Introduction to statistics

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About Me

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  - B.S. in Statistics, Seoul National University
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- **Experience:**
  - 2024.10 - Present: Assistant professor, Korea Military Academy
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  - 2022.08 - 2022.12: Statistics Lab Instructor, Iowa State University
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Course Objectives

Objectives:

- Understand the basic theories and principles of statistics.
- Be able to analyze real data using R program.

Eligible Cadets and Course Credits:

- First-year cadets (3 credits / 3 hours per week)

Grading:

- Quizzes (30%) - Four Quizzes (90%), Attitude in class (10%)
- Midterm Exam (30%)
- Final Exam (40%)

Important Course Guidelines

- Bring the textbook and the **printed lecture notes** to class.
  - Textbook: Openintro Statistics(4th ed.); pdf available online.
- All the course materials are available on **LMS.**
- **Evening study sessions** will be conducted
  - for those who do not meet the desired level (scoring below 60 on quizzes or midterm) and volunteers.
- Grading on **attitude:**
  - Deductions for poor classroom behavior.
  - Positive behavior can offset deductions.
  - We go over the assignments every Tuesday in class.
- **Section leader**'s responsibilities:
  - Clean the blackboard, and perform other assigned duties.

Chapter 1: Introduction to data

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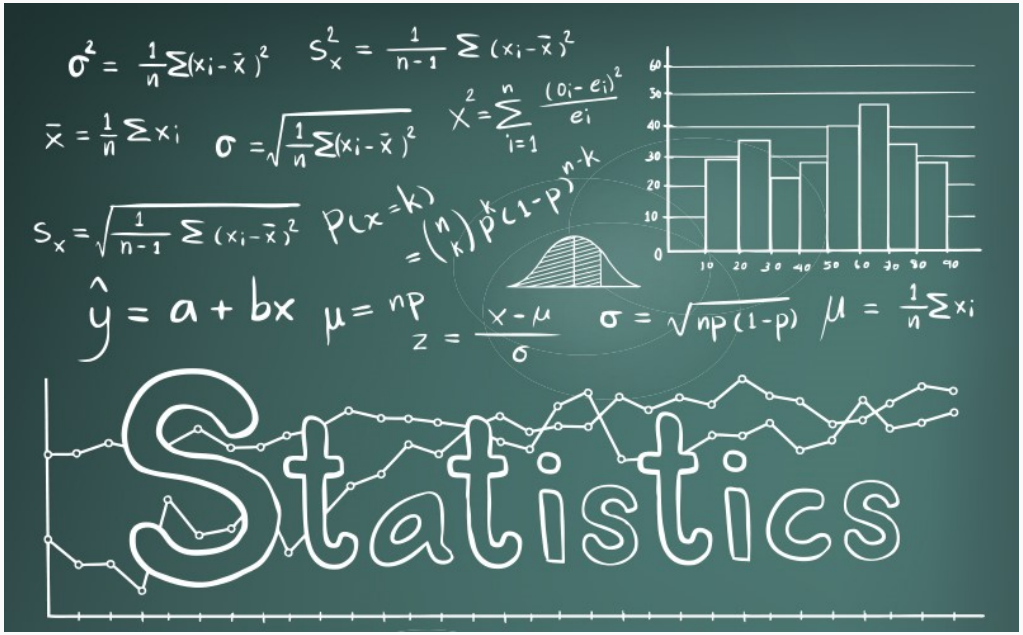
What is statistics?



- **Statistics** is the study of how best to collect, analyze, and draw conclusions from data.
- **Data** is collected from various sources like field notes, surveys, and experiments.

Classroom survey

A survey was conducted on students in an introductory statistics course. Below are a few of the questions on the survey, and the corresponding variables the data from the responses were stored in:

- `gender`: What is your gender?
- `intro_extra`: Do you consider yourself introverted or extraverted?
- `sleep`: How many hours do you sleep at night, on average?
- `bedtime`: What time do you usually go to bed?
- `countries`: How many countries have you visited?
- `dread`: On a scale of 1-5, how much do you dread being here?

Data matrix

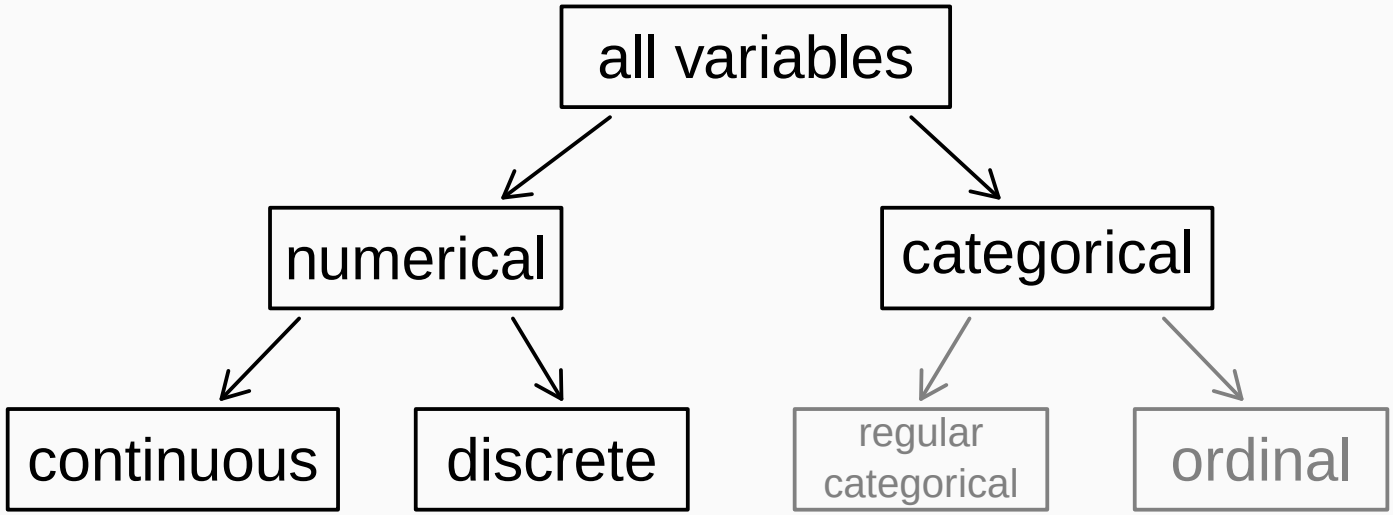
Data collected on students in a statistics class on a variety of variables:

variable ↓

Stu.	`gender`	`intro_extra`	$\cdots$	`dread`
1	male	extravert	$\cdots$	3
2	female	extravert	$\cdots$	2
3	female	introvert	$\cdots$	4
4	female	extravert	$\cdots$	2
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
86	male	extravert	$\cdots$	3

← *observation*

Types of variables



Types of variables (cont.)

	gender	sleep	bedtime	countries	dread
1	male	5	12-2	13	3
2	female	7	10-12	7	2
3	female	5.5	12-2	1	4
4	female	7	12-2	0	2
5	female	3	12-2	1	3
6	female	3	12-2	9	4

- `gender`:
- `sleep`:
- `bedtime`:
- `countries`:
- `dread`:

Practice

What type of variable is a telephone area code?

(a) numerical, continuous

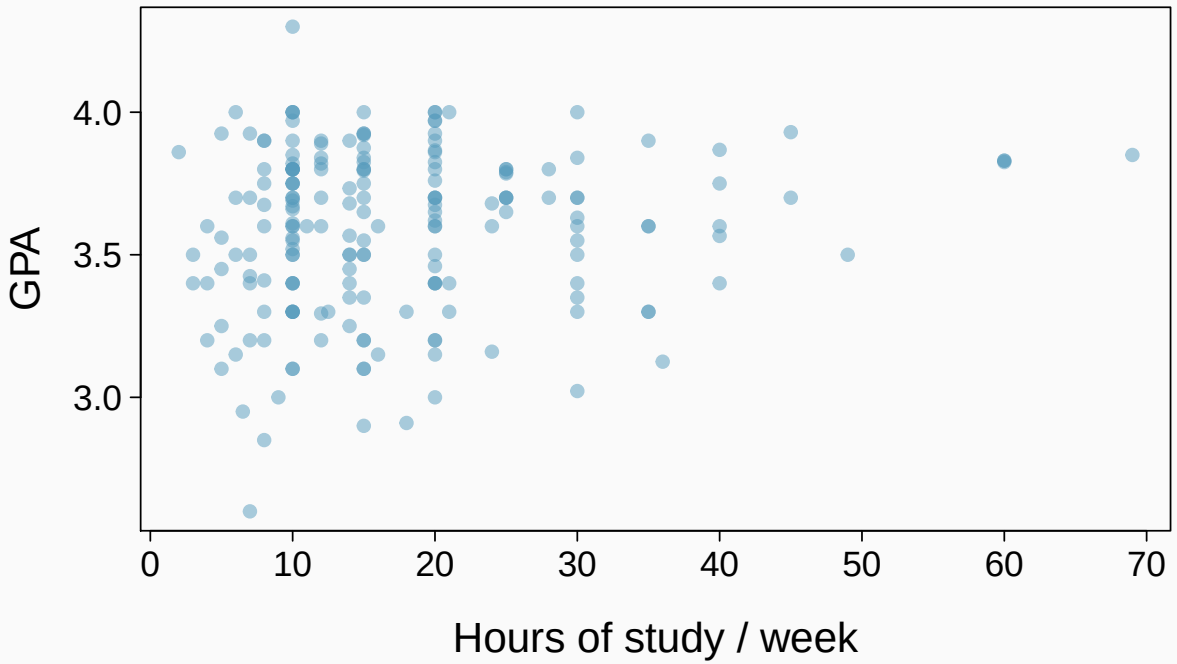
(b) numerical, discrete

(c) categorical

(d) categorical, ordinal

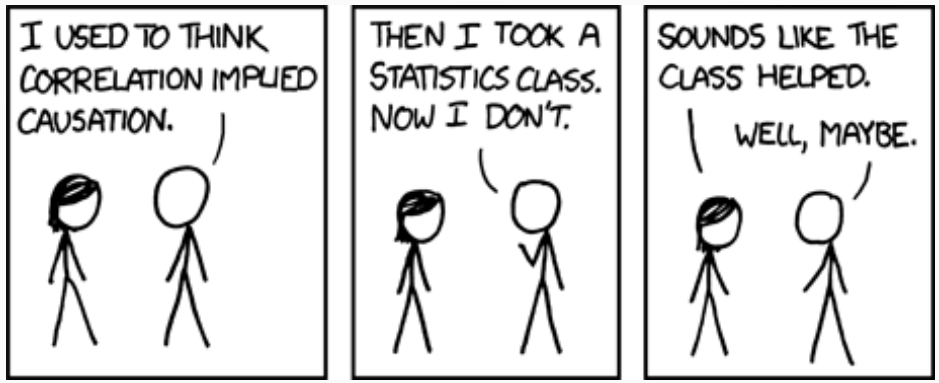
Relationships among variables

Does there appear to be a relationship between GPA and number of hours students study per week?



Association vs. causation

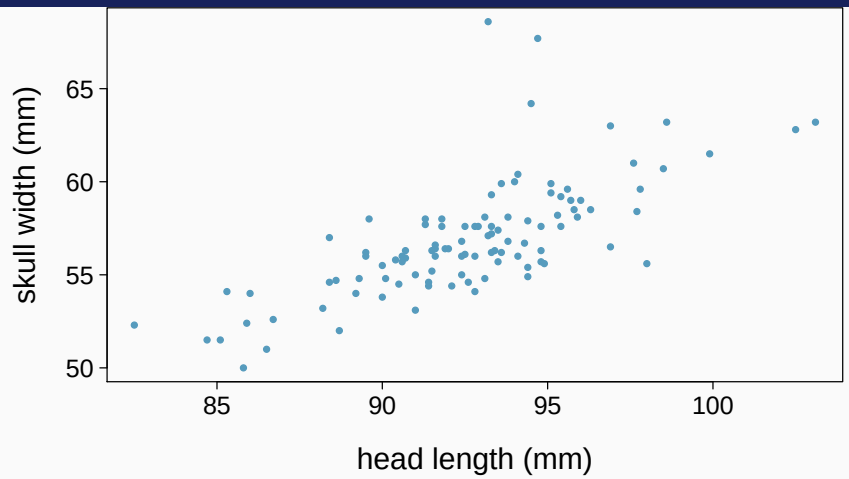
- When two variables show some connection with one another, they are called *associated* variables.
- If two variables are not associated, i.e. there is no evident connection between the two, then they are said to be *independent*.
- In general, association does not imply causation, and causation can only be inferred from a randomized experiment.



http://xkcd.com/552/

Practice

Based on the scatterplot on the right, which of the following statements is correct about the head and skull lengths of possums?



(a) There is no relationship between head length and skull width, i.e. the variables are independent.

(b) Head length and skull width are positively associated.

(c) Skull width and head length are negatively associated.

(d) A longer head causes the skull to be wider.

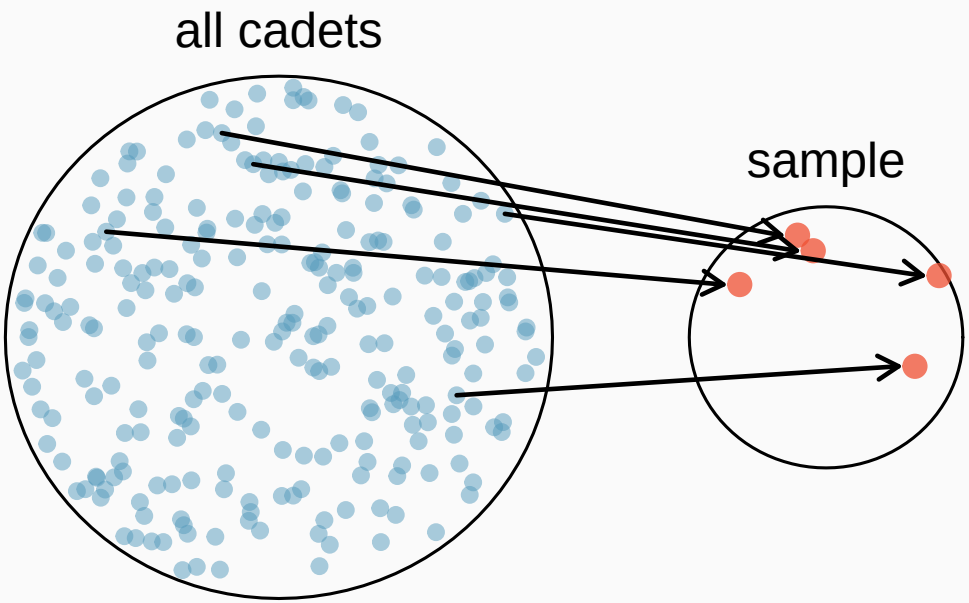
(e) A wider skull causes the head to be longer.

Populations and samples

Population: a set of similar items or events which is of interest.

Sample: a subset of the population.

Example: Estimate the average height of KMA cadets by collecting a sample of cadets.



Populations and samples(cont.)


PHYS ED | AUGUST 29, 2012, 12:01 AM | 21 Comments

Finding Your Ideal Running Form

By GRETCHEN REYNOLDS

David De Lossy/Getty Images

http://well.blogs.nytimes.com/2012/08/29/finding-your-ideal-running-form

Research question: Can people become better, more efficient runners on their own, merely by running?

Population of interest:

Sample: Group of adult women

Population to which results can be generalized: