Introduction to inferential notes

Notes of class

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1 name

2 Binomial distribution

$x \sim B()$

$\mu = np$ and $\sigma^2 = np(1-p)$

Note that is related with bernoulli varianle.

$$\begin{aligned} E(x) &= \sum xp(x) \\ &= \sum x \binom{n}{x} p^x (1-p)^{n-x} \end{aligned} \tag{1}$$

using the binomial theorem you can proof that is rewritten.

3 Bias of estimators

4 Confidence interval for mean

5 Confidence interval proportion

the concept involved here is margin of error.

unlike to point estimators, range give us a width of values that contain the true parameter.

$$\hat{p} \pm 1.96\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \tag{2}$$

where n is the sample size.

with 95% confidence, this means that: confidence interval not is a 95% of probability that the population parameter is in in the interval.

we have seen that $\bar{X}$ (sample mean) is a unbiased estimator of μ (population mean), we can prove this with maximum likelihood. Build an app to see the Confidence interval in my web page.

6 Hypothesis testing over bernoulli

suppose that we have a random variable with Bernoulli distribution with θ unknown parameter. to get $\hat{\theta}$ we take a random sample $x_1, x_2, .., x_n$. And given data, we known that:

$$H_0 = \frac{1}{2} \text{ or } H_1 \neq \frac{1}{2} \tag{3}$$

there are doubt about of the real value of θ however, we define a zone of rejected if: $|\bar{x} - \frac{1}{2}| > k$ where c is any number, therefore this zone is composed of a set of values in which we reject the hypothesis.

6.0.1 How define k

here play a big role α or significance level.

note here that is the error kind one $\alpha = P(|\bar{x} - \frac{1}{2}| > k \mid \theta = \frac{1}{2})$. using the property of $P(X > x) = 1 - P(X < x)$ and the property of absolute value we have: $1 - P(-k < \bar{x} - \frac{1}{2} < k \mid \theta = \frac{1}{2})$.

Remember that the $var(x) = \theta(1-\theta)$ and that by sampling distribution the standard error have $\sqrt{\frac{sd}{n}}$. therefore the last expression involving α could be write as

$$\alpha = 1 - P\left(\frac{-k}{\sqrt{\frac{\theta(1-\theta)}{n}}} < \frac{\bar{x} - \frac{1}{2}}{\sqrt{\frac{\theta(1-\theta)}{n}}} < \frac{k}{\sqrt{\frac{\theta(1-\theta)}{n}}}\right) \tag{4}$$

we can redirect to collab, plus.. at least for me.