

F-Test of Equality of Variances - USE

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2018S - ADVANCED TOPICS IN PARALLEL COMPUTING

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Mean and Variance

- ▶ Mean measures the central tendency of a random variable. It is synonym of expected value.
- ▶ Variance measures how far from mean are the values of a random variable.

$$\mu = \frac{1}{n} \sum_{i=1}^n x_i.$$

$$\text{Var}(X) = \mathbf{E}[(X - \mu)^2].$$

F-Test

- ▶ Sometimes we have two random variables and we want to know if they have the same variance.
- ▶ F is the test statistic to do this analysis.
- ▶ \bar{X} and \bar{Y} are the sample means.
- ▶ S_X^2 and S_Y^2 are the sample variances.

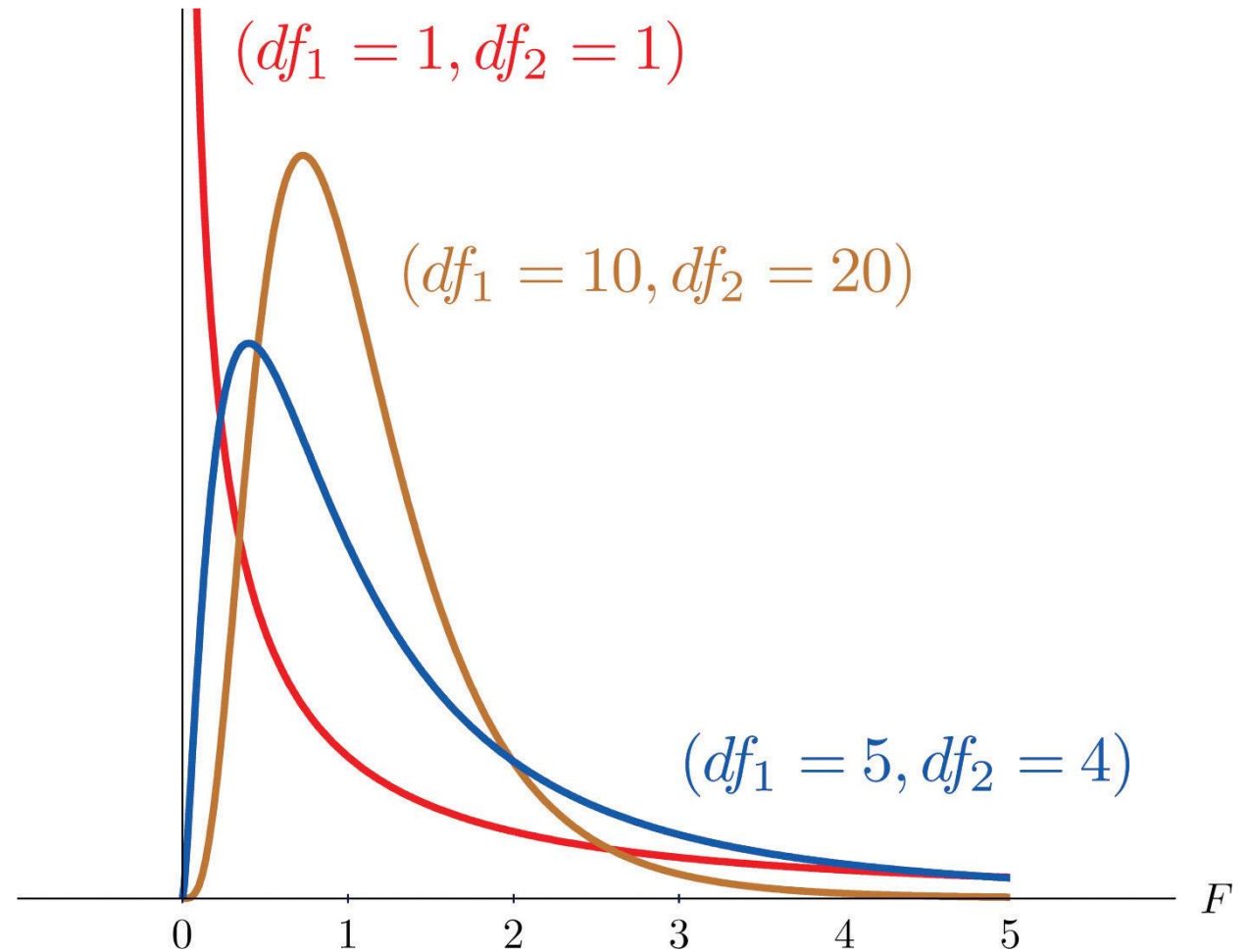
$$\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i \text{ and } \bar{Y} = \frac{1}{m} \sum_{i=1}^m Y_i$$

$$S_X^2 = \frac{1}{n-1} \sum_{i=1}^n (X_i - \bar{X})^2 \text{ and } S_Y^2 = \frac{1}{m-1} \sum_{i=1}^m (Y_i - \bar{Y})^2$$

$$F = \frac{S_X^2}{S_Y^2}$$

PDF of F-Distribution

- ▶ F follows the F-distribution with $n - 1$ and $m - 1$ degrees of freedom.
- ▶ $F \gg 1$ or $F \ll 1$ indicate very significant differences.



Use Cases

Compare the similarity between two streams of samples.

Calculates the probability of two random variables has the same variance.