Lecture Outlines:

* Large Sample Confidence Interval for a Population Proportion (Sec 7.2)
* Small Sample Confidence Interval for $μ$ (Sec 7.3).
1. Large Sample Confidence Interval for a Population Proportion (Sec 7.2).

Let $p$ denote the proportion of “success” in a population (i.e., the proportion of individuals who graduated from college). A random sample of $n$ individuals is to be selected, and $X$ is the number of successes in the sample. The point estimate of $p$ is the sample proportion $\hat{p} $. When $n$ is large, $\hat{p}$ approximately has the normal distribution with mean $p$ and variance $p(1-p)/n$. From this fact, the $\left(1-α\right)100\%$ confidence interval can be derived as (please read p.266 of the textbook for details)

$\hat{p}\pm z\_{α/2}\sqrt{\hat{p}\left(1-\hat{p}\right)}$.

1. Small Sample Confidence Interval for $μ$

Here we assume that a random sample $X\_{1},…X\_{n}$is from a normal distribution $N\left(μ,σ^{2}\right)$ and the sample size $n<30$. We will use the following fact to construct the confidence interval for $μ$:

$$T=\frac{\left(\overbar{X}-μ\right)}{\left(\frac{S}{\sqrt{n}}\right)}$$

has a $t-$distribution with $(n-1)$ degrees of freedom. The critical values $t\_{α}$ are provided in Table A.5. It follows that the $\left(1-α\right)100\%$ confidence interval is

$$\overbar{x}\pm t\_{\frac{α}{2}}\frac{S}{\sqrt{n}} $$

Note that the critical value $t\_{\frac{α}{2}}$ corresponds to $(n-1)$ degrees of freedom. For example, for a sample size 16, the critical value for the 95% confidence interval is $t\_{0.025}=2.131$ from Table A.5.

Please read Example 7.11 on page 273.