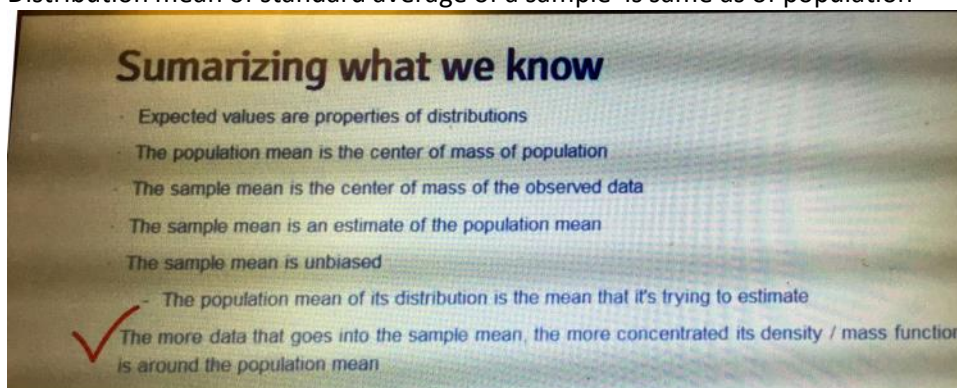


Probability

Sunday, January 17, 2016 8:24 AM

- Mutually exclusive : only one occurs. Sum of the probability is the probability of the union
- Probability that nothing occurs is 0 and occurs is 1
- If intersection exist between two probability, subtract the intersection
- Random variable : numerical outcome of an experiment.
 - Discrete(coin, die) or Continuous(traffic, Bmi,)
 - continuous because no upper bound
- PMF : Probability mass function
 - Binomial, canonical
 - Eg $P(x) = \epsilon^x(1-x)^{(1-x)}$
- PDF probability density function
 - It's about population quantity not probability
 - $P_{\text{beta}}(0.65, 2, 1)$
- CDF Cumulative Distribution Function
- Survival Function
- Quantile : median is the 50th Quantile $q_{\text{beta}}(0.5, 2, 1)$
- Estimand to estimator
- Conditional probability : $p(a) = p(a \& b) / p(b)$
- Expected values : the process of making conclusions about populations from noisy data that was drawn from it.
- Population mean: it's center of mass. It's the sum of the value and it's probability
- Distribution mean of standard average of a sample is same as of population



- Variance : measure of spread

Example

What's the variance from the result of the toss of a coin with probability of heads (1) of p ?

$$E[X] = 0 \times (1 - p) + 1 \times p = p$$

$$E[X^2] = E[X] = p$$

- $$Var(X) = E[X^2] - E[X]^2 = p - p^2 = p(1 - p)$$



The sample variance

$$Var(X) = E[(X - \mu)^2] = E[X^2] - E[X]^2$$

- $$s^2 = \frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n - 1}$$

It has an associate population distribution

- ```
round(c(var(x), var(x) / n, sd(x), sd(x) / sqrt(n)), 2)
```

### Binomial distribution

- Arises from binary outcome  
 $P(X=x) = p^x \cdot (1-p)^{n-x}$
- Binomial trials
- Pbinom gives the function in R

### Normal distribution

#### Gaussian distribution

Standard normal distribution : \_ mean is 0 and distribution is 1

`Qnorm(.95, must, SD)`

