



DCGI

DEPARTMENT OF COMPUTER GRAPHICS AND INTERACTION
CZECH TECHNICAL UNIVERSITY IN PRAGUE



Experiment Evaluation and Power Analysis - PRACTICE

SAN 2016/17

POWER ANALYSIS | DISCOVERY

- To detect X % of problems that affects Y % of users.
- To have a X % chance of detecting ...

$$n = \frac{\ln(1 - X)}{\ln(1 - Y)}$$

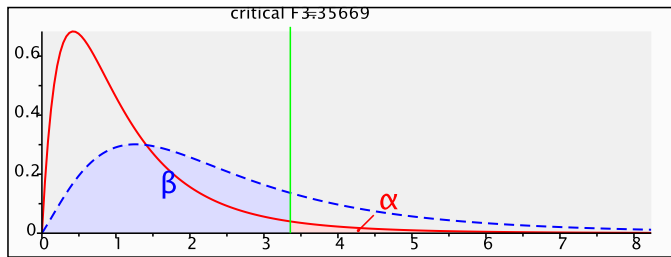
$$n = 16$$

$$\text{chance} = 95 \%$$

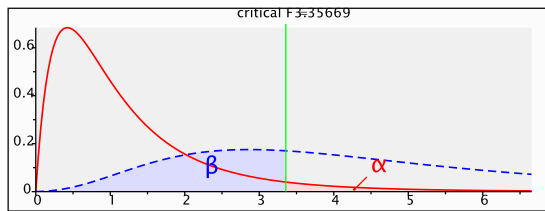
$$\text{rareness} = Y \%$$

POWER ANALYSIS | COMPARING

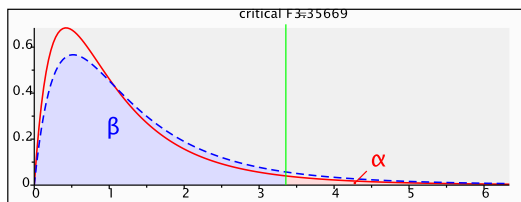
F test (MANOVA: Repeated measures, within factors)



$\alpha = 0.05$
 $\beta = 0.73$ for $\beta = 0.2, n = 44$
 $f = 0.25$ (medium)
 $n = 16$



$\alpha = 0.05$
 $\beta = 0.37$ for $\beta = 0.2, n = 22$
 $f = 0.4$ (large)
 $n = 16$



$\alpha = 0.05$
 $\beta = 0.92$ for $\beta = 0.2, n = 244$
 $f = 0.1$ (small)
 $n = 16$

EXPERIMENT RESULTS

F test (MANOVA: Repeated measures, within factors)

Keyboard type means:

A=239.43750

B=81.12500

Group means:

AB=152.50000

BA=168.06250

ANOVA_table_for_Completion Time (s)

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| Effect | df | SS | MS | F | p |
|------------------------|----|------------|------------|---------|---------|
| Group | 1 | 1937.531 | 1937.531 | 1.525 | 0.23722 |
| Participant(Group) | 14 | 17789.438 | 1270.674 | | |
| Keyboard type | 1 | 200502.781 | 200502.781 | 157.693 | 0.00000 |
| Keyboard type x Group | 1 | 810.031 | 810.031 | 0.637 | 0.43810 |
| Keyboard type_x_P(Grou | 14 | 17800.688 | 1271.478 | | |

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EXPERIMENT RESULTS

F test (MANOVA: Repeated measures, within factors)

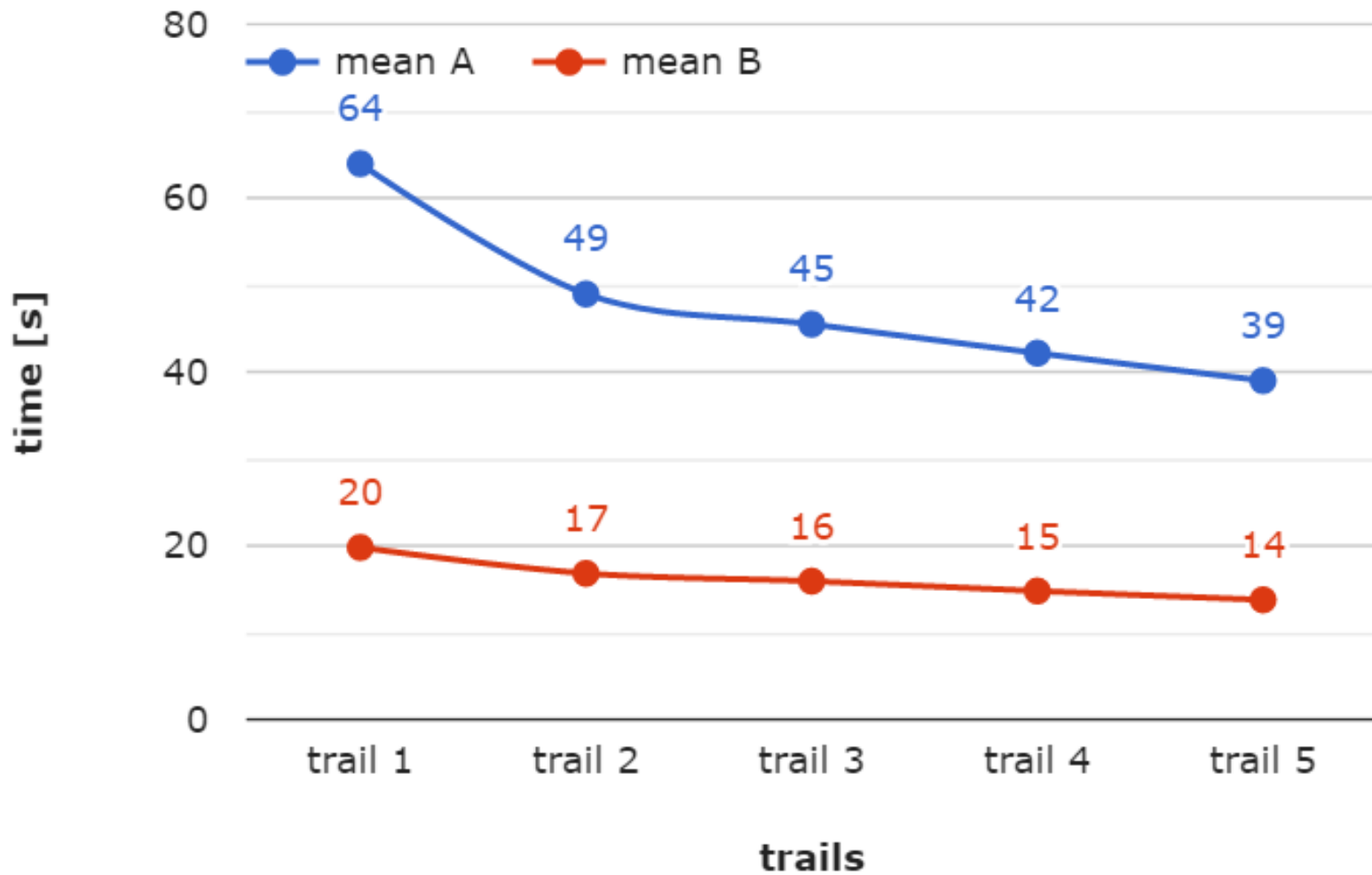
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----- MAIN EFFECT MEANS -----
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Grand mean: 32.06153125000001
Keyboard type means:
  A=47.90000
  B=16.22306
Trails means:
  One=41.86884
  Two=32.88356
  Three=30.70050
  Four=28.47219
  Five=26.38256
Group means:
  AB=30.50881
  BA=33.61425
```

ANOVA_table_for_Completion Time (s)

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Effect                df          SS          MS          F          p
-----
Group                 1          385.750        385.750        1.517        0.23832
Participant (Group)   14         3559.375        254.241
Keyboard type         1         40137.135       40137.135      156.764      0.00000
Keyboard type_x_Group 1          162.903        162.903         0.636        0.43839
Keyboard type_x_P(Group) 14         3584.505        256.036
Trails                4          4603.059       1150.765        34.943      0.00000
Trails_x_Group        4          113.961         28.490         0.865        0.49064
Trails_x_P(Group)    56         1844.236         32.933
Keyboard type_x_Trails 4          1762.761       440.690        16.168      0.00000
Keyboard type_x_Trails 4           45.055         11.264         0.413        0.79838
Keyboard type_x_Trails 56         1526.430         27.258
=====
```

EXPERIMENT RESULTS

Learning curves



INSTRUCTIONS FOR 2ND PART

Analyze the data gathered on the 1st practice (see <https://goo.gl/nwj2hb>). The report should contain:

- statistical analysis of data reporting
 - H_0/H_1 rejection/acceptance
 - group effect, asymmetric learning effect
 - learning curve across trials
 - compare learning curve of method A and B
 - how to determine number of trials when the method A will become faster than method B
- power analysis of the experiment setup
 - compute and discuss optimal parameters (power, effect size, α , n) for such study
- determine parameters of discovery experiment
 - n, X % chance of discovering problems affecting Y % of users

THANK YOU FOR ATTENTION



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