STAT 702/J702

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-*Lecture 28*-

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Today

- Some Notes on the Exam
- The Results from Last Time
- Examples
- Course Evaluations

Distributions

- If $Z \sim N(0,1)$ then $Z^2 \sim \chi^2_{df=1}$
- If $X_1, \ldots X_k$ are independent χ^2 with df = $v_1, \ldots v_k$ then $\Sigma X_i \sim \chi^2_{df=\Sigma vi}$

- If Z~N(0,1) and X ~ $\chi^2_{df=v}$ are independent then $$\frac{Z}{\sqrt{\frac{X}{v}}} \sim t_{df=v}$$
- If U~ $\chi^2_{df=m}$ and V~ $\chi^2_{df=n}$ independent then (U/m)/(V/n) ~ $F_{df=m,n}$

Relationships: If $X_1, \ldots, X_n$ are i.i.d. $N(\mu,\sigma^2)$ then

- $$\frac{(n-1)s^2}{\sigma^2} \sim \chi^2_{df=n-1}$$
- $$\frac{\overline{X}-\mu}{s/\sqrt{n}} \sim t_{df=n-1}$$

If $X_1, \ldots, X_{nx}$ are i.i.d. $N(\mu_X,\sigma_X^2)$ and $Y_1, \ldots, Y_{ny}$ are i.i.d. $N(\mu_Y,\sigma_Y^2)$ then

$$\frac{s_X^2/\sigma_X^2}{s_Y^2/\sigma_Y^2} \sim F_{df=n_X-1,n_Y-1}$$

Example 1: A random sample of battery lifespans of size 20 shows an average of 15.4 hours and standard deviation of 2.8 hours.

Is this enough evidence to reject the manufacturer's claim that the batteries have an average lifespan of at least 16 hours?

Example 2: What is the distribution of the difference of two means?

Example 3:

Let $W_1, \ldots, W_k$ be i.i.d. $N(\mu_W,\sigma_1^2)$

$X_1, \ldots, X_L$ be i.i.d. $N(\mu_X,\sigma_1^2)$

$Y_1, \ldots, Y_M$ be i.i.d. $N(\mu_Y,\sigma_2^2)$

$Z_1, \ldots, Z_N$ be i.i.d. $N(\mu_Z,\sigma_2^2)$

How can we see if $\sigma_1^2 = \sigma_2^2$?