

Pre-class preparation

Please read the following textbook sections from Degroot and Schervish's *Probability and Statistics* (fourth edition) or watch the video, as indicated:

- Textbook: Sections 8.1-8.2

Objectives

By the end of the day's class, students should be able to do the following:

- State the definition of the sampling distribution of a statistic, and find the sampling distribution for a variety of common statistics.
- Compute probabilities based on the sampling distribution of a statistic.
- Explain how to use properties of the sampling distribution of an estimator quantify how close an estimator.
- Give the PDF and CDF of the χ^2 distribution, and explain its relationship to the Gamma distribution and exponential distribution.
- Calculate the mean, variance, moments, and MGF of the χ^2 distribution using properties of the Gamma distribution.

Reflection Questions

Please submit your answers to the following questions to the corresponding Canvas assignment by 8:45AM:

1. Example 8.1.2 shows that $X_1, \dots, X_n | \mu, \sigma^2 \stackrel{\text{iid}}{\sim} N(\mu, \sigma^2)$, then the sampling distribution of $\bar{X}_n \sim N(\mu, \sigma^2/n)$. Suppose now that $n = 100$ and $\sigma^2 = 1$. Explain how to use this information along with the 68-95-99.7 rules to calculate the probability that the sample mean is within 0.2 of the true mean μ .
2. True or false? The sampling distribution for every statistic is approximately Normal.
3. Use known properties of the Gamma distribution to briefly show that if $X \sim \chi^2$ with m degrees of freedom, then $\mathbb{E}[X] = m$ and $\text{Var}(X) = 2m$.
4. (Optional) Is there anything from the pre-class preparation that you have questions about? What topics would you like some more clarification on?