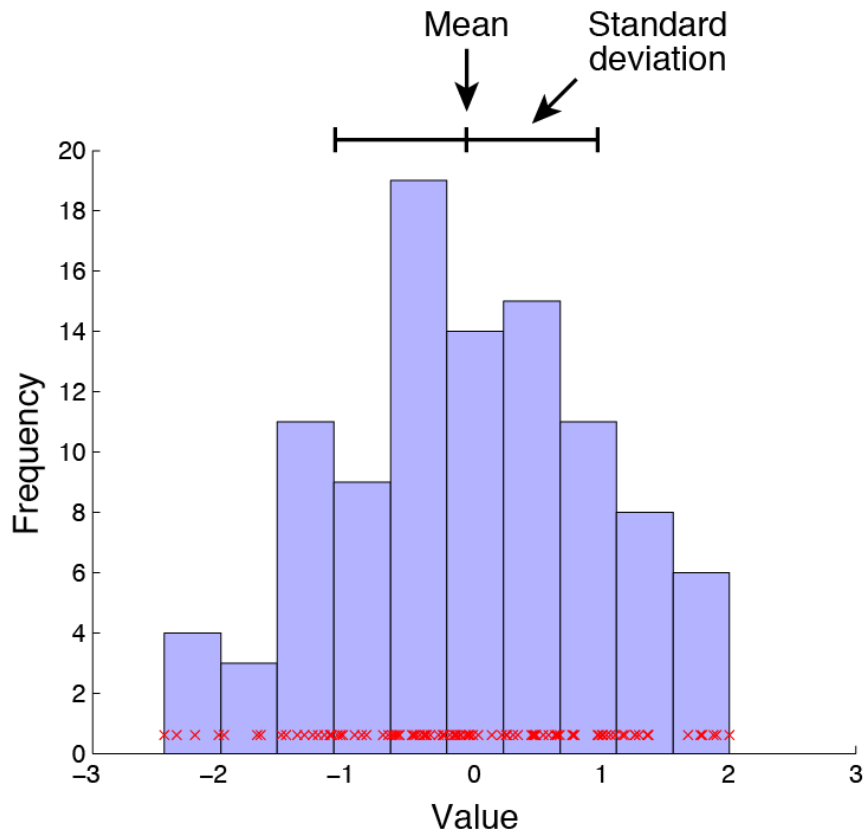


# **Statistics and Data Analysis in MATLAB**

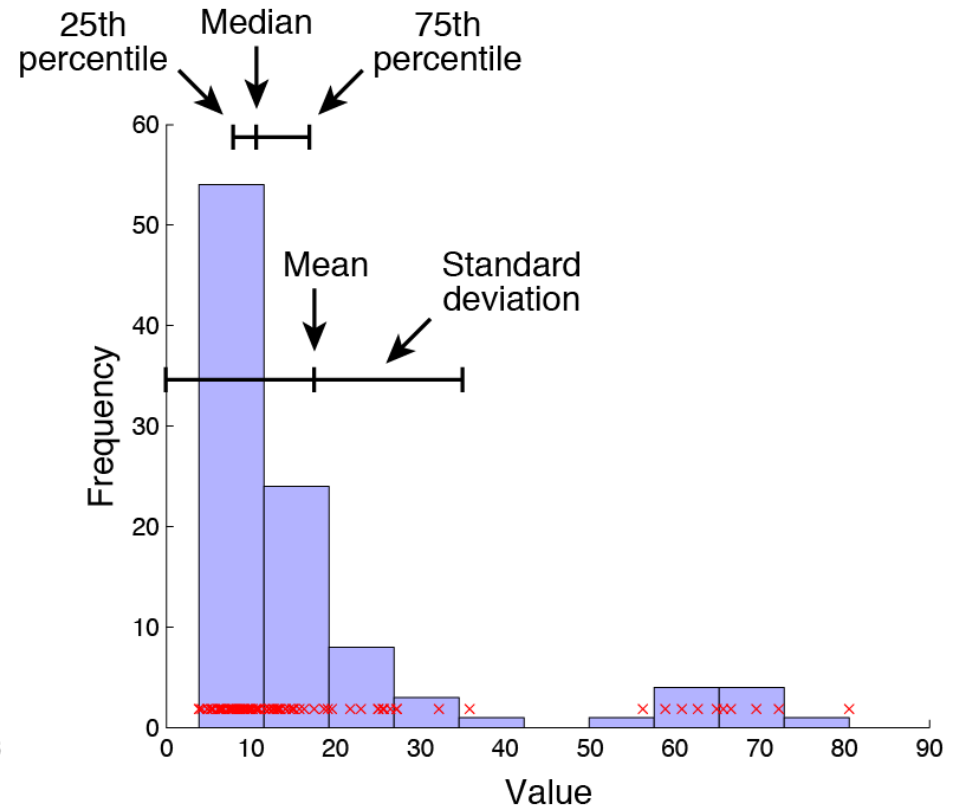
## **Lecture 1: Probability distributions and error bars**

Kendrick Kay  
Washington University in St. Louis

## Histogram of normal data



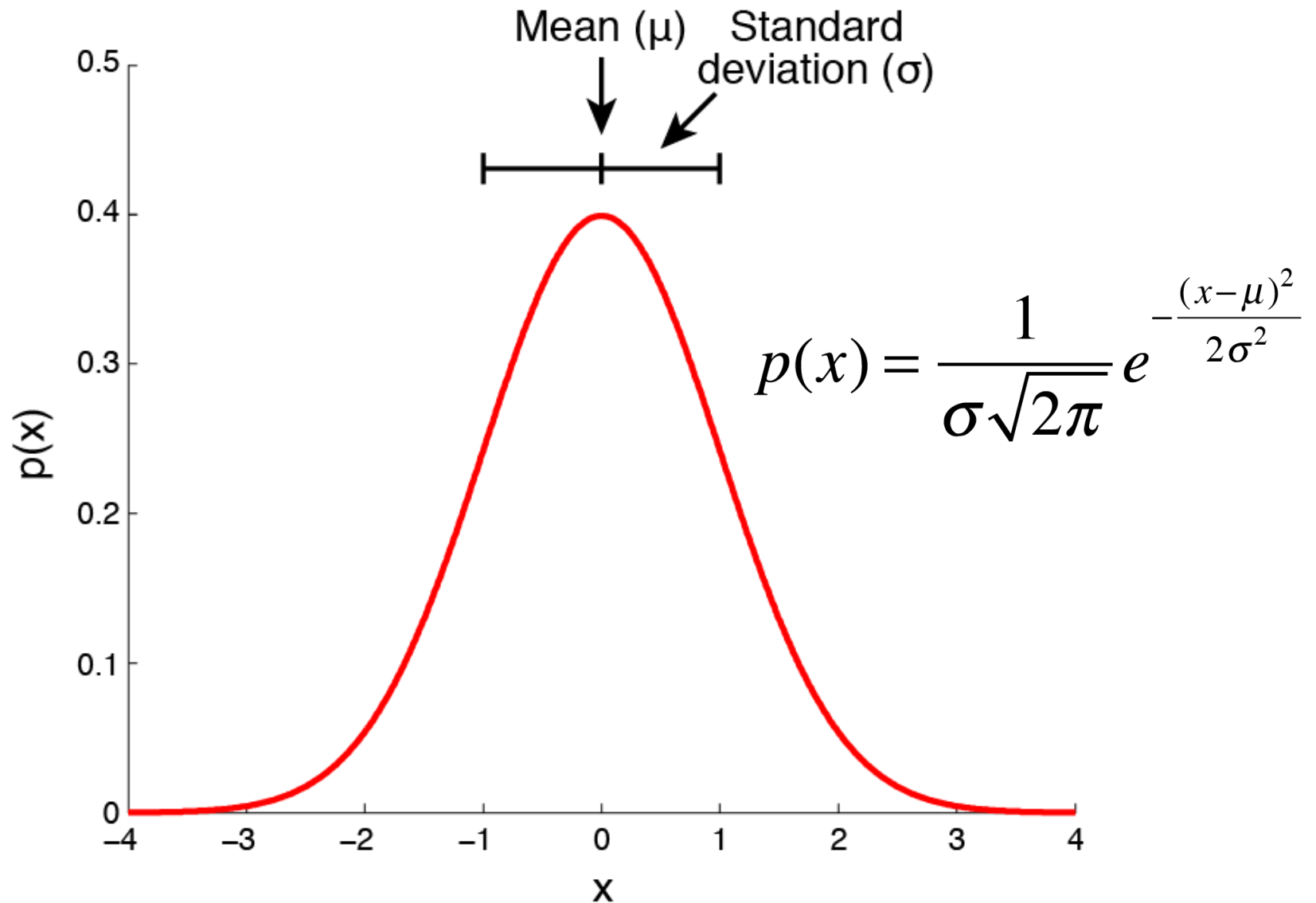
## Histogram of non-normal data



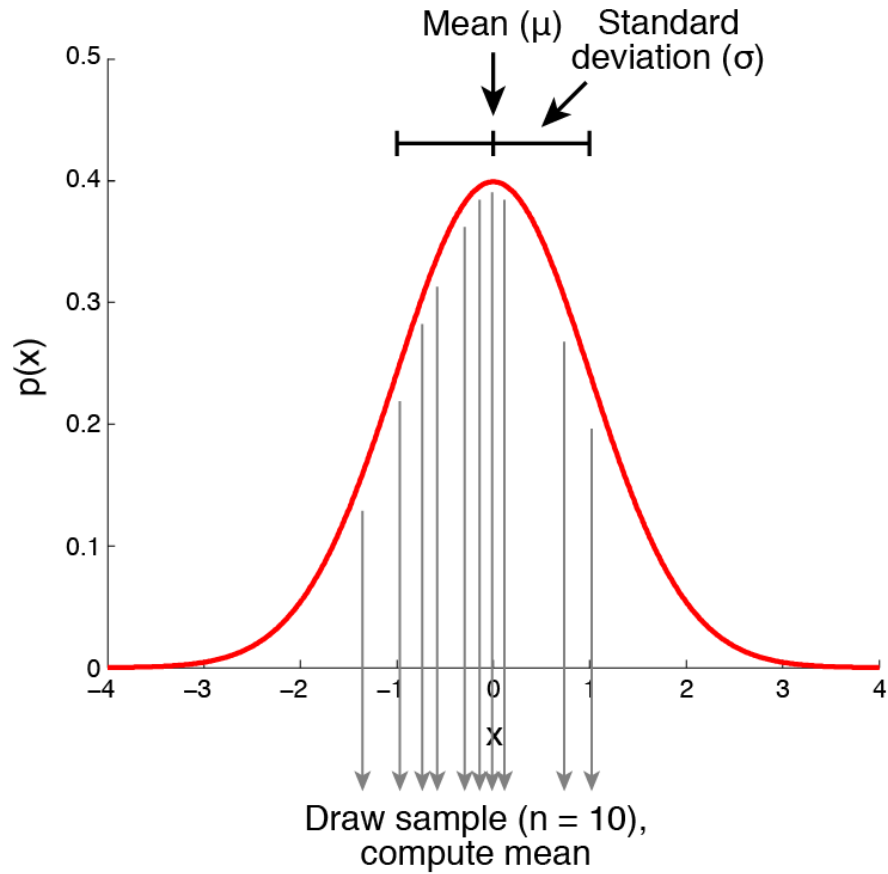
$$\text{mean}(x) = \bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

$$\text{std}(x) = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$$

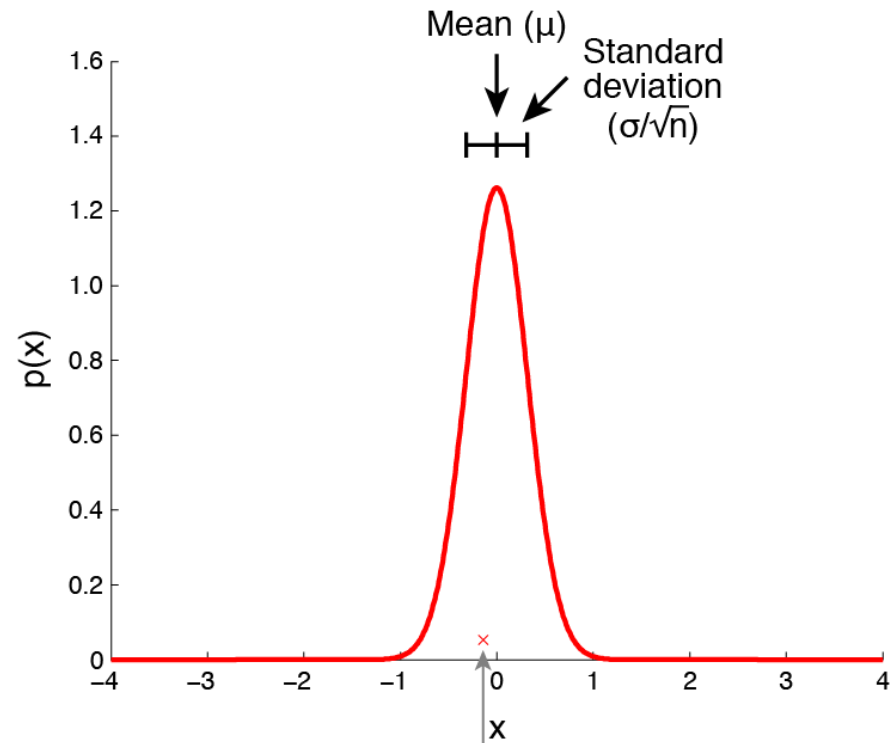
# Gaussian probability distribution



## Population

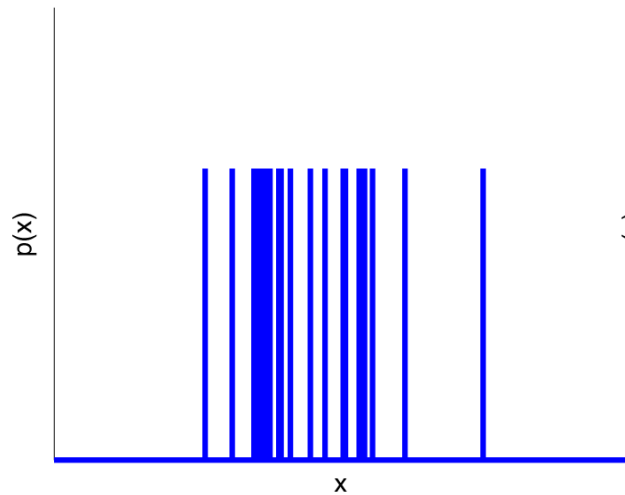


## Sampling distribution of the mean

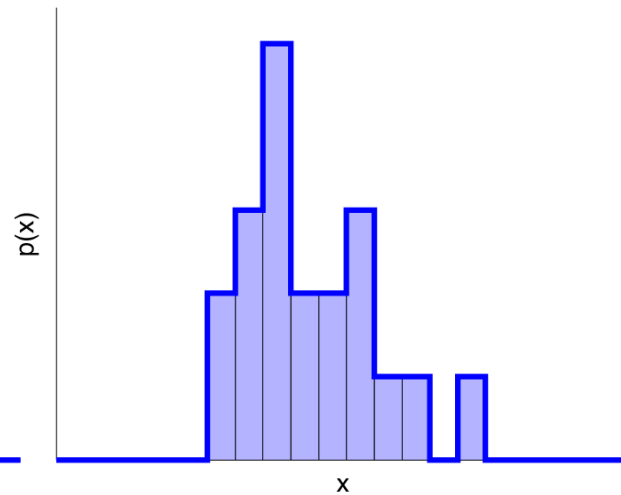




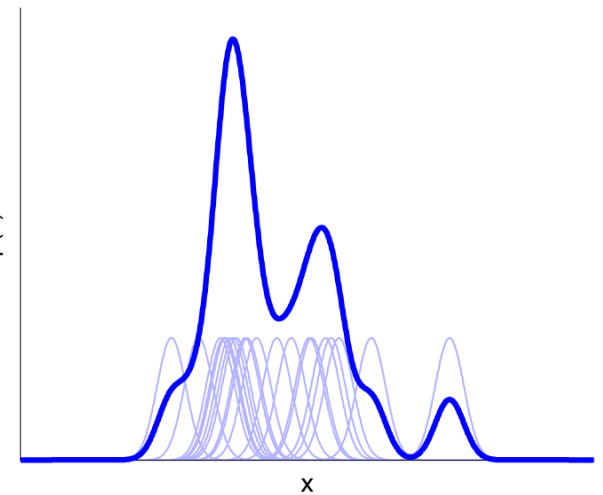
**Probability distribution implicit in bootstrapping**



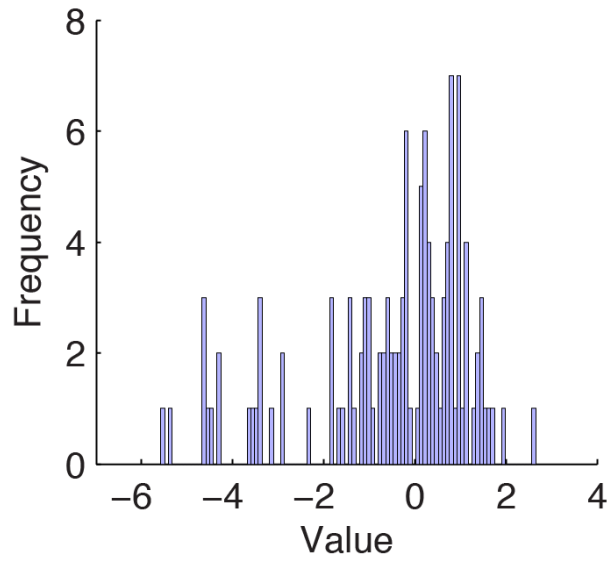
**Probability distribution via histogram**



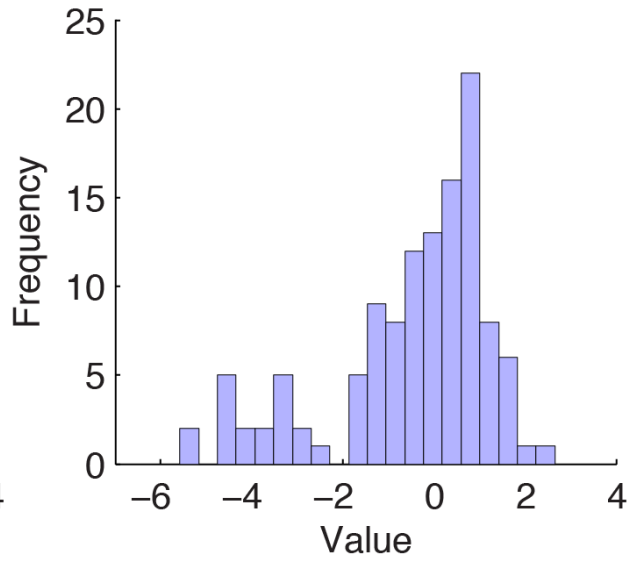
**Probability distribution via kernel density estimation**



**Bin size too small**



**Bin size just right?**



**Bin size too large**

