Introduction to Statistics

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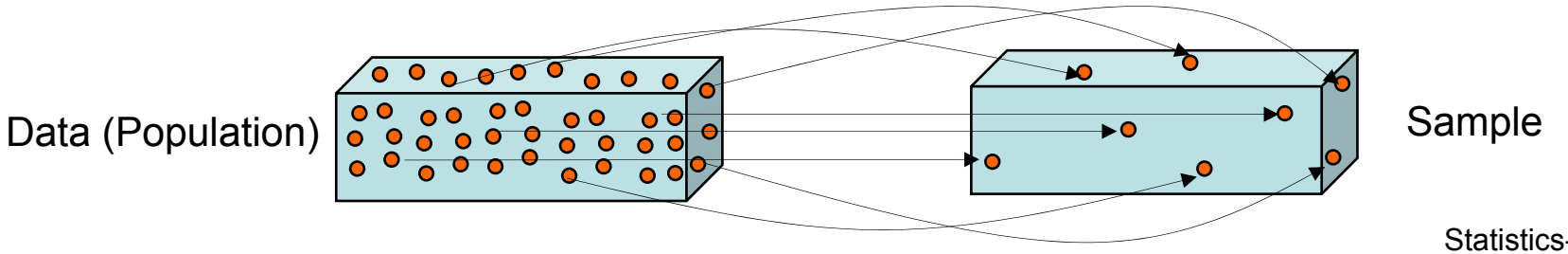
What is Statistics?

- Statistics is the field of study concerned with the collection, analysis, and interpretation (making decisions on) of uncertain data
  - E.g., the explanation of social or economic trends through the analysis of data

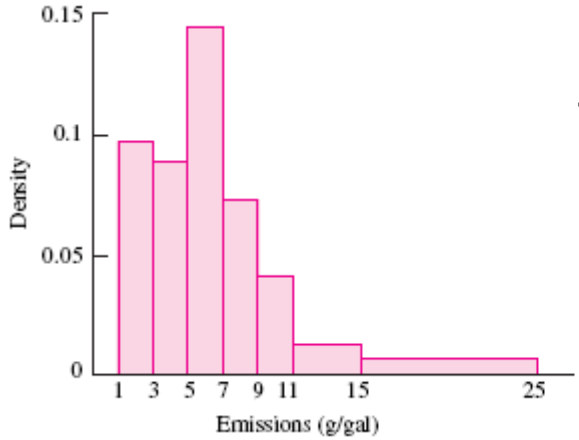
- Or, in more common usage, statistics refers to numerical facts of the data
  - E.g., the age of a student, the allowance of a student, the height of a student, etc.

Types of Statistics (1/3)

- Broadly speaking, statistics can be divided into two areas
  - Descriptive statistics
  - Inferential statistics
- Descriptive Statistics
  - Concerned with the methods of collecting data and of summarizing clearly the basic information they contain
  - Collecting data refers to sampling, i.e., choosing a subset of data (a sample)
  - Summarizing data refers to organizing, displaying, and describing data by tables, graphs, and summary measures



Types of Statistics (2/3)



Class Interval (g/gal)	Frequency	Relative Frequency	Density
1 – < 3	12	0.193	0.0965
3 – < 5	11	0.178	0.0890
5 – < 7	18	0.290	0.1450
7 – < 9	9	0.146	0.0730
9 – < 11	5	0.082	0.0410
11 – < 15	3	0.048	0.0120
15 – < 25	4	0.063	0.0063

- Frequency table for PM emissions of 62 vehicles driven at high altitude

- Inferential statistics
  - Concerned with the methods that use sample results to help make decisions or predictions about the data (population)
  - Or, the methods that draw conclusions from the data

Types of Statistics (3/3)

- E.g., Association Rule:

  P(buying “Pattern Classification”| buying “Machine Learning”) = ?

Textbook and Reference

- Textbook
  - William C. Navidi, “Statistics for Engineers and Scientists,” McGraw-Hill (2 edition, 2007)

- Reference
  - Prem S. Mann, "Introductory Statistics," Wesley, (6 edition, 2007)
  - D. P. Bertsekas, J. N. Tsitsiklis, “Introduction to Probability,” Athena Scientific (2002)

Topics to be Covered

Date	Content
03/02, 03/09	Descriptive Statistics (Chapter 1)
03/16, 03/23	Probability and Common Used Distributions (Chapters 2 & 4, quick review)
03/23, 03/30	Propagation of Error (Chapter 3)
04/20, 04/27	Confidence Intervals (Chapter 5)
05/04, 05/11	Hypothesis Testing (Chapter 6)
05/18, 05/25	Correlation and Simple Linear Regression (Chapter 7)
06/01~	More Topics …

Grading (Tentatively)

- Midterm and Final: 45%
- Homework: 30%
- Attendance/Other: 25%

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