INDIAN INSTITUTE OF TECHNOLOGY MADRAS

सिद्धिर्भवति कर्मजा

IIT Madras

ONLINE DEGREE

Statistics for Data Science -1

Lecture 3.1: Describing Numerical Data- Frequency tables for numerical data

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Review

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1. What is statistics?
    - Descriptive statistics, inferential statistics.
    - Distinguish between a sample and a population.

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   - Descriptive measures of Mode and Median

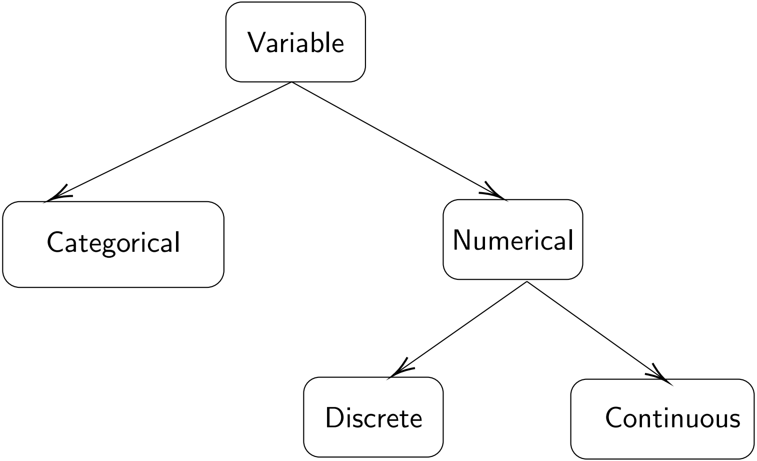
Frequency tables

- Organizing numerical data

Graphical summaries

- Histograms
- Stem-and-leaf diagram

Types of variables



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- First group the observations into classes (also known as categories or bins) and then treat the classes as the distinct values of qualitative data.
- Once we group the quantitative data into classes, we can construct frequency and relative-frequency distributions of the data in exactly the same way as we did for categorical data.

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- Each class represents a distinct value (single value) along with its frequency of occurrence.

Example

- Suppose the dataset reports the number of people in a household. The following data is the response from 15 individuals.

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- 2,1,3,4,5,2,3,3,3,4,4,1,2,3,4
- The distinct values the variable, number of people in each household, takes is 1,2,3,4,5.
- The frequency distribution table is

Value	Tally mark	Frequency	Relative frequency
1			
2			
3			
4			
5			
Total			

Graph

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1. Number of classes: The appropriate number is a subjective choice, the rule of thumb is to have between 5 and 20 classes.
2. Each observation should belong to some class and no observation should belong to more than one class.
3. It is common, although not essential, to choose class intervals of equal length.

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4. Class mark: The average of the two class limits of a class.
5. A class interval contains its left-end but not its right-end boundary point.

Example

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- 68, 79, 38, 68, 35, 70, 61, 47, 58, 66, 60, 45, 61, 60, 59, 45, 39, 80, 59, 62, 49, 76, 54, 60, 53, 55, 62, 58, 67, 55, 86, 56, 63, 64, 67, 50, 51, 78, 56, 62, 57, 69, 58, 52, 42, 66, 42, 56, 58.

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- 68, 79, 38, 68, 35, 70, 61, 47, 58, 66, 60, 45, 61, 60, 59, 45, 39, 80, 59, 62, 49, 76, 54, 60, 53, 55, 62, 58, 67, 55, 86, 56, 63, 64, 67, 50, 51, 78, 56, 62, 57, 69, 58, 52, 42, 66, 42, 56, 58.

Class interval	Tally mark	Frequency	Relative frequency
30-40			
40-50			
50-60			
60-70			
70-80			
80-90			
Total			

Frequency table

68, 79, 38, 68, 35, 70, 61, 47, 58, 66, 60, 45, 61, 60, 59, 45, 39, 80, 59, 62, 49, 76, 54, 60, 53, 55, 62, 58, 67, 55, 86, 56, 63, 64, 67, 50, 51, 78, 56, 62, 57, 69, 58, 52, 42, 66, 42, 56, 58.

Class interval	Tally mark	Frequency	Relative frequency
30-40	𝍷𝍷𝍷	3	0.06
40-50	𝍸𝍷	6	0.12
50-60	𝍸𝍸𝍸𝍷𝍷𝍷	18	0.36
60-70	𝍸𝍸𝍸𝍷𝍷	17	0.34
70-80	𝍷𝍷𝍷𝍷	4	0.08
80-90	𝍷𝍷	2	0.04
Total		50	1

Section summary

1. Frequency table for discrete single value data.
2. Frequency table for continuous data using class intervals.

Steps to construct a histogram

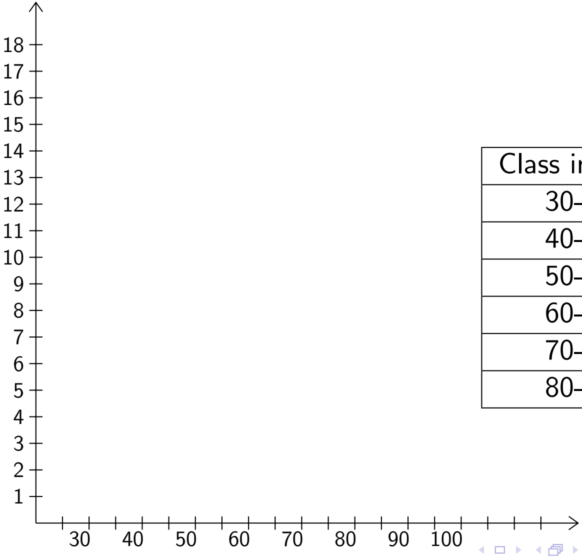
Step 1 Obtain a frequency (relative-frequency) distribution of the data.

Step 2 Draw a horizontal axis on which to place the classes and a vertical axis on which to display the frequencies (relative frequencies).

Step 3 For each class, construct a vertical bar whose height equals the frequency (relative frequency) of that class.

Step 4 Label the bars with the classes, the horizontal axis with the name of the variable, and the vertical axis with "Frequency" ("Relative frequency").

Histogram



Class interval	frequency
30-40	3
40-50	6
50-60	18
60-70	17
70-80	4
80-90	2

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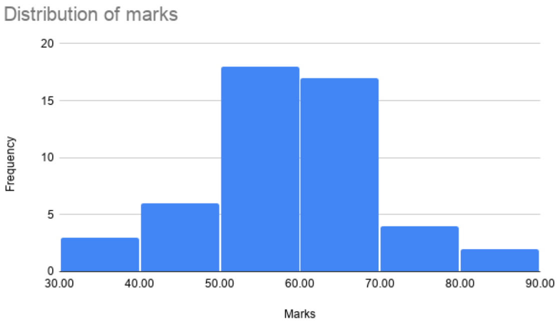

Stem-and-leaf diagram

Definition

In a stem-and-leaf diagram (or stemplot)[1] *, each observation is separated into two parts, namely, a stem-consisting of all but the rightmost digit-and a leaf, the rightmost digit.*

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Stem	Leaf
7 |	5

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7	5

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Stem	Leaf
7	5,8

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Steps to construct a stemplot

Step 1 Think of each observation as a stem—consisting of all but the rightmost digit—and a leaf, the rightmost digit.

Step 2 Write the stems from smallest to largest in a vertical column to the left of a vertical rule.

Step 3 Write each leaf to the right of the vertical rule in the row that contains the appropriate stem.

Step 4 Arrange the leaves in each row in ascending order.

Example

- The following are the ages, to the nearest year, of 11 patients admitted in a certain hospital: 15, 22, 29, 36, 31, 23, 45, 10, 25, 28, 48

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- Draw a stem-and-leaf plot for this data set.

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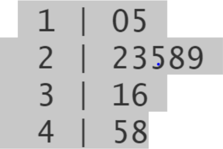

1	|	05
2	|	23589
3	|	16
4	|	58

Section summary

1. Construct a histogram for grouped data.
2. Construct a stemplot to describe numerical data.