

Lecture 20: Chapter 6

Section 6B: Measuring Variation

Averages

Why do we care about variation?

Example 1. Lets say you took a test in two classes and scored a 78 on each.

Lets also suppose that the average score for each test was 70. Now also suppose that the variation of the distribution for each test was given according to the following figures. Which grade should you be more proud of?

Definition 1. The **range** of a data set is the difference between its highest and lowest data values

Range can give a general characterization of data, but a much better way to

describe a distribution is through a five number summary:

Definition 2. The **lower quartile** divides the lowest fourth of a data set from the upper three-fourths. It is the median of the data values in the lower half of the data set.

Definition 3. The **middle quartile** is the overall median.

Definition 4. The **upper quartile** divides the lowest three-fourths of a data set from the upper fourth. it is the median of the data values in the upper half of a data set.

Definition 5. The **five-number summary** for a data distribution consists of the lowest value, the lower quartile, the median, the upper quartile, and the highest value.

Example 2. Find the five-number summary for the following data and construct a boxplot for it.

4 5 2 6 3 8 9 1 2 5

2 1 8 3 4 6 2 9 5 3

Standard Deviation

Standard deviation is the most commonly used quantity in describing deviation of a distribution. We list the steps to calculating it.

Step 1: Compute the mean of the data set. Then find the deviation for the mean for every data value by subtracting the mean from the data value.

Step 2: Find the squares of all the deviations from the mean.

Step 3: Add all the squares of the deviations from the mean.

Step 4: Divide this sum by the total number of data values minus 1.

Step 5: The standard deviation is the square root of this quotient.

Example 3. Find the mean and standard deviation of the following data values:

4.3 5.6 3.2 4.2 5.2 4.1 5.6 3.4 5.4 3.4