

POIR 613: Computational Social Science

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Course website:

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Experimental research in the digital age

Experimental research in the digital age

Field experiments combine the control of laboratory experiments ([high internal validity](#)) with the generalizability of a real setting ([external/convergent validity](#)).

Challenge: cost, particularly if scale is sufficient to study high-variance social phenomena.

[Digital technologies](#) offer practical and cost-effective venues for conducting field experiments (*aka* **A/B tests**).

Given sufficient [access](#) and existence of [software](#) that allows randomization, researchers can study both short- and long-term effects of manipulations

How Obama raised \$60 million using experiments



How Obama raised \$60 million using experiments

IMAGES



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6 Media variation \times 4 button combinations = 24 combinations

Which one do you think will get a higher conversion rate?

How Obama raised \$60 million using experiments

Combinations (24)		Page Sections (2)		Download: XML CSV TSV Print		
Relevance Rating	Variation	Est. conv. rate	Chance to Beat Orig.	Observed Improvement	Conv./Visitors	
Button <div>5 / 5</div>	Original	7.51% ± 0.2%	—	—	5851 / 77858	
	Learn More	8.91% ± 0.2%	100%	18.6%	6927 / 77729	
	Join Us Now	7.62% ± 0.2%	73.5%	1.37%	5915 / 77644	
	Sign Up Now	7.34% ± 0.2%	13.7%	-2.38%	5660 / 77151	
Media <div>5 / 5</div>	Original	8.54% ± 0.2%	—	—	4425 / 51794	
	Family Image	9.66% ± 0.2%	100%	13.1%	4996 / 51696	
	Change Image	8.87% ± 0.2%	92.2%	3.85%	4595 / 51790	
	Barack's Video	7.76% ± 0.2%	0.04%	-9.14%	3992 / 51427	
	Sam's Video	6.29% ± 0.2%	0.00%	-26.4%	3261 / 51864	
	Springfield Video	5.95% ± 0.2%	0.00%	-30.3%	3084 / 51811	

Outcome variable: sign-up rates

Dashboard shows sign-up rates for each separate variation

How Obama raised \$60 million using experiments

Combinations (24)		Page Sections (2)		Download: XML CSV TSV Print		
Disable	All Combinations (24) ▼		Key: Winner Inconclusive Loser ?			
<input type="checkbox"/> Combination	Status ?	Est. conv. rate ?	Chance to Beat Orig. ?	Observed Improvement ?	Conv./Visitors ?	
Original	Enabled	8.26% ± 0.5%	—	—	1088 / 13167	
★ Top high-confidence winners. Run a follow-up experiment »						
<input type="checkbox"/> Combination 11	Enabled	11.6% ± 0.6%	100%	40.6%	1504 / 12947	
<input type="checkbox"/> Combination 7	Enabled	10.3% ± 0.6%	100%	24.0%	1340 / 13073	
<input type="checkbox"/> Combination 3	Enabled	9.80% ± 0.6%	99.7%	18.7%	1277 / 13025	
<input type="checkbox"/> Combination 10	Enabled	9.23% ± 0.6%	95.9%	11.7%	1203 / 13031	
<input type="checkbox"/> Combination 8	Enabled	9.03% ± 0.6%	91.6%	9.28%	1178 / 13046	
<input type="checkbox"/> Combination 9	Enabled	8.77% ± 0.6%	81.8%	6.10%	1111 / 12672	
<input type="checkbox"/> Combination 6	Enabled	8.64% ± 0.5%	75.3%	4.58%	1108 / 12822	

Dashboard shows sign-up rates for each separate variation

Experimental research in the digital age

Experimental technologies for online interventions:

1. Email and text messages

- ▶ More likely to get subjects' attention
- ▶ e.g. [Blair *et al* \(2017\)](#): randomized text messages in India to encourage people to report corruption

2. Modified web interface

- ▶ Manipulation: platform features, exposure to information, display of specific web elements, etc.
- ▶ e.g. [Bakshy *et al* \(2012\)](#): social cues on FB ads

3. Bots

- ▶ Program or script that makes automated requests
- ▶ e.g. [Munger \(2016\)](#): reducing harassment on Twitter

4. Add-ons

- ▶ Additional software that nudges or tracks subjects
- ▶ e.g. [Guess \(2016\)](#): web tracking software to observe individuals' news consumption in response to monetary encouragement to seek information

Experimental research in the digital age

Experimental technologies for *social media* interventions
(Guess, 2021):

1. **Recruitment:**

- ▶ Followers of an account; random sample of users; survey participants

2. **Treatment delivery:**

- ▶ DMs; replies; promoted tweets; ads; bot interventions; followed pages/groups

3. **Outcome variables:**

- ▶ Behavioral (e.g. clicks, tweets) or self-reported (via survey responses)
- ▶ Spillover effects

Experimental research in the digital age

What can go wrong? (And potential solutions)

1. Logging errors: covariate balance in pre-treatment variables, A/A tests
2. Novelty effects: longer experiments
3. Multiple testing: Bonferroni correction
4. High significance due to large sample sizes: Cohen's D
5. SUTVA (interference between units): better research design
6. The 'free beer' problem: social science theory!

Side note: power calculations

- ▶ **Power** is the probability of detecting a specified *effect size* with specified sample characteristics (*size* and *variability*)
- ▶ Four interrelated components:
 1. Sample size
 2. Effect size you want to detect
 3. Desired significance level (false positive rate you're fine with)
 4. Power
- ▶ Before you run an experiment, you can compute necessary sample size assuming other 3 components:

```
> power.prop.test (p1=0.30, p2=0.35,  
sig.level=0.05, power=0.80)
```