Lecture 12

Normal Distribution

Useful in many situations in many case the data is approximately normal. eg heights of adults about the same age, test scores, ...

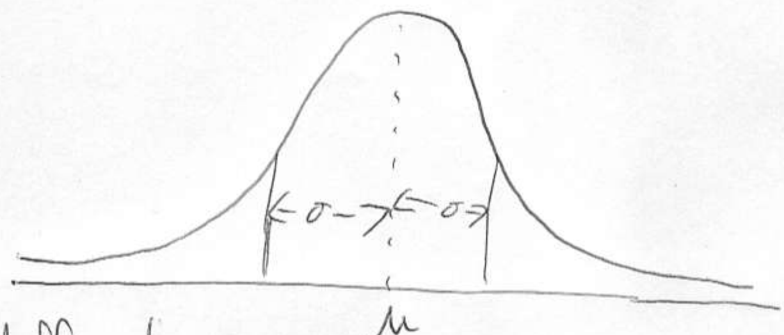
Continuous distribution. Two parameters

$$\frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

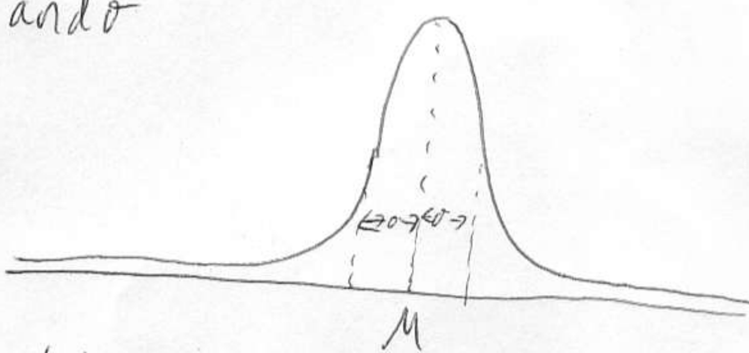
function for density curve

μ – mean

σ – standard deviation



different μ and σ



μ controls the center

σ controls the spread

Note that approximately 68% of observations in a normal distribution fall within 1σ of the mean (ie between $\mu-\sigma$ and $\mu+\sigma$)

95% with 2σ of the mean (ie between $\mu-2\sigma$ and $\mu+2\sigma$)

99.7% within 3σ of the mean (ie between $\mu-3\sigma$ and $\mu+3\sigma$)

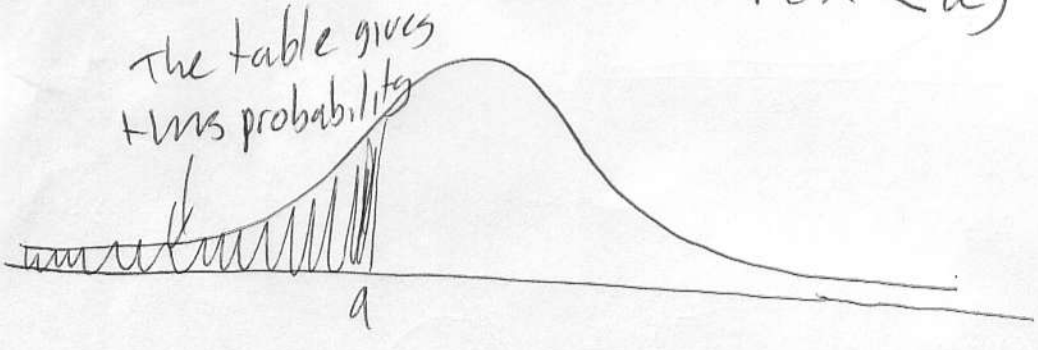
A special case

The Normal distribution with mean 0 and std dev 1 is known as the standard Normal Distribution.

As discussed last time areas under density curves give probabilities. There is a special table which gives these probabilities for the standard normal distribution (see attached table or in textbook).

Suppose X is a standard normal random variable and "a" is a constant number (eg 1.5, −2.34, ...)

then the table gives $P(X < a)$



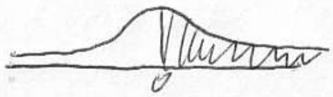
eg $P(X < -2.23) = .0129$ (Find this in the table)

Some special probabilities and relationships

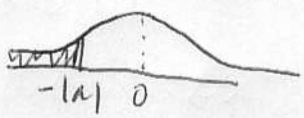
X is standard normal random variable

$P(X<0)=0.5$

$P(X>0)=0.5$



$P(X<-|a|)=P(X>|a|)$ where "a" is a constant



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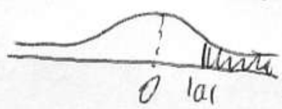

(this is from symmetry of normal distribution)

$P(X<\infty)=1$

$P(X>-\infty)=1$

$P(X>\infty)=0$

$P(X<-\infty)=0$

$P(X>a)=1-P(X<a)$ where "a" is a constant

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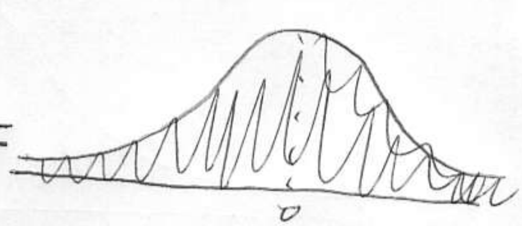

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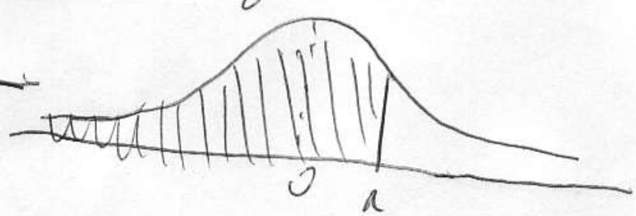

In groups work on exercises. . . . . . .