Lecture 2 Standardization, Normal distribution, Stem-leaf, histogram

- Standardization is a re-scaling technique, useful for conveying information about the relative standing of any number of interest with respect to the whole distribution
- Normal distribution : ideal bell shape curve
- Stem-leaf, histogram: empirical

Measure of dispersion

- Maximum - minimum=range
- Average distance from average
- Average distance from median
- Interquartile range= third quartile - first quartile
- Standard deviation = square root of '*average*' squared distance from mean (NOTE: n-1)
- The most popular one is standard deviation (SD)

Why range is not popular?

- Only two numbers are involved : regardless of what happen between.
- Tends to get bigger and bigger as more data arrive

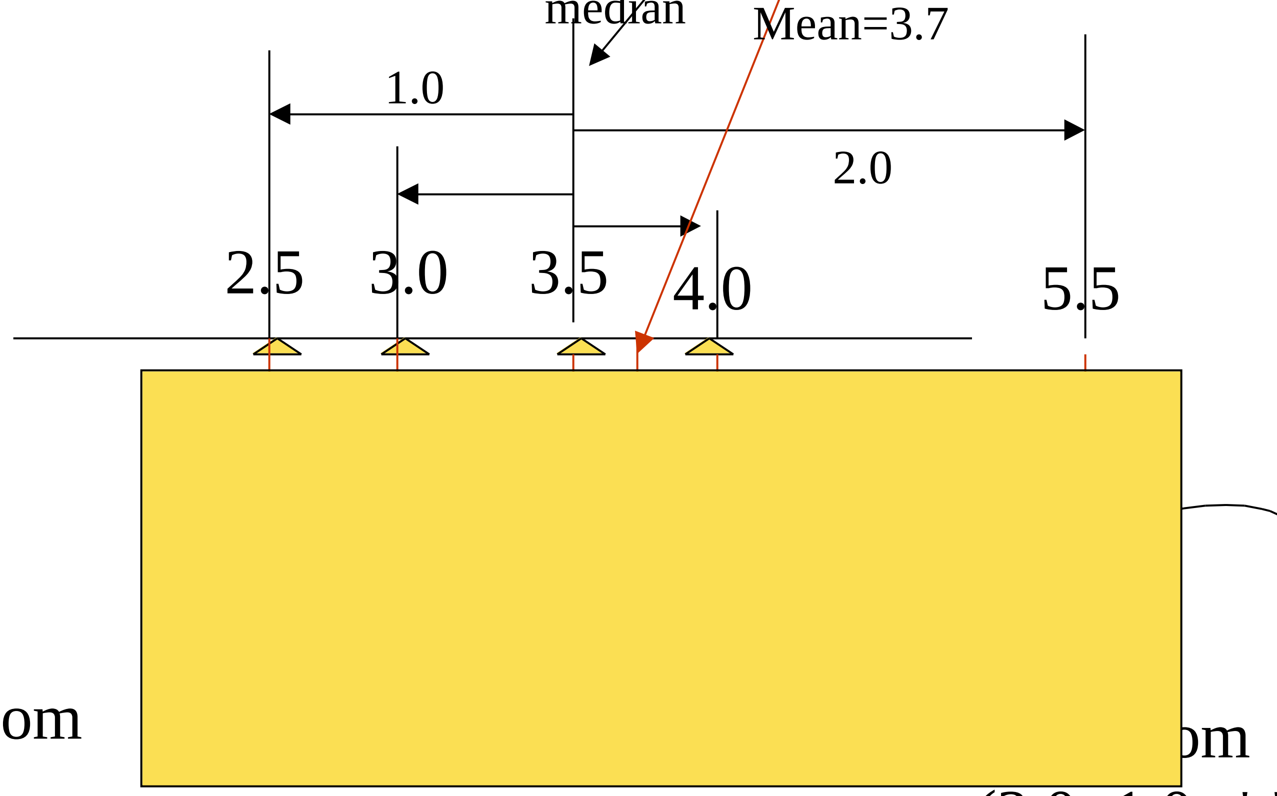
Vhy not use average
istance from mean?

ns: the center point C that
inimizes the average distance
not mean

nat is it?

: median

center point= C



Average dist from
nedian=
1.0+2+0.5+0.5+0)/5=
3.0+1.0+0)/5=5/5

om
mean= (3.0+1.0+**

where **= length o

Mean or Median

- Median is insensitive to outliers. Why not use median all the time?
- Hard to manipulate mathematically
- Median price of this week (gas) is $1.80
- Last week : $2.0
- What is the median price for last 14 days?
- Hard! How about if last week’s median is $1.80
- Still hard.
- The answer : anything is possible! Give Examples.
- Median minimizes average of absolute distances.

- Mean is still the more popular measure for the location of “center” of data points
- What does it minimize?
- It minimizes the average of squared distance
- The average squared distance from mean is called variance
- The squared root of variance is called standard deviation
- How about the “n-1” (instead of n, when averaging the squared distance), a big deal ? Why?

Yes, at least at the conceptual lev

If n is large, it does not matter to use n or n-1

- Population : the collection of all data that you imagine to have (It can be really there, but most often this is just an ideal world)
- Sample : the data you have now
- ALL vs. AML example
- =====well-trained statistician++++
- Use sample estimates to make inference on population parameters; need sample size adjustment
- (will talk about this more later)

Sample mean = sum divided by ??? n or n-1?

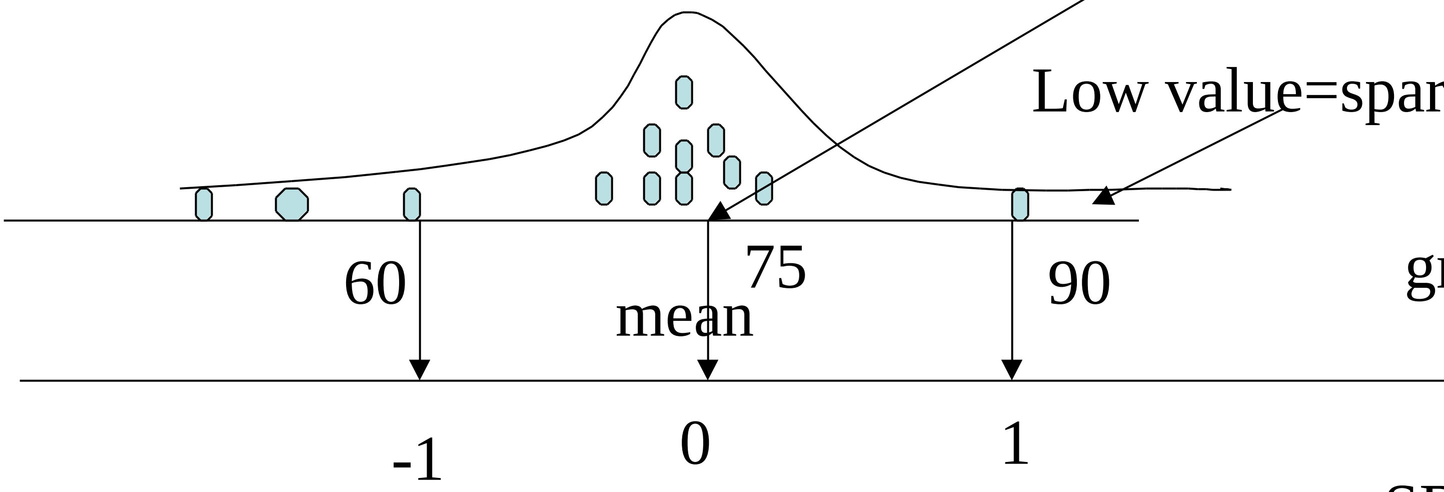
- One standard deviation within the mean covers about 68 percent of data points
- Two standard deviation within the mean cover about 95 percent of data points
- The rule is derived under “normal curve”
- Examples for how to use normal table.

Course scores

A long list of values from an ideal population

Density curve represents the distribution in a way that

High value = dense



Low value=spar

SD
15

- Find mean and Set mean to 0; apply formula to find height of curve

2. Find SD and set one SD above mean to 1.

3. Set one SD below mean to -1

Normal distribution

When does it make sense? Symmetric; one mode

- How to draw the curve?
- Step 1 : standardization: change from original scaling to standard deviation scaling using the formula
  z= (x minus mean) divided by SD
- Step 2 : the curve has the math form of

$$\frac{1}{\sqrt{2\pi}} \; e^{-\frac{z^2}{2}}$$

Use normal table

- For negative z, page
- For positive z, page
- Q: suppose your score is 85, What percentage of students score lower than you?
- Step 1 : standardization (ask how many SD above or below mean your score is)
- answer : z= (85-75)/15=.666
- Look up for z=.66; look up for z=.67; any reasonable value between the two is fine
- (to be continued)

Step by Step illustration for finding median through Stem-leaf plot

- (bring final scores for in class demo)
- Find Interquartile range
- Guess the mean , SD

- From Stem-leaf to Histogram
- Three types of histograms (equal intervals recommended)

Homework 1 assigned (due Wed. 2nd week)

- Reading mean and median from histogram
- Symmetric versus asymmetric plot.
- Normal distribution

From stem-leaf to histogram

- Using drug response data

- NOT all bar charts are histograms!!!
- NCBI’s COMPARE

- Histograms have to do with “frequencies”