

Finding Great Properties

How Airbnb uses open-source technology and analytics to deliver meaningful experiences



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The Plan

1 The Story of Airbnb

2 Search at Airbnb

A The Challenge

B The Solution

3 Takeaways

The Story of Airbnb

Joe



Nate



Text



Brian

The Story

● **2007:** Brian moves in with Joe



The Story

- **2007:** Brian moves in with Joe
Rent increases, they can't afford it



The Story

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No vacancy



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AirBed & Breakfast Find a place to stay.



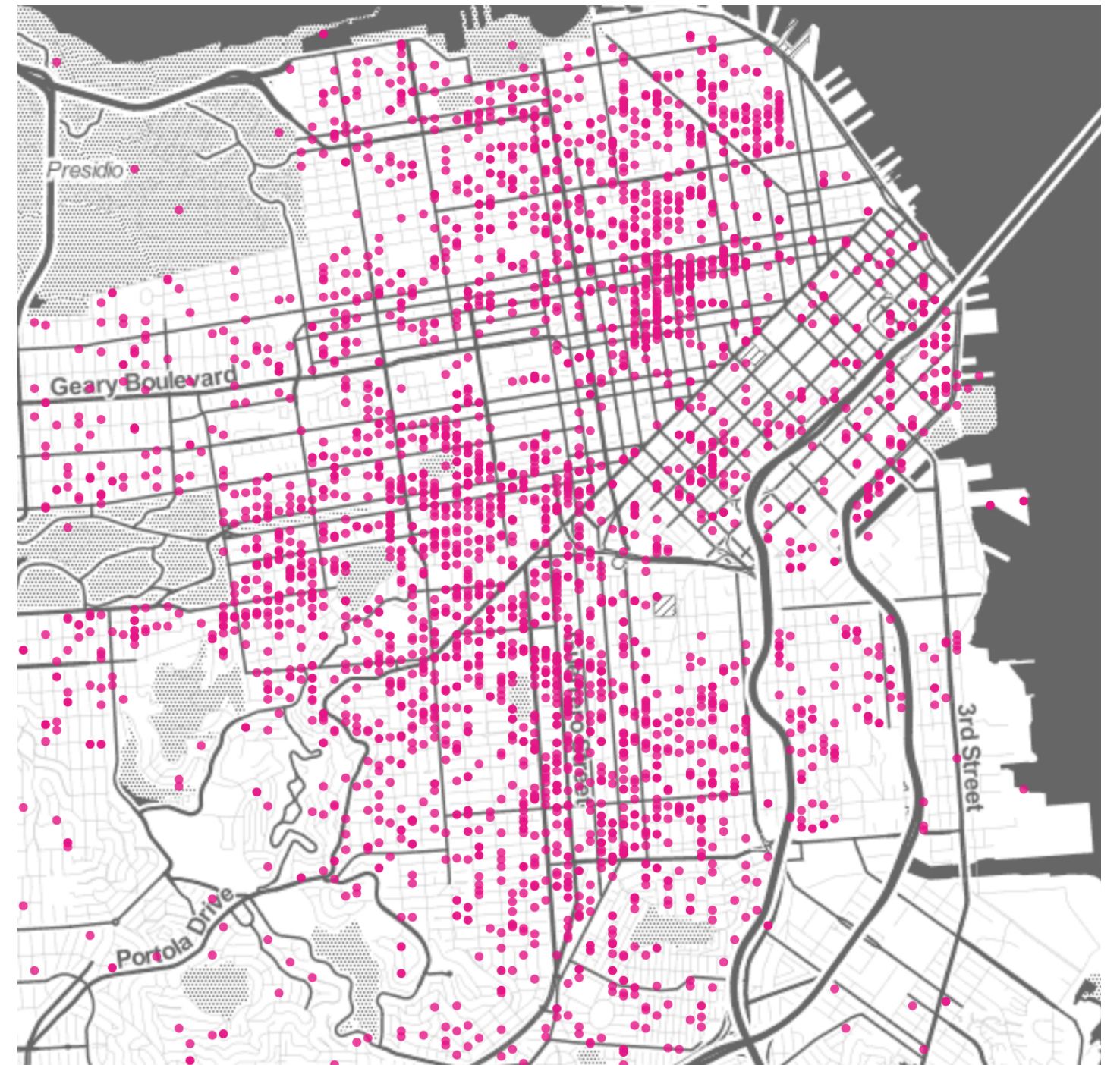
The Story

● **2007:** Brian moves in with Joe
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No vacancy



● **2011:** 1M guests booked



The Story

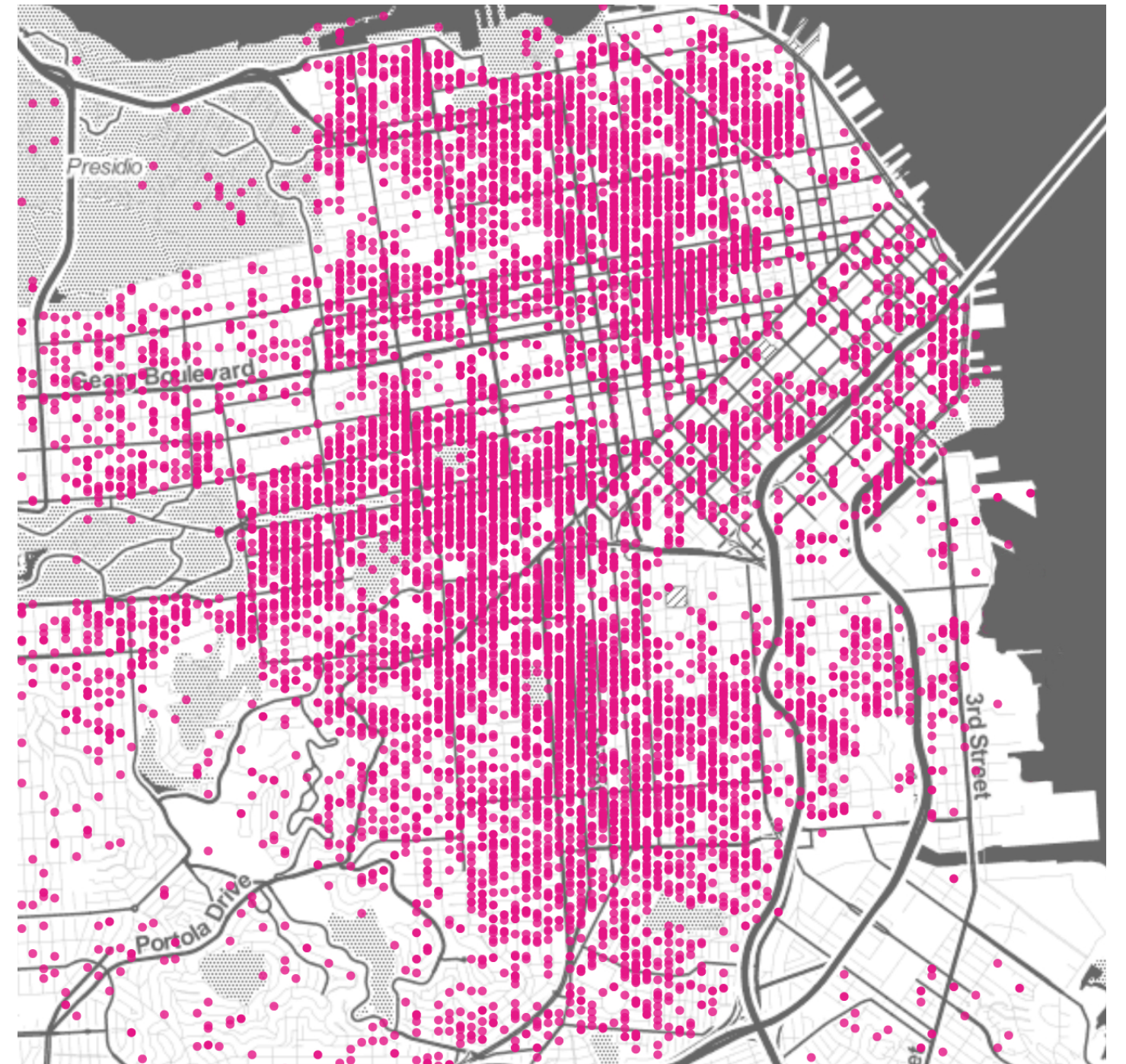
● **2007:** Brian moves in with Joe
Rent increases, they can't afford it

● **2008:** San Francisco Design Conference
No vacancy



● **2011:** 1M guests booked

● **2013:** 9M guests booked



The Problem: Search

Challenge: Quality

Treehouse at Earth 'N Us Farm

Treehouse - Private room · Northeast 1st Avenue, Miami, FL 33138, United States

Photos

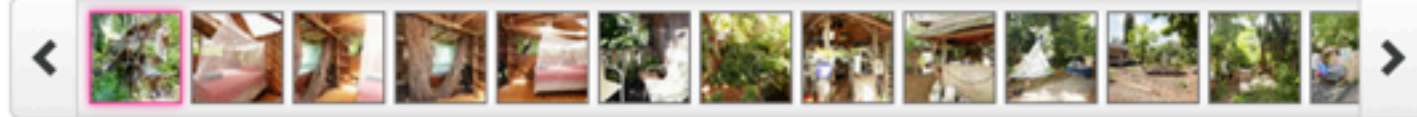
Maps

Street View

Calendar



Treehouse, full view



A Tiny Cave

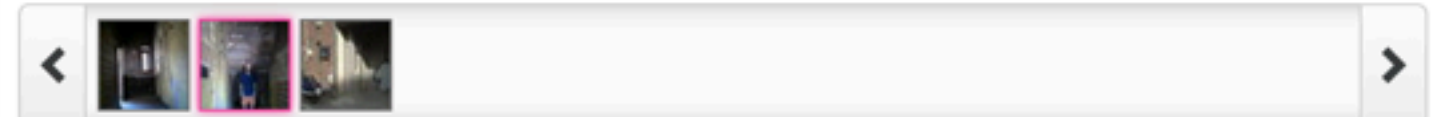
Cave - Entire home/apt · Gerichtstraße, Berlin, Berlin 13347, Germany

Photos

Maps

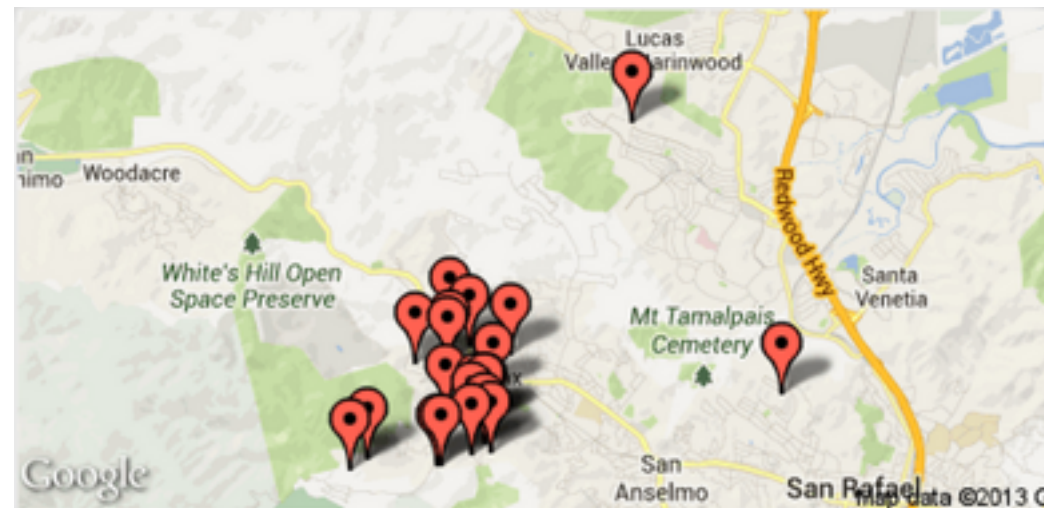
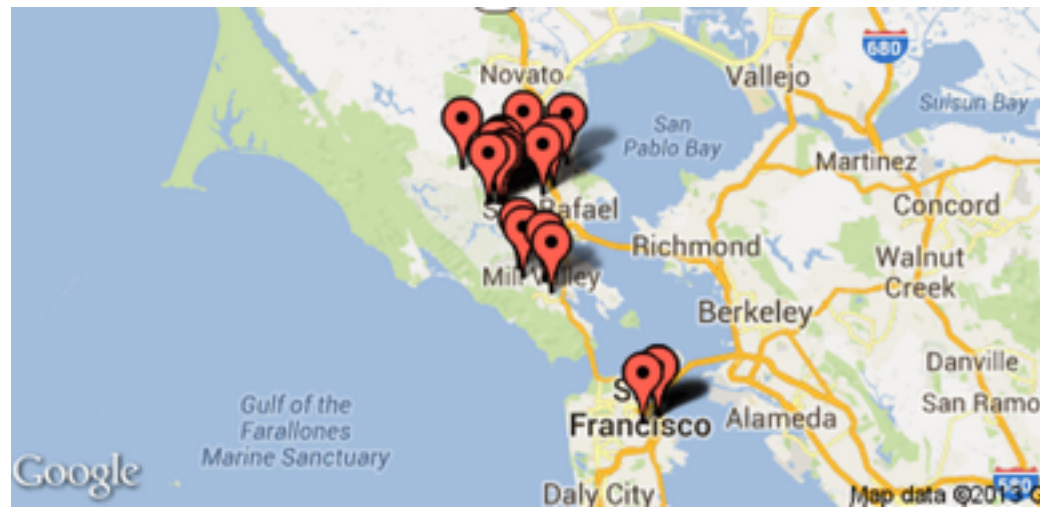
Street View

Calendar



Challenge: Relevance, globally

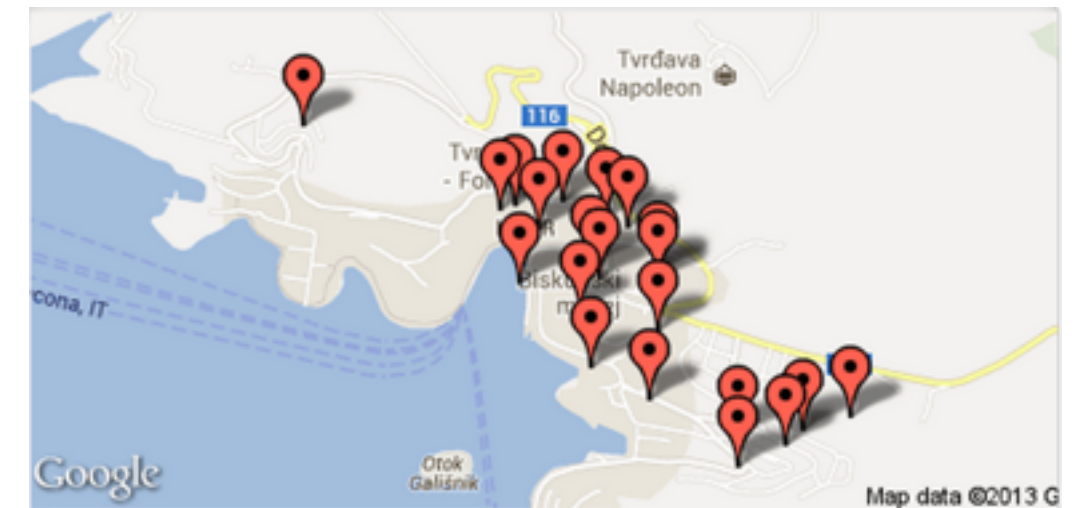
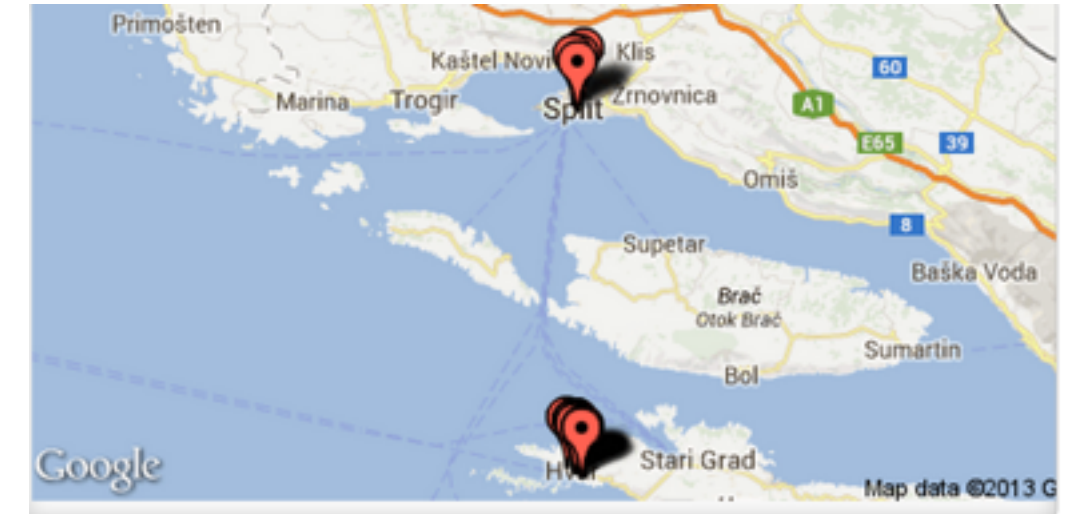
Fairfax, CA



Amsterdam, The Netherlands



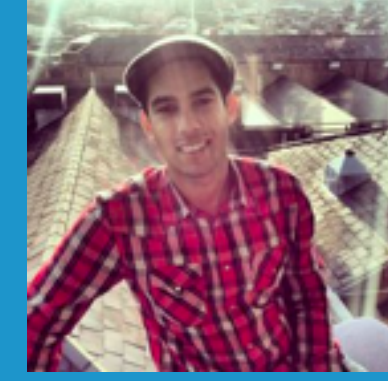
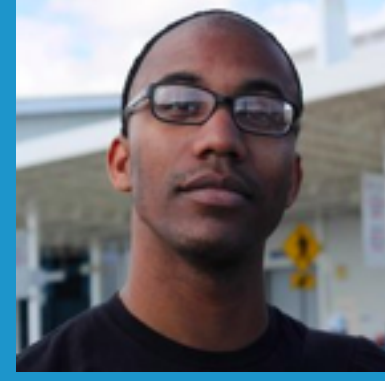
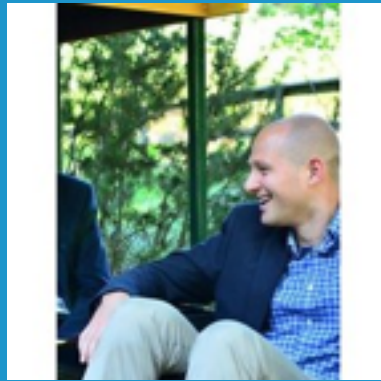
Hvar, Croatia



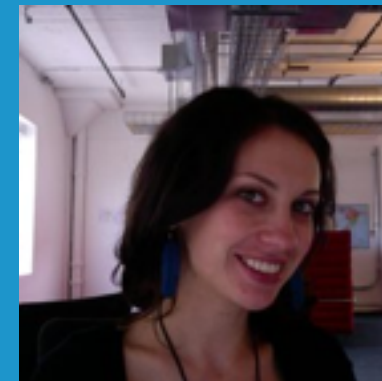
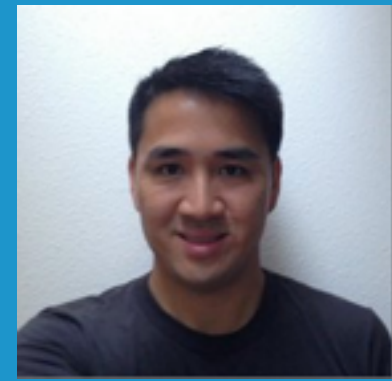
More info:
<http://nerds.airbnb.com/location-relevance/>

The Search Team

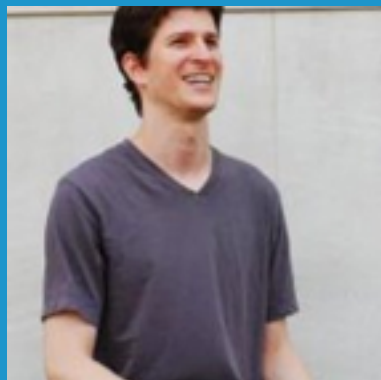
Design



Analytics



Product



Engineering

The Stack

Open Source, mostly Apache Software Foundation

+ **Site** - Rails, MySQL

+ **Search** - Java, Lucene

+ **Data-Infra** - Hadoop, Mesos, Chronos

+ **Query** - Hive, Redshift

+ **Analysis** - R/Shiny, d3

+ **Experiments** - Trebuchet



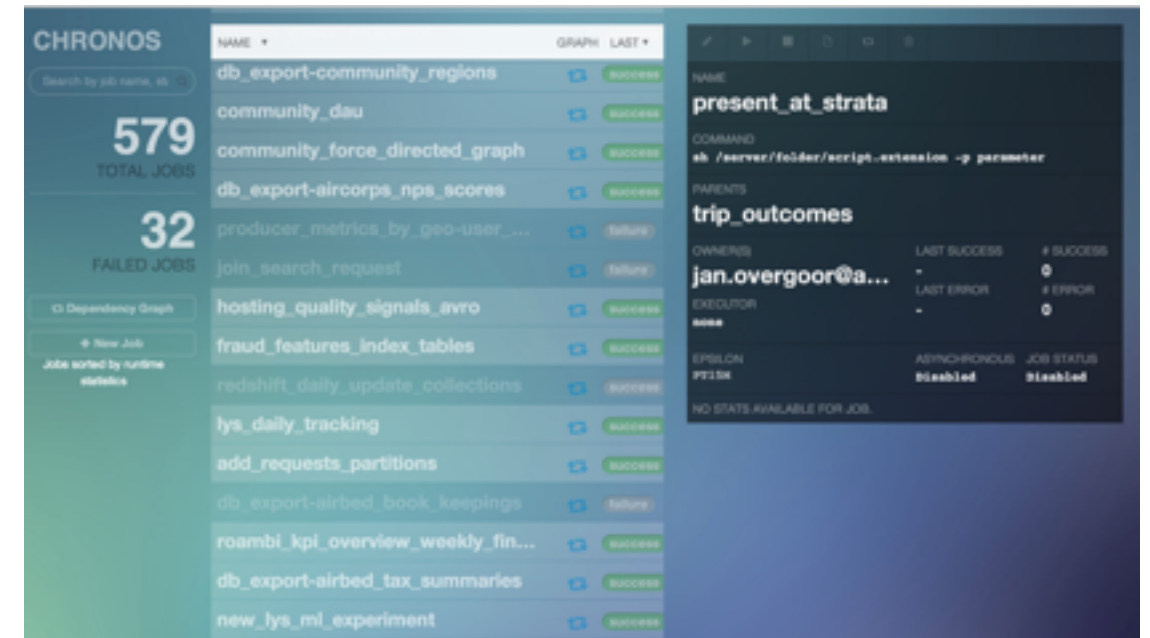
Apache Mesos



The Stack

Homegrown

- + **Site** - Rails, MySQL
- + **Search** - Java, Lucene
- + **Data-Infra** - Hadoop, Mesos, **Chronos**
- + **Query** - Hive, Redshift
- + **Analysis** - R/Shiny, d3
- + **Experiments** - **Trebuchet**



<https://github.com/airbnb/chronos>

gaf_c1	• buckets (1) of total: 20 for user experiment: gingerwap_old_flow	Success
gaf_c2	• buckets (1) of total: 20 for user experiment: gingerwap_old_flow	Success
gaf_exp	• buckets (2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20) of total: 20 for user experiment: gingerwap_old_flow	Success
g4	• roles (custom) "g4"	Success
Guest sees host responsiveness	• admins (custom) • buckets (1, 2, 3) of total: 5 for user experiment: Guest sees host responsiveness	Success
hc_cms1	• buckets (1) of total: 3 for visitor experiment: host_cancel	Success
hc_cms2	• buckets (2) of total: 3 for visitor experiment: host_cancel	Success
hc_exp	• buckets (3) of total: 3 for visitor experiment: host_cancel	Success
help_center_redirect	• everyone (custom)	Success
help_center_redirect_control	• buckets (2) of total: 2 for visitor experiment: help_center_redirect	Success
help_exp_control1	• buckets (1, 2) of total: 4 for visitor experiment: help_exp	Success
help_exp_exp	• everyone (custom)	Success
help_side_globe_control	• buckets (1) of total: 4 for visitor experiment: help_side_globe	Success
help_side_globe_exp	• buckets (1, 2, 3) of total: 4 for visitor experiment: help_side_globe	Success
help_neighbors	• admins (custom)	Success
help_videos_control	• buckets (1) of total: 2 for visitor experiment: help_videos	Success

<https://github.com/airbnb/trebuchet>

Experiments

A/B Testing

Control

BOOK IT!

Treatment

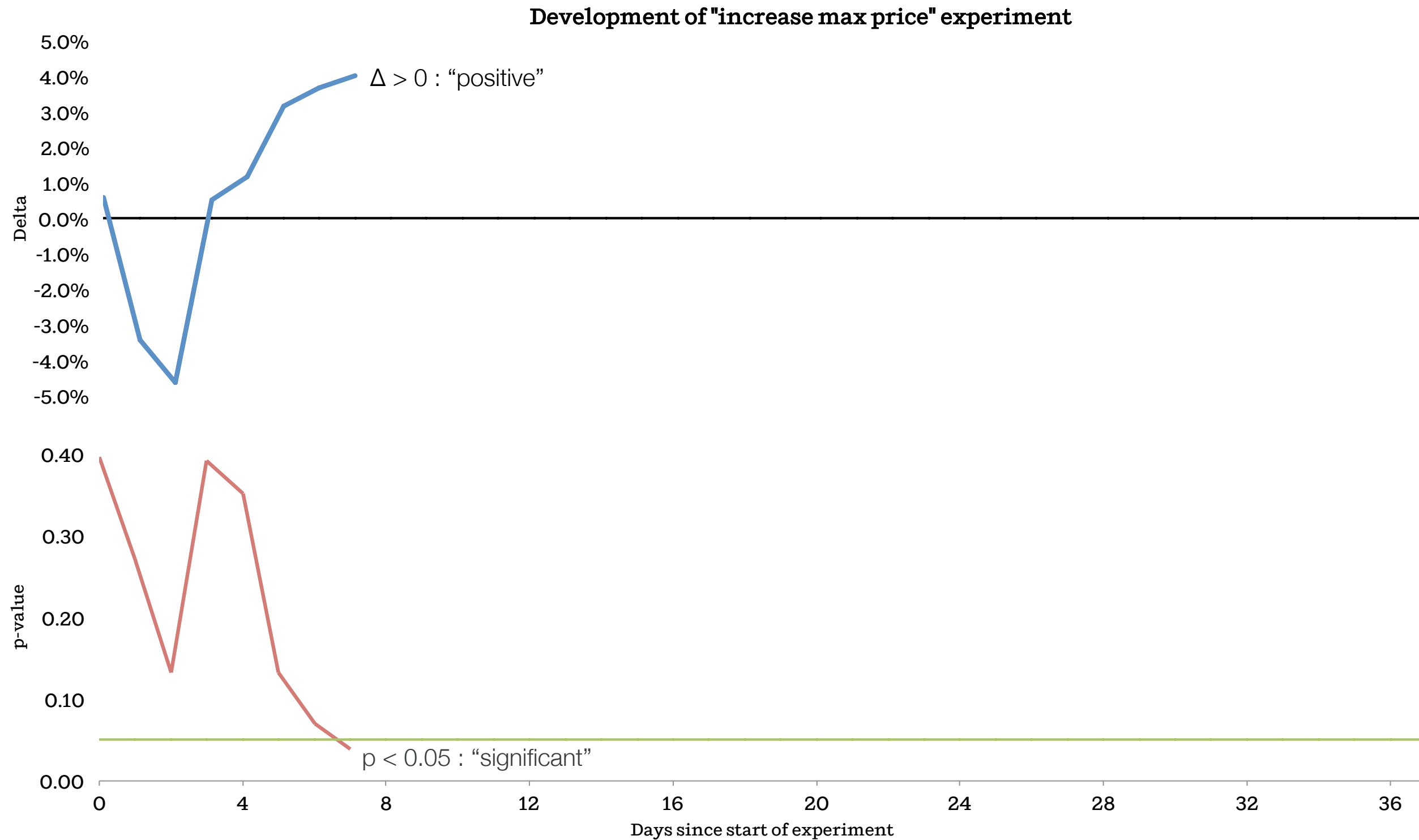
Book it!

Great sources:

<http://www.evanmiller.org/how-not-to-run-an-ab-test.html>

<http://mcfunley.com/design-for-continuous-experimentation>

A/B Testing - Give it time



A/B Testing - Give it time

Statistical significance by itself does not tell the whole story



A/B Testing - Break it down

A new design

airbnb BROWSE

London Check in Check out 1 Guest SEARCH LIST PHOTO MAP

Going to London? Visit the Airbnb Neighbourhood Guide to London!

Redo search in map

1000+ Rentals (London) with 1000+ popular on Wish Lists

- Comfy Central Home in Camden Town**
Private room — London > LB of Camden
\$82 Per night
- Vintage bedroom near Big Ben Nr1!**
Private room — London > Vauxhall
\$80 Per night
- A cosy home in central London**
Private room — Paddington > Paddington
\$82 Per night
- Large lux.double 2mins Kilburn tube**
Private room — London > Hampstead
\$82 Per night
- Piccadilly Circus Central London 2**
Entire home/flat — London > St. James's
\$99 Per night

airbnb London

Search when I move the map

TRIP 11/21/2013 → 11/22/2013 1 Guest

ROOM TYPE Entire Place Private Room Shared Room

PRICE Min Price \$10 Max Price \$1000

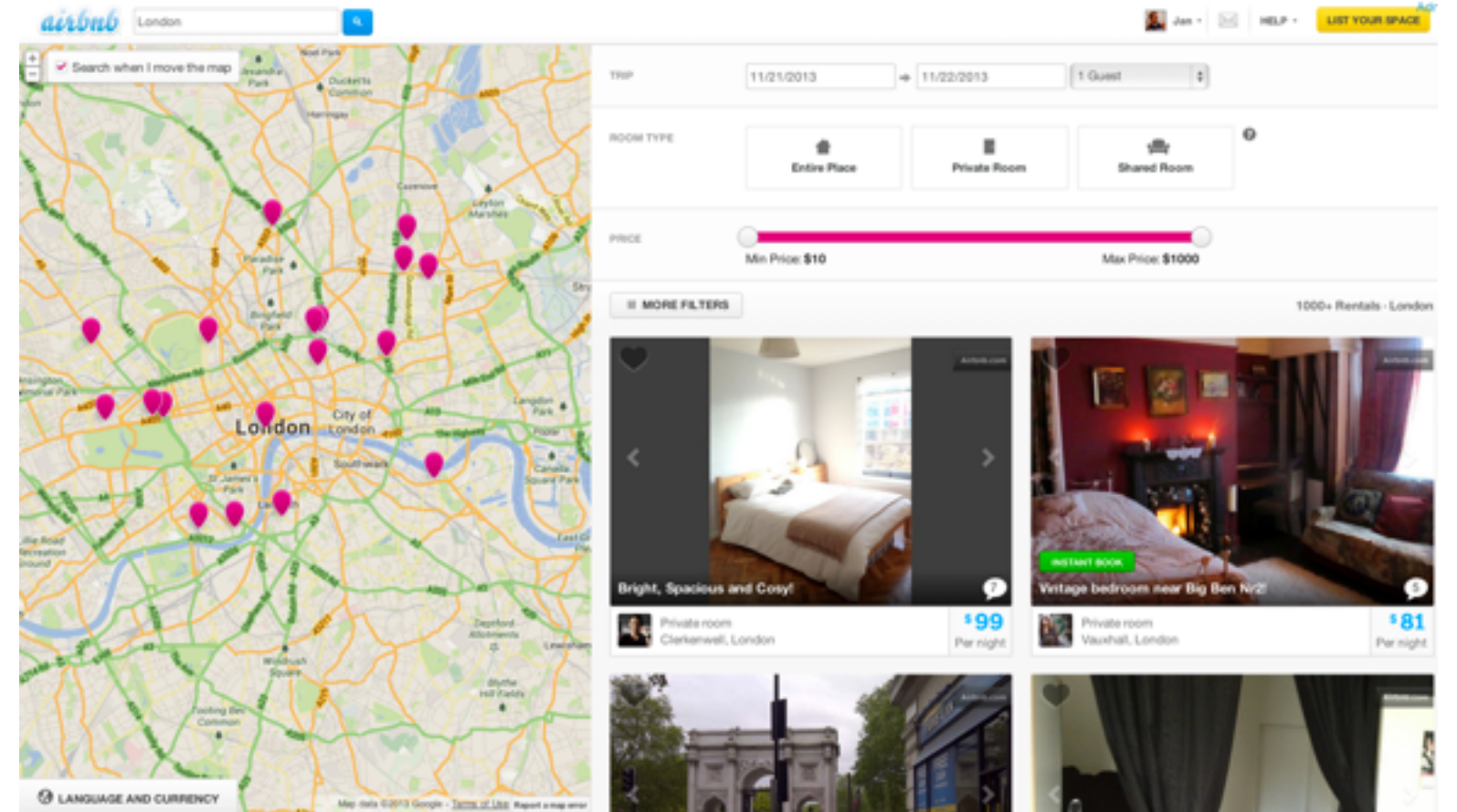
MORE FILTERS 1000+ Rentals - London

- Bright, Spacious and Cozy!**
Private room Clerkenwell, London
\$99 Per night
- Vintage bedroom near Big Ben Nr2**
Private room Vauxhall, London
\$81 Per night

A/B Testing - Break it down

A neutral result

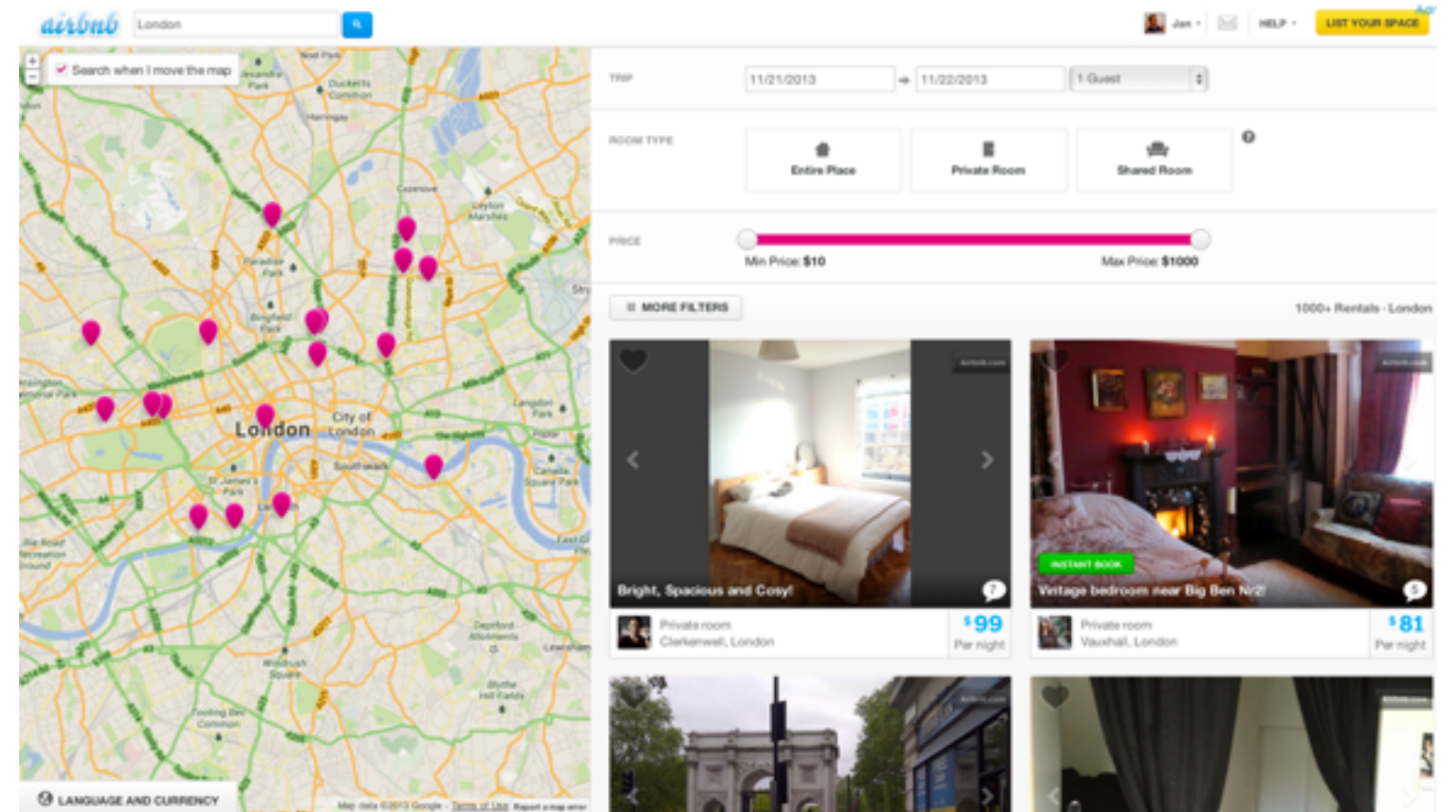
	Δ	p
Treatment	-0.27%	0.29



A/B Testing - Break it down

Breaking down results can highlight problems and opportunities

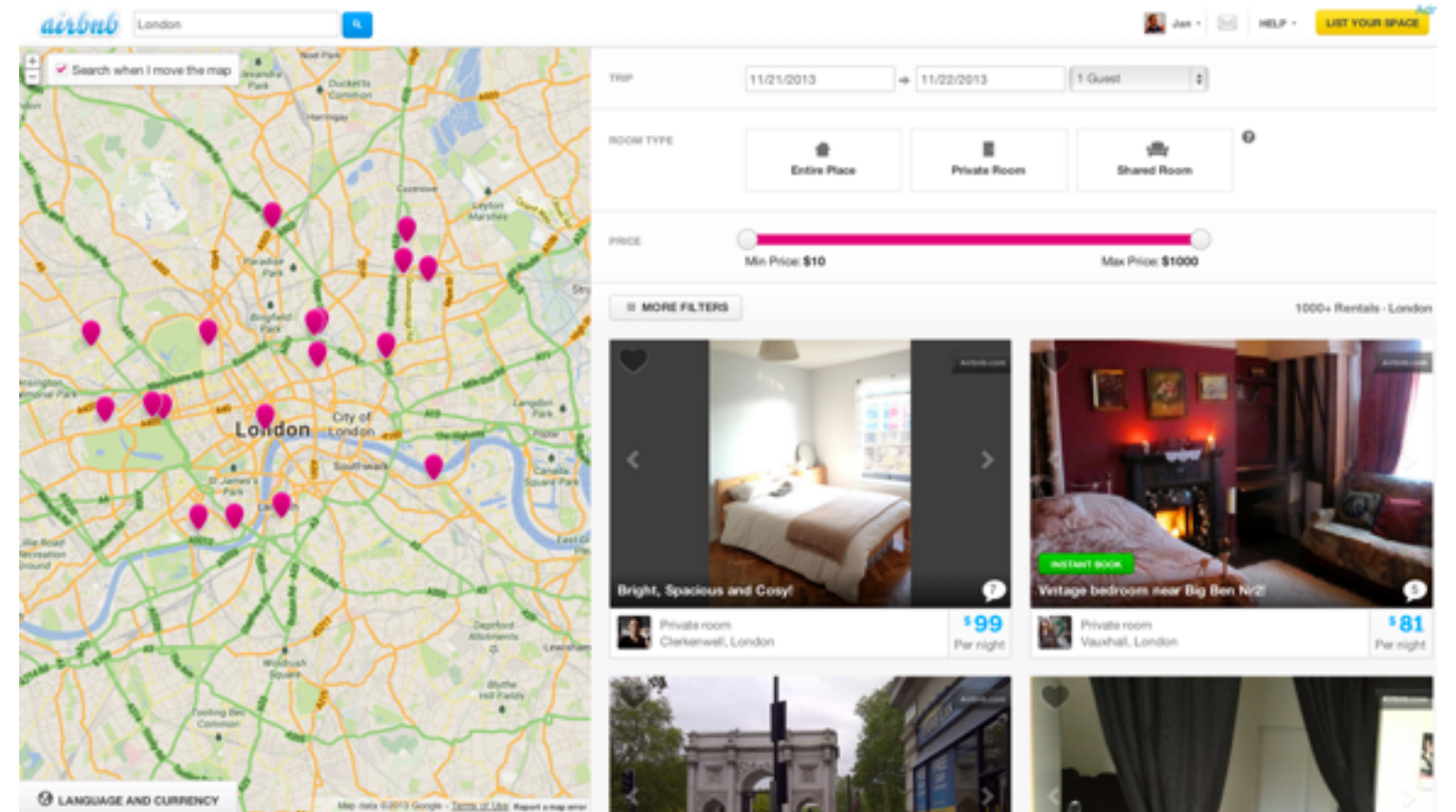
Browser	Δ	p
All	-0.27%	0.29
Chrome	2.07%	0.01
Firefox	2.81%	0.00
IE	-3.66%	0.00
Safari	0.86%	0.26
Rest	-0.74%	0.33



A/B Testing - Break it down

Use regression to estimate subtle (interaction) effects

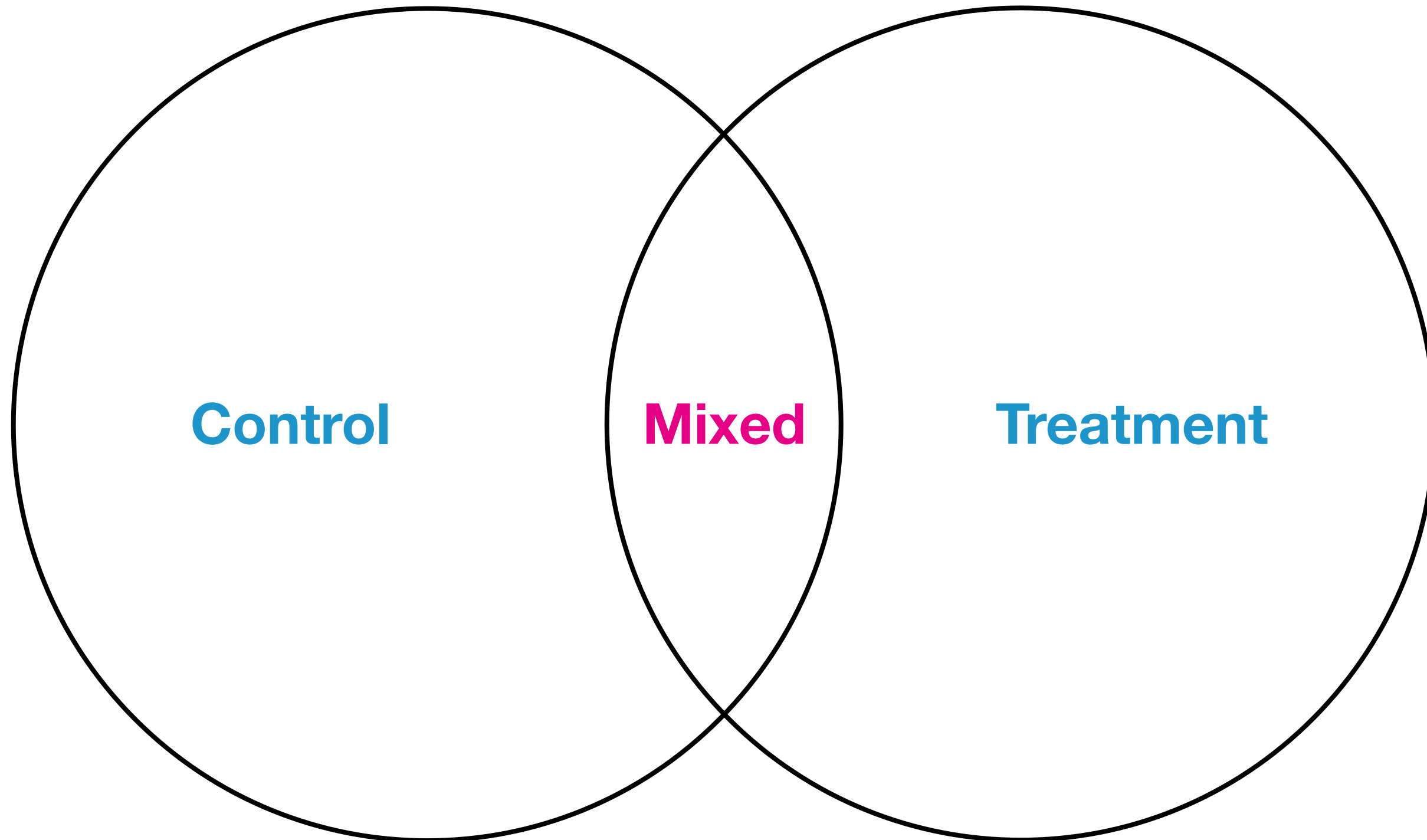
Browser	Δ	p
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Chrome	2.07%	0.01
Firefox	2.81%	0.00
IE	-3.66%	0.00
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Rest	-0.74%	0.33



```
f <- glm(conversion ~ day_of_week + user_is_new + browser * user_in_treatment,  
         data = data,  
         family = binomial())
```


A/B Testing - Beware of Bias

Background: mixed group problem



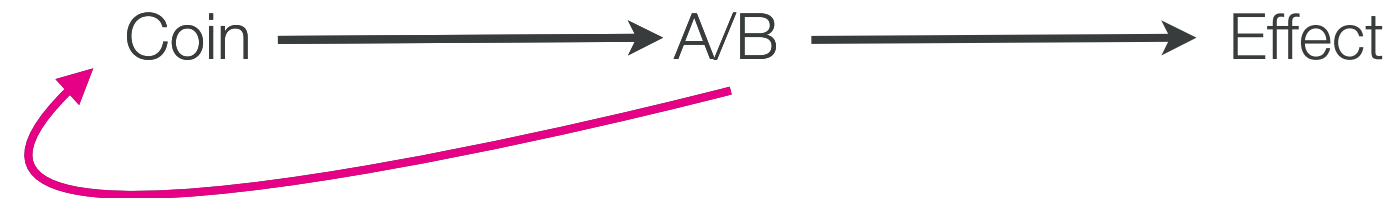
A/B Testing - Beware of Bias

Think hard about confounding factors

Should be:



Actual:

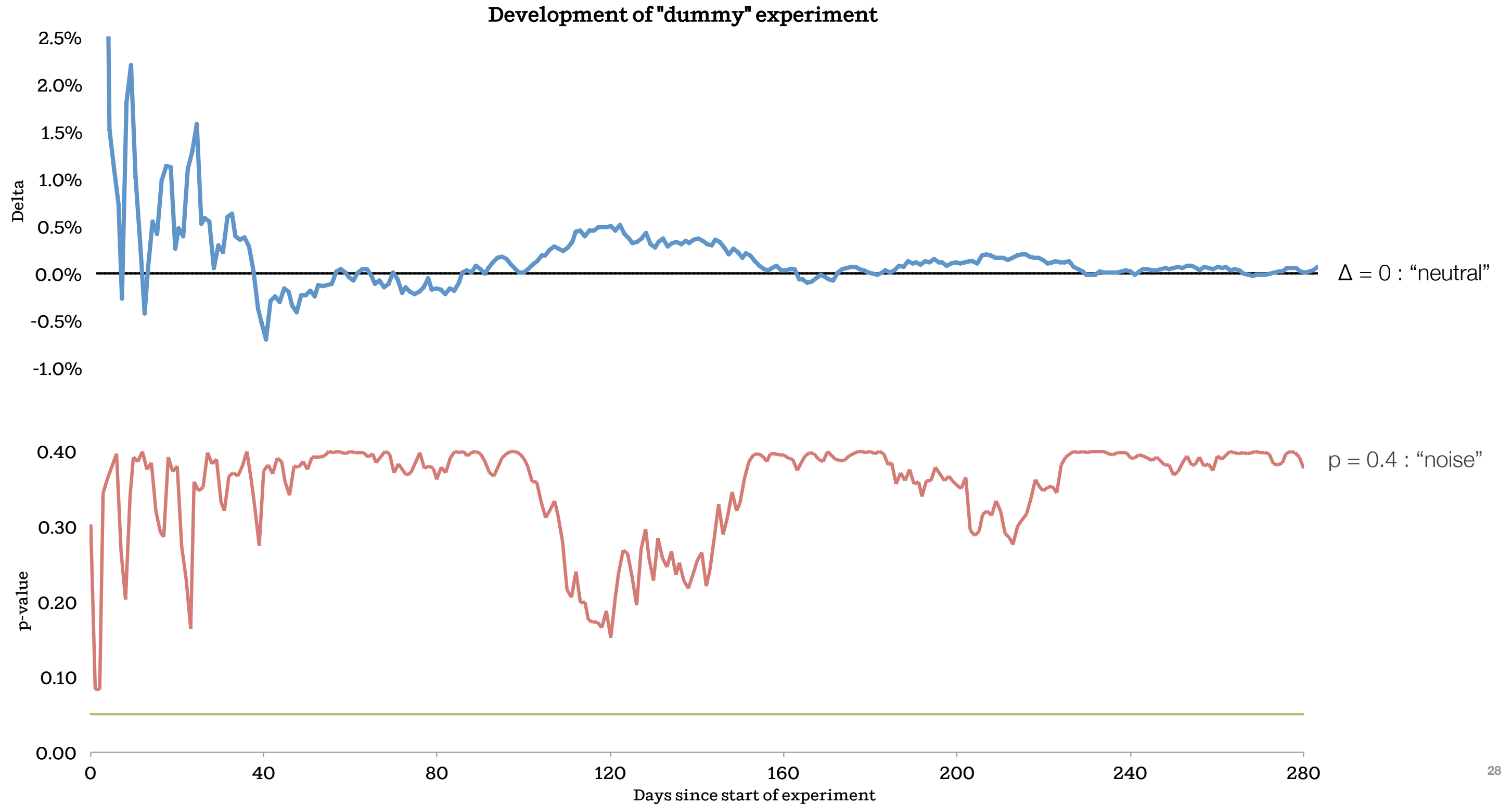


Best practices

- + thinks hard about confounding factors
- + have equal sample sizes, reduces randomization errors

Bonus - A/A Testing

Test the soundness of your set-up



Takeaways

+ Use experiments to develop your product

but:

+ Give it time, look at progress over time

+ Break results down into meaningful cohorts or use regression

+ Analyze the set-up, identify confounding factors

+ Use equal sample sizes

+ Run dummy experiments



airbnb