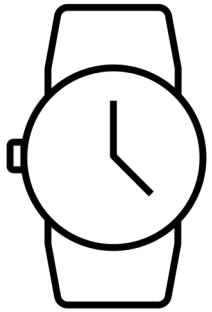

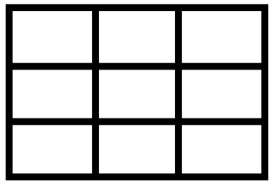

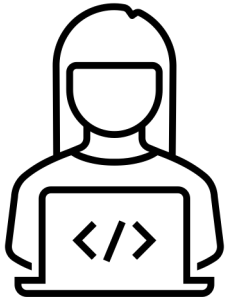

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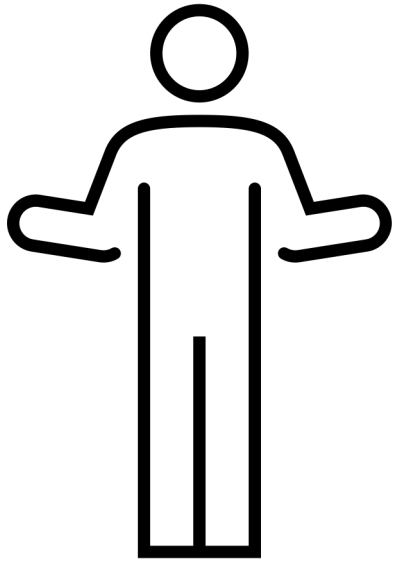

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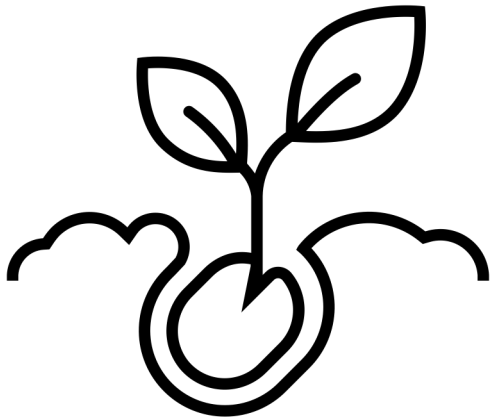

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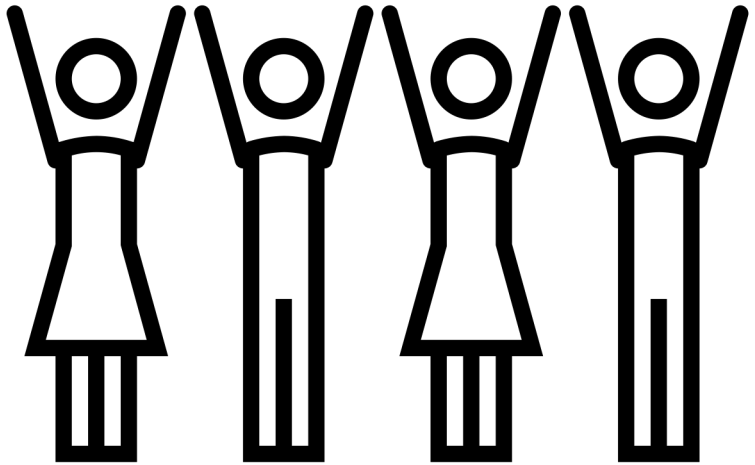

Formulation of Research Question – Stepwise Approach. Ratan et al. (2019).

Research Questions

- Developing a RQ
  1. Identify an area of interest
  2. Research the area
     I. What is known?
     II. What do you (we) still need to know?
     III. What question(s) does II imply?
  3. Narrow and refine

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Interactive graphs

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Interactive graphs

- Interaction improves exploration, interaction makes apps harder to build and use

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Interactive graphs

- Interaction improves exploration, interaction makes apps harder to build and use
- How interaction affects reasoning with graphs

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Interactive graphs

- Interaction improves exploration, interaction makes apps harder to build and use
- How interaction affects reasoning with graphs
- How does interaction affect reasoning with graphs?

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  3. Narrow and refine (FINER)

How does interaction affect reasoning with graphs?

Very broad

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How does an interactive icon array affect accuracy on a reasoning task?

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Your turn! Find two people to work with and develop a research question. Be ready to share with the class

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