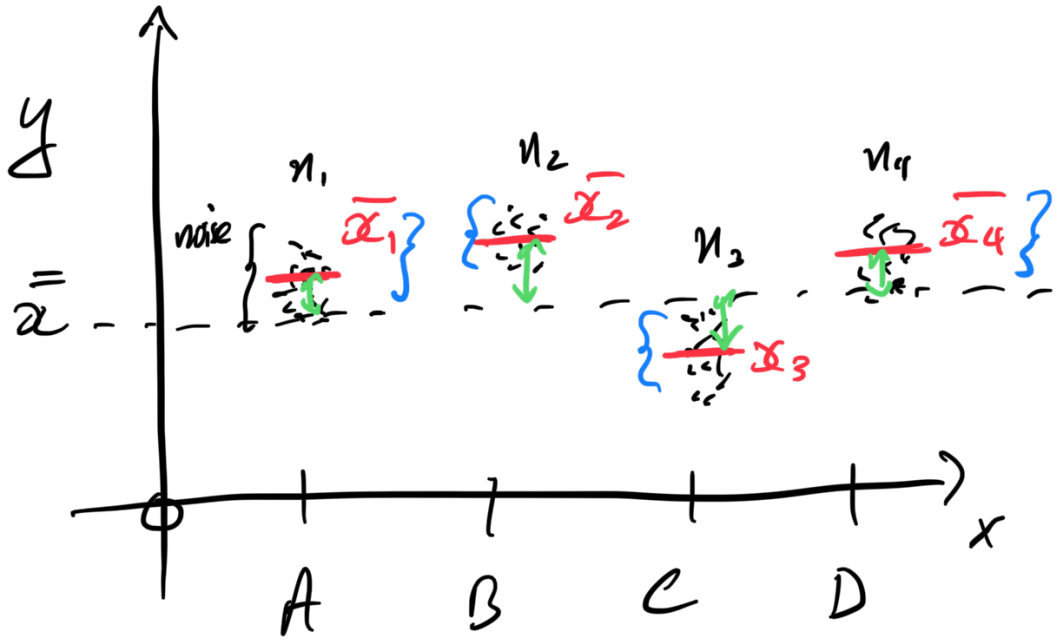
Physics 341 - Lecture 21

→ ANOVA - Part Deux



$$S^2 = \frac{1}{N_{dof\ total}} \underbrace{\sum_{i=1}^{a} \sum_{j=1}^{n_j} (x_{ij} - \bar{\bar{x}})^2}_{SS_{TOTAL}}$$

$$SS = N_{dof} S^2$$

① TOTAL — Easy.

$N_{total} - 1$ — easy.

Easy.

$$SS = \sum_{\text{treatment } i=1}^{a} n_i \left(\bar{x}_i - \bar{\bar{x}} \right)^2 \quad \text{②}$$

Easy.

③ $$SS_{error} = \sum_{i=1}^{a} \sum_{j=1}^{n_j} \left(x_{ij} - \bar{x}_i \right)^2$$ ⇐ Hard.

$SS_{TOTAL} = SS_{treatment} + SS_{error}$

$$SS_{error} = \underbrace{SS_{TOTAL}}_{\text{easy}} - \underbrace{SS_{treatment}}_{\text{fairly easy.}}$$

$\mu_1 = 100$	$\mu_1 = 100$

$\mu_2 = 103$

$\mu_3 = 97$

$\mu_2 = 100$

$\mu_3 = 100$

$SS_{TOTAL} = (N-1)\, s^2$

data1 . var (ddof = 1)

$SS_{treatment} =$

First Data Set

$SS_{TREATMENT} \simeq 0$

MS

2800

$SS_{treatment}$

$MS_{treatment}$ = $\frac{SS_{treatment}}{N_{dof}(treatment)}$

$= \frac{11000}{2}$

MS_{error} = $\frac{SS_{error}}{N_{dof}(error)}$

$= \frac{}{297}$

(a) settings of the experiment.

n data pts at each setting.

$$N_{total} = an$$

$$N_{dof}^{total} = an - 1$$

$$N_{dof}^{treatment} = a - 1$$

$$N_{dof}^{error} = N_{dof}^{total} - N_{dof}^{treatment}$$

$(a-1)$

$= an - 1 - (\quad)$

$= an - a$

$= an - a$

$N_{dof}^{error} = a(n-1)$

$a = 3$

$n = 100$

$> N = an = 300$

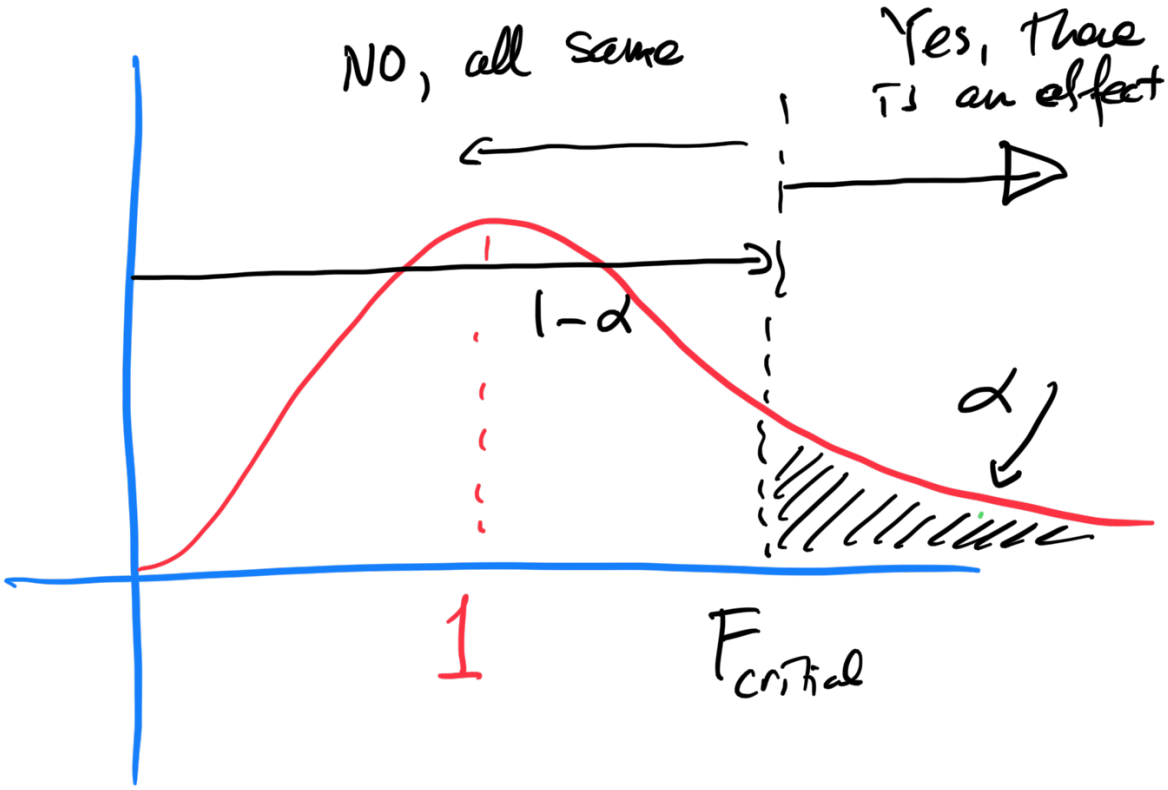
$N_{dof}^{total} = \boxed{299} =$

$N_{dof}^{treatment} = a - 1 = \boxed{2}$

$N_{dof}^{error} = 299 - 2$

$= \boxed{297}$

$$S/N = \frac{MS_{treatment}}{MS_{error}} \Leftarrow F$$



$$fdist\left(\frac{N_{dof}^{treatment}}{}, \frac{N_{dof}^{error}}{}\right)$$

One-Way ANOVA

Scipy.stats
R
SPSS

ANOVA Table

Source	DF	SS	MS	F
Treatment	2	435.2	217.6	2.406.0
Error	297	26 855.3	90.4	

Computing → Tool

Woodworking → Thing of Beauty

XKCD

Ph.D.

Doctor of Natural Philosophy.