

Information Flow Investigations

Michael Carl Tschantz
UC Berkeley

Amit Datta
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Jeannette M. Wing

www.cs.cmu.edu/~mtschant/info-experiments

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Human immunodeficiency virus infection / acquired immunodeficiency syndrome (HIV/AIDS) is a disease of the human immune system caused by infection with ...

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Blue Cross, Kaiser, CIGNA, United. Search Top CA Plans, from \$49/month

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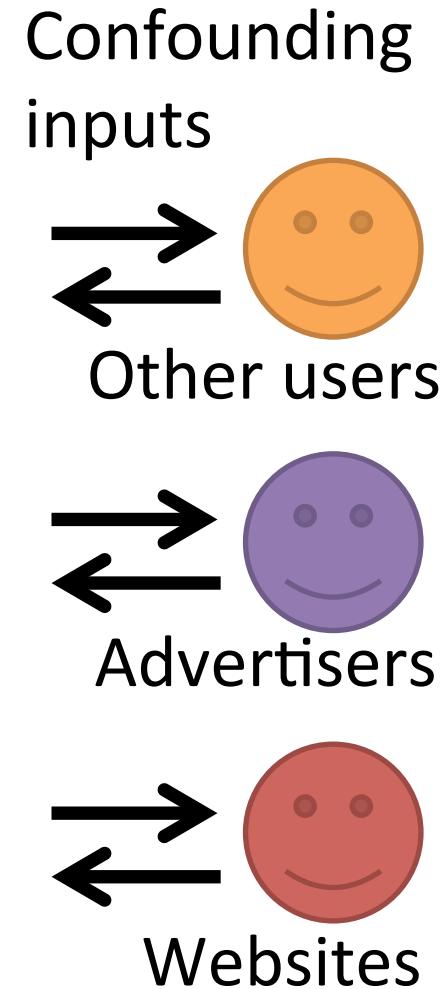
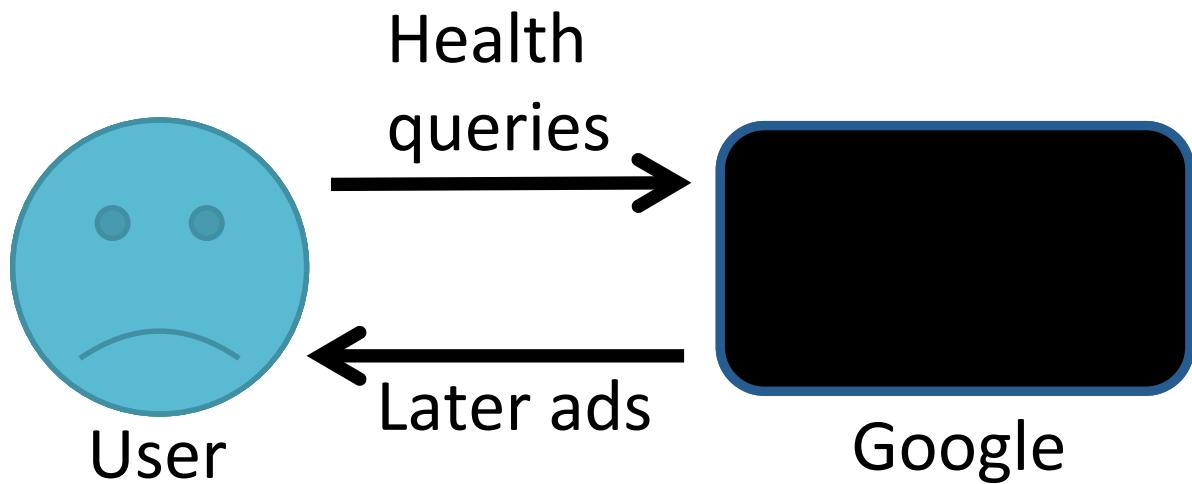
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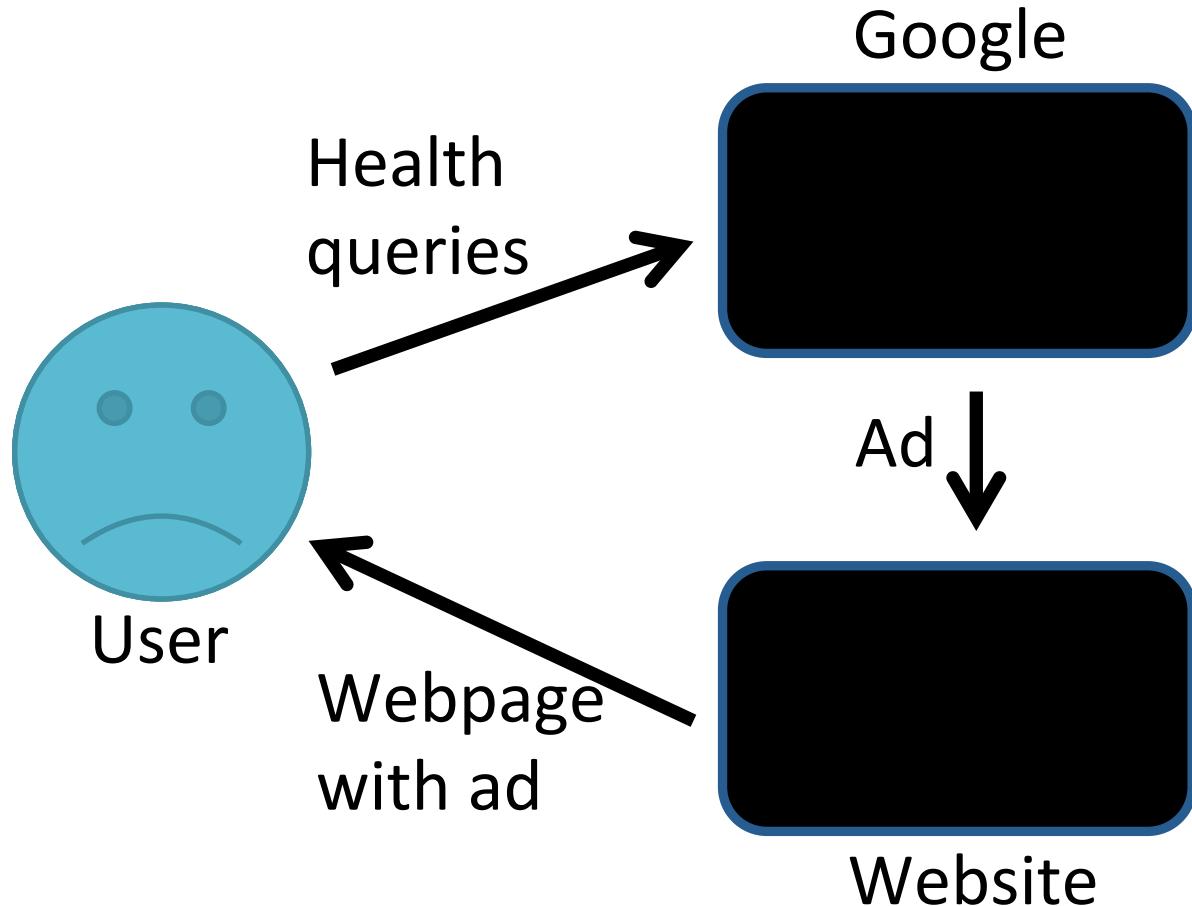
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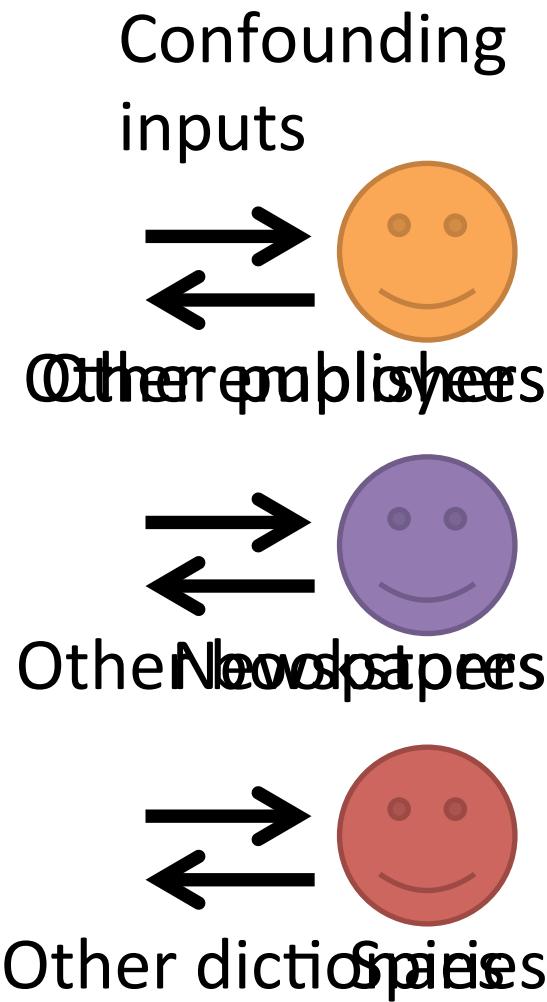
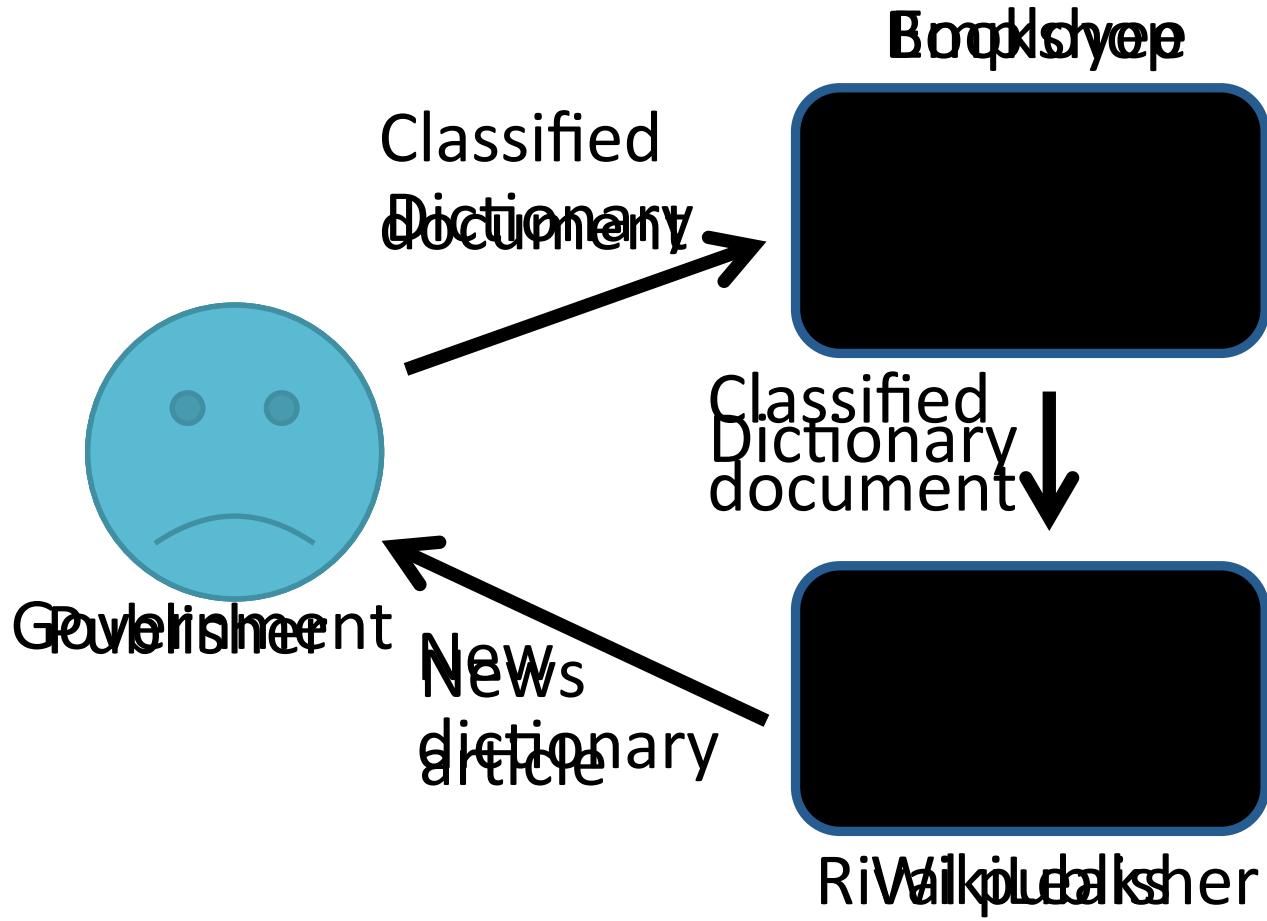
Web Tracking



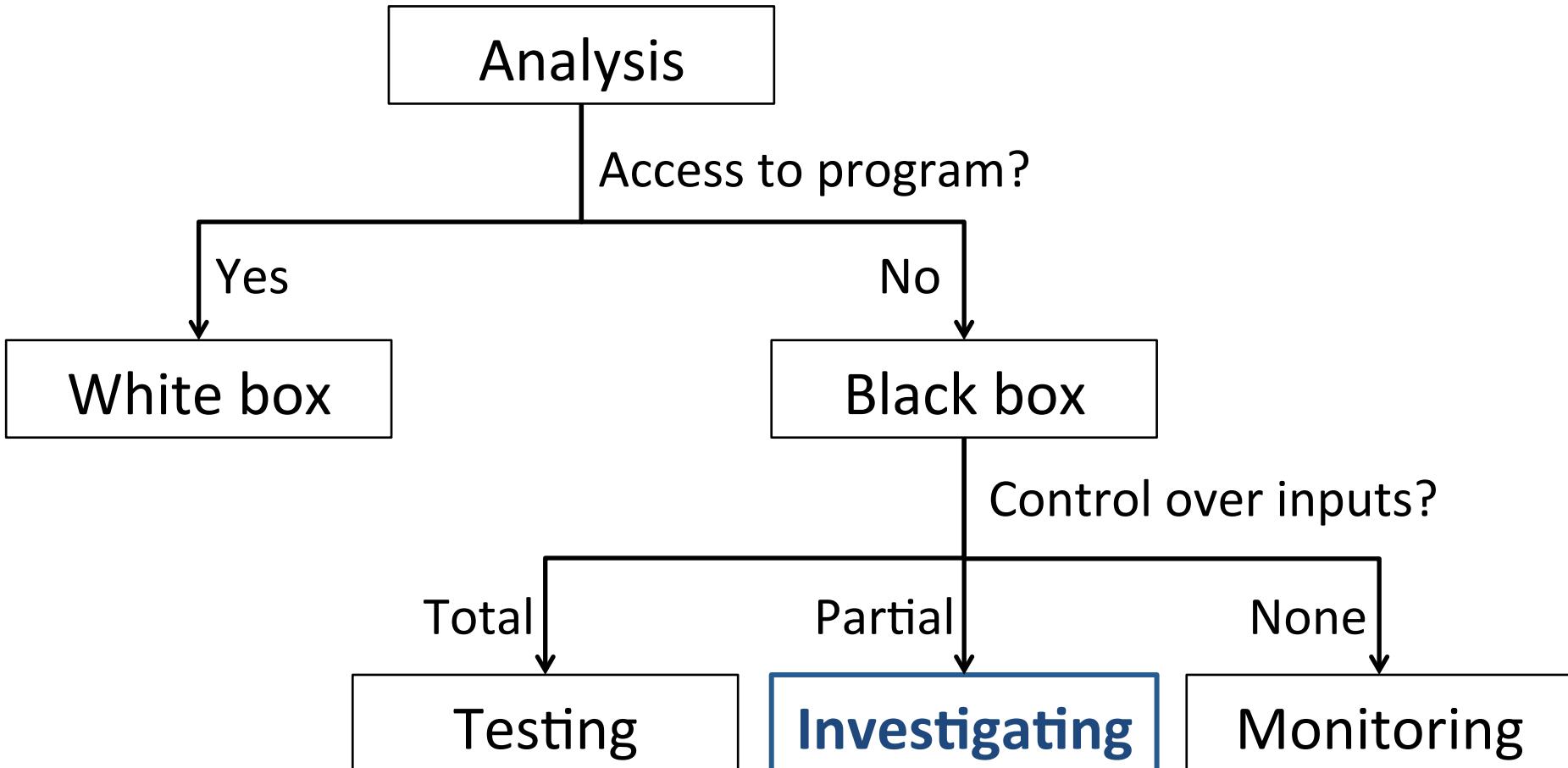
Web Tracking



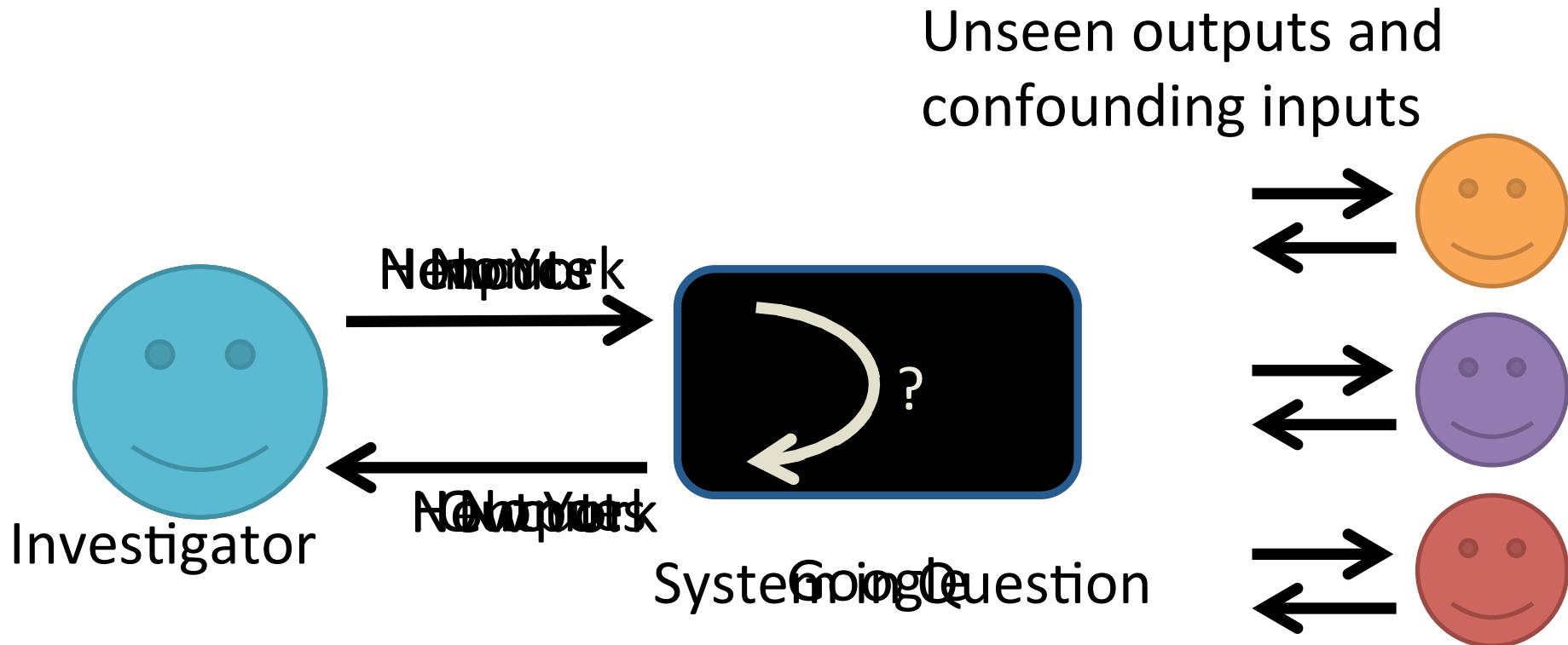
Data Leaking Prevention



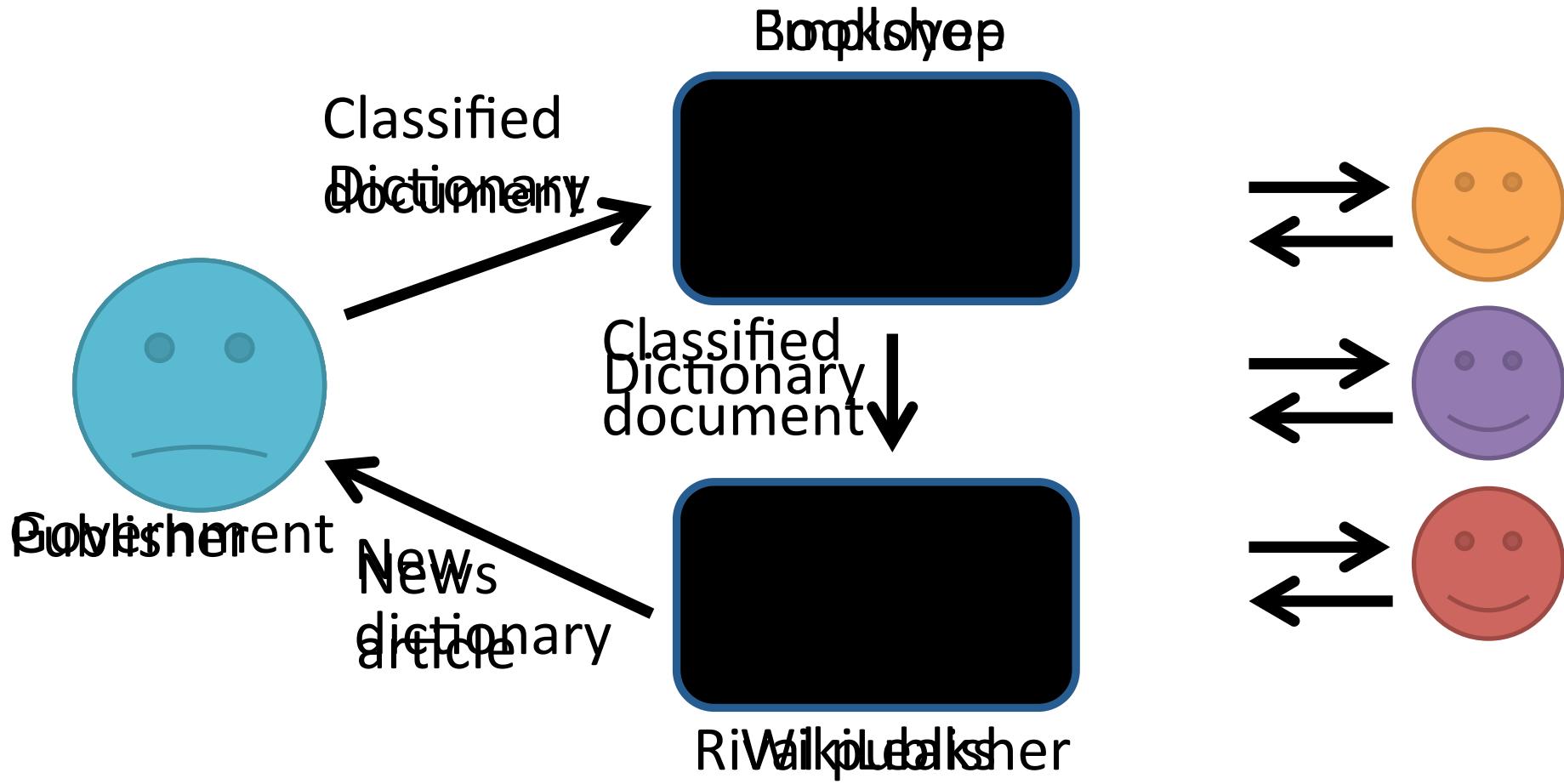
Information Flow Investigations



Information Flow in Investigations



Nonce String



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We Found Michael Tschantz

www.whitepages.com/Michael+Tschantz

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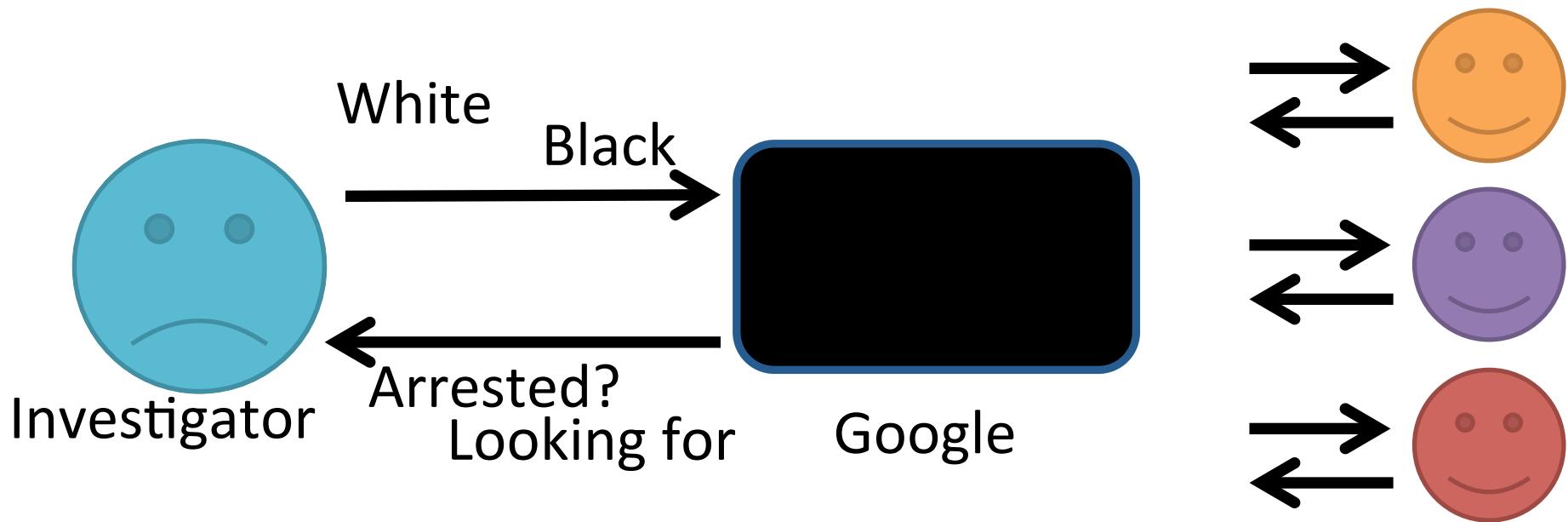
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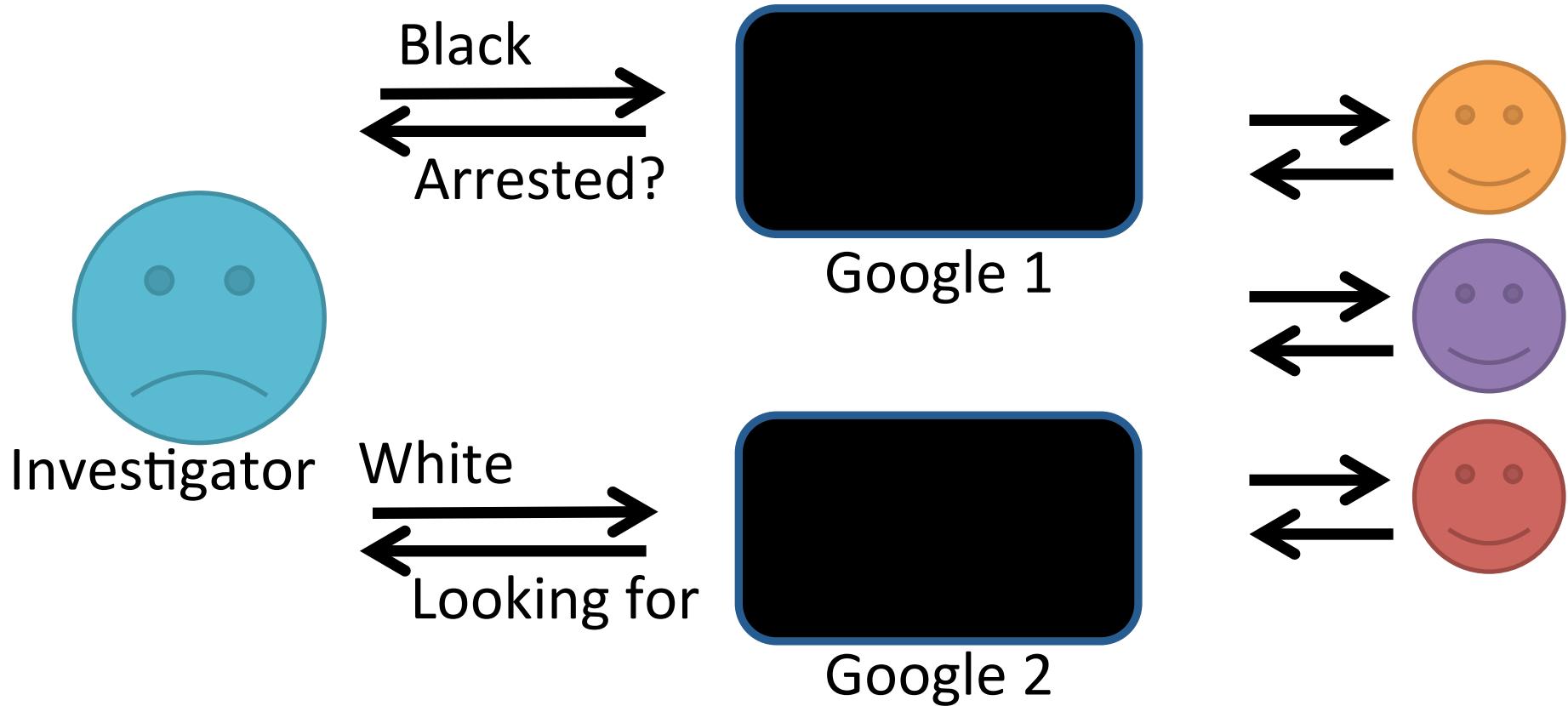
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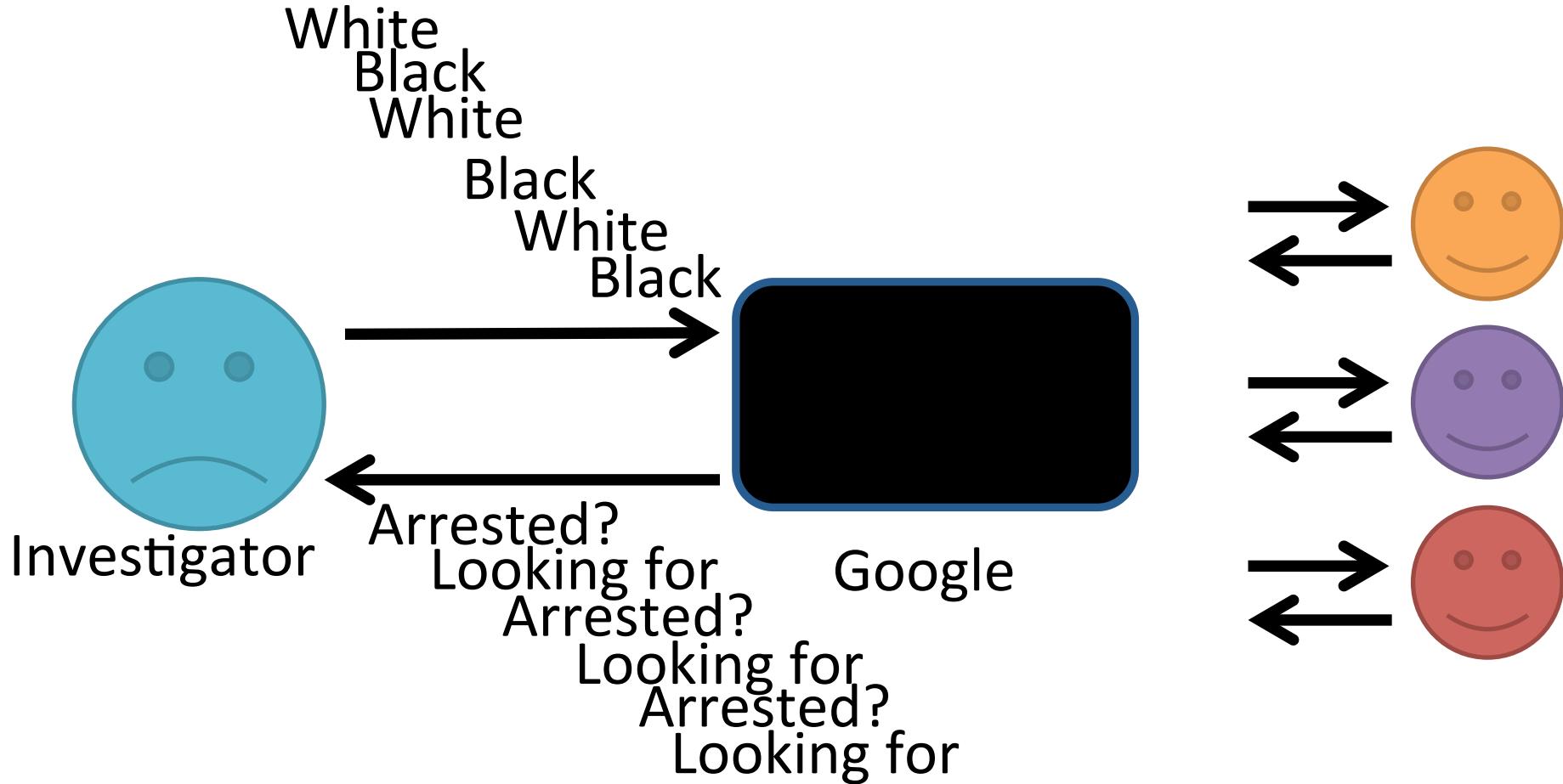
Differencing



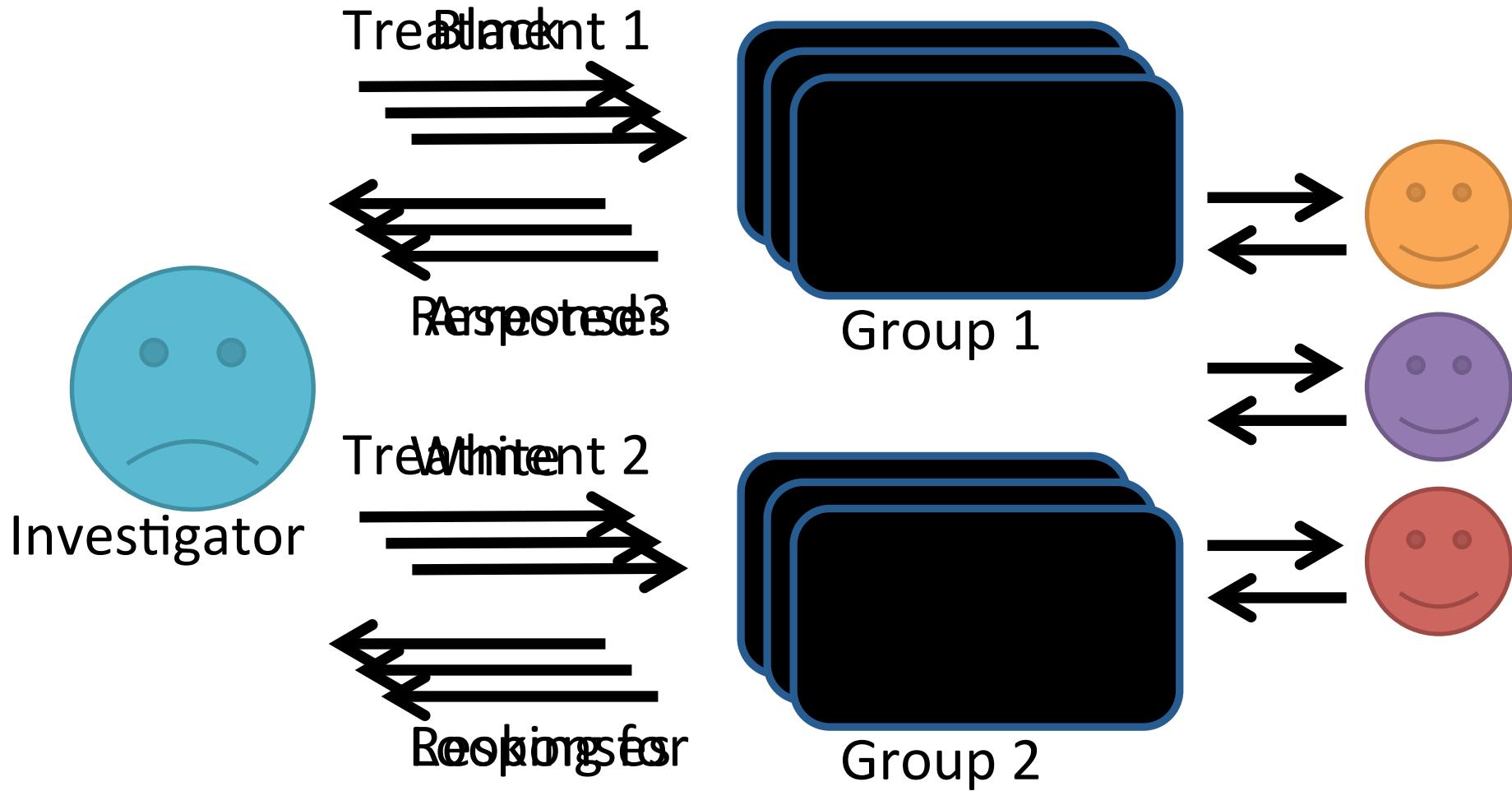
Differencing



Differencing



Differencing



Information Flow Investigations as Science

Experimental Science	Information Flow
Natural process	System in question
Factors	Input channels
Treatments	Controlled inputs
Confounding factors	Uncontrolled input channels
Response variables	Output channels
Causation	Information flow

Differences

Experimental Science

Population of units

Treatments across units

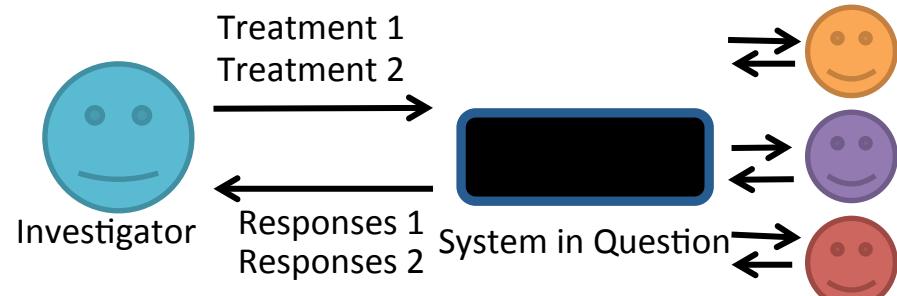
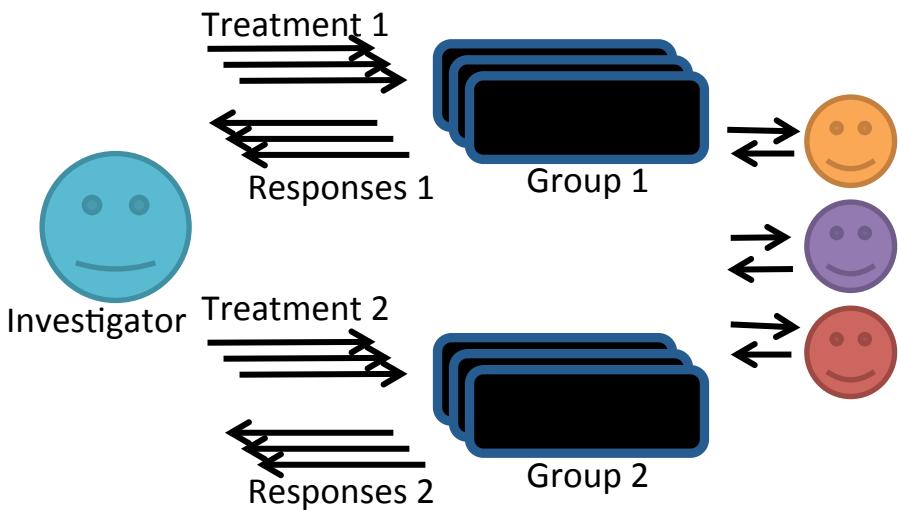
Independent units

Information Flow

Single system

Inputs in sequence

Independent sub-runs



On Going Work

- Where's the nonce sting in science?
- Information flow vs. causation
- Statistics
 - Theorem: If independent sub-runs and no confounding, then sound
 - Goal: If ε_1 -independent and ε_2 -bounded confounding, then $(\varepsilon_1, \varepsilon_2)$ -sound
- Experiments

Investigating Google

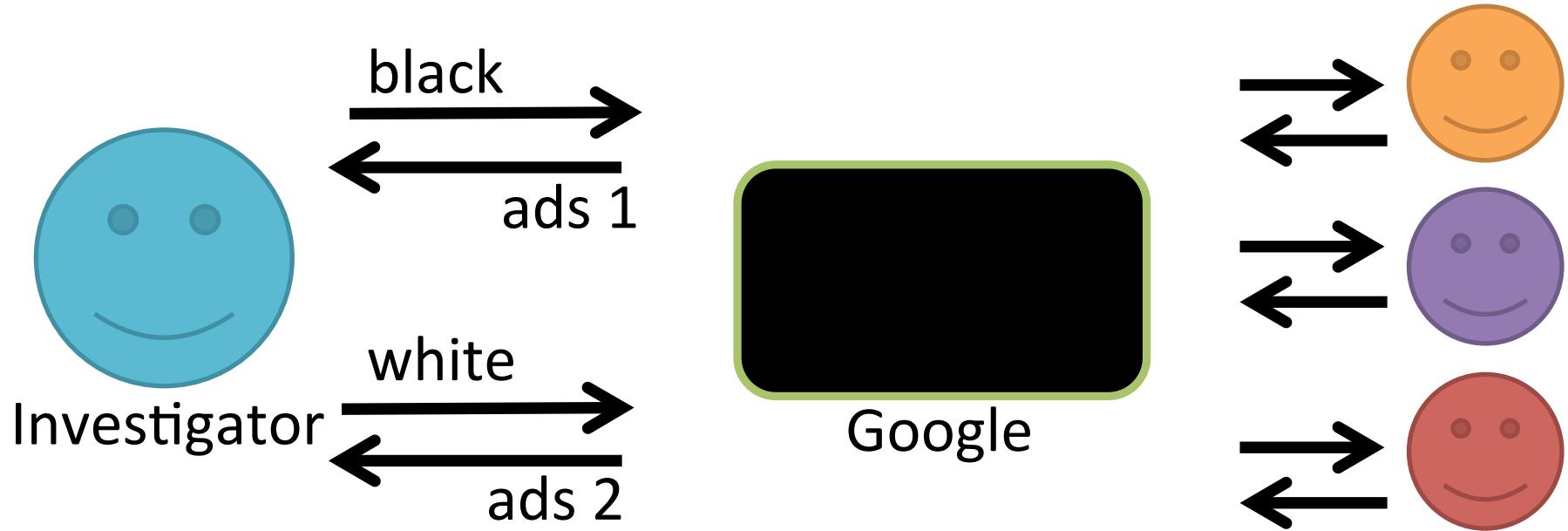
Amit Datta

Michael Carl Tschantz

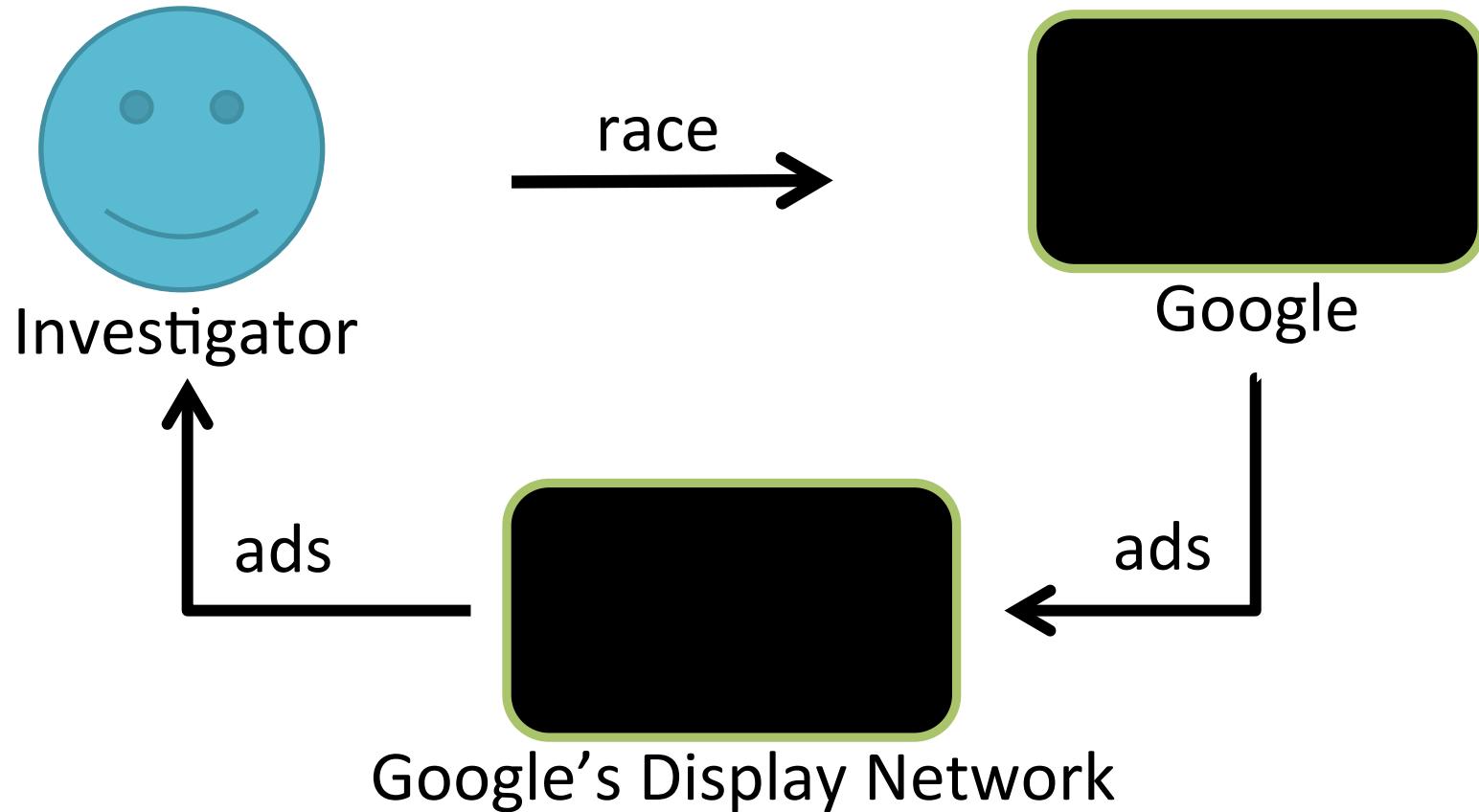
Anupam Datta

Carnegie Mellon University

Differencing: Race



Entities Involved



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Police: Suspect said 'I stabbed them all'

Updated 17 minutes ago

A man who tried to break up a fight between two brothers was fatally stabbed by one of them, prosecutors said in court Saturday.

- [More Austin crime »](#)



6-year-old survives after being buried in sand at Indiana Dunes

Updated 55 minutes ago

A 6-year-old boy is still alive after being buried under 11 feet of sand for about 3.5 hours Friday evening at the Indiana Dunes National Lakeshore, officials said.

- [Video: Boy recovering after rescued from sand](#)



Man charged with sexual assault of girl, 12



MUGS IN THE NEWS

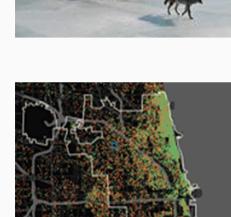


Mugs in the news

Rail petitions for better protections

Updated 15 hours ago

The family of a man who died last month after he accidentally touched the third rail at a North Side "L" station has started an online petition asking the CTA to put up protection along the...



Maps & Apps:
Data you can use

Des Plaines parolee accused of threatening, spitting on witness

Updated 23 hours ago

A 29-year-old parolee who, according to state correctional records, has a tattoo on his abdomen reading, "snitches are a dying breed," appeared in court today to answer charges he...



Classic Chicago

Former Bear Chris Zorich sentenced to probation in tax case

Updated 24 hours ago

Wearing a three-piece beige suit, former Bear Chris Zorich stood before a federal judge Friday and apologized for not filing his federal income tax returns for four years.



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bloodcenter.stanford.edu

Vibha Bay Area
Volunteer for Charitable Non-Profit Join to build kids future in India
bayarea.vibha.org

Get Paid \$90 Per Survey?
Easy Money At Home - Try It Now! Take Surveys and Get Paid (Free)
SurveyMoneyMachines.com

Sixth person arrested in 2012 Tinley Park mob attack

Updated Jul 12, 2013

A 28-year-old Chicago man has been charged for his role in a bizarre mob attack on a group of alleged white supremacists dining at a Tinley Park family restaurant in May 2012, officials said.



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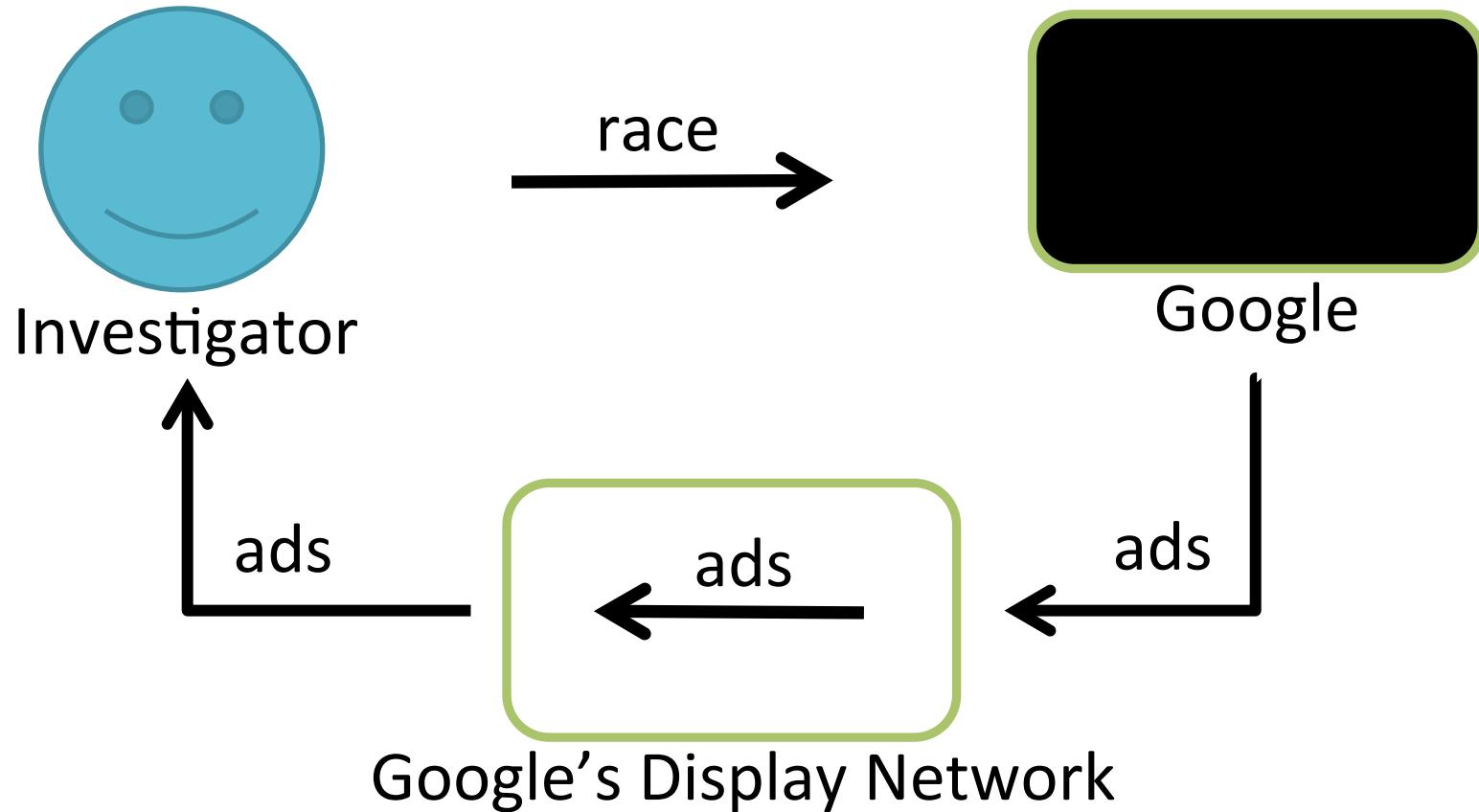
TRENDS IN CHICAGO

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Metra CEO memo alleges more Madigan influences



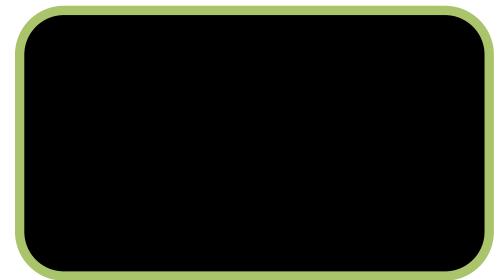
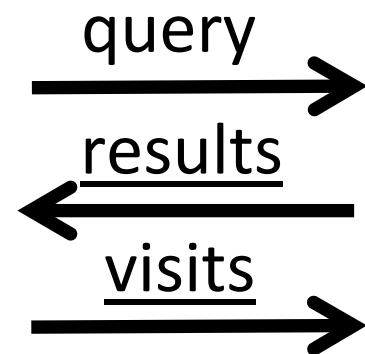
Entities Involved



Interaction with Google



Investigator



Google

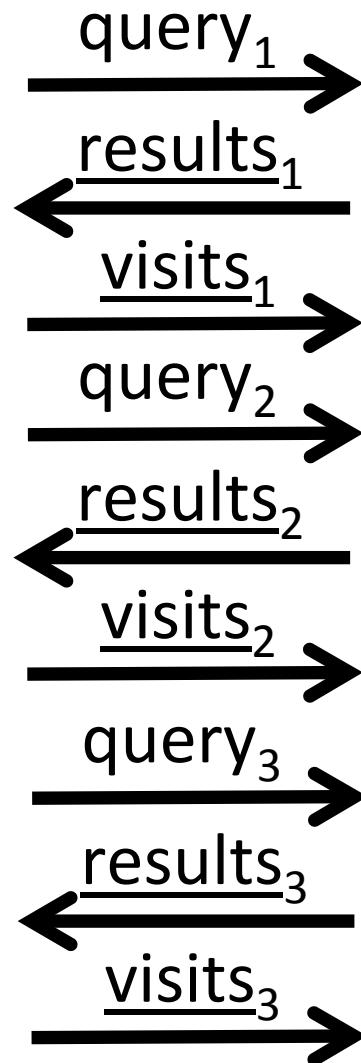
Interaction with Google



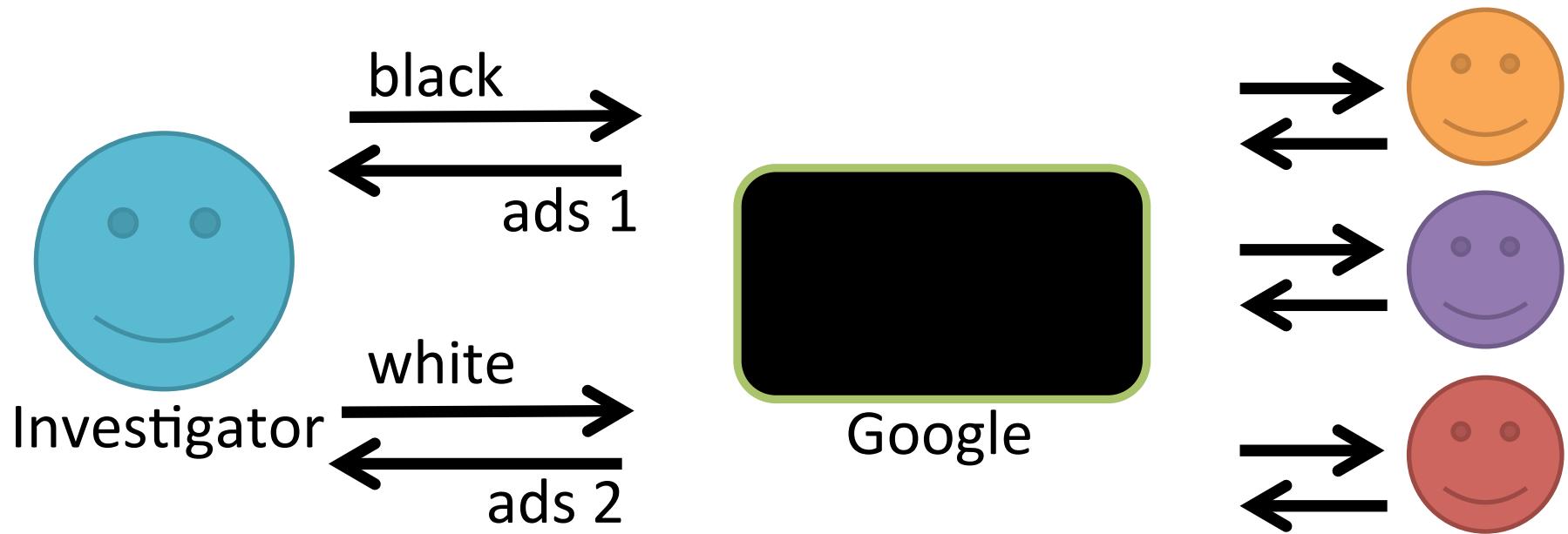
Investigator



Google



Differencing: Race



For us, by us.





Abercrombie & Fitch

Queries

African American

FUBU

Apple Bottom Jeans

Hpnotiq

Courvoisier

Rap music

Hip-Hop music

McDonalds

Caucasian American

Abercrombie & Fitch

Stella McCartney Jeans

Jim Bean

Remy Martin

Indie music

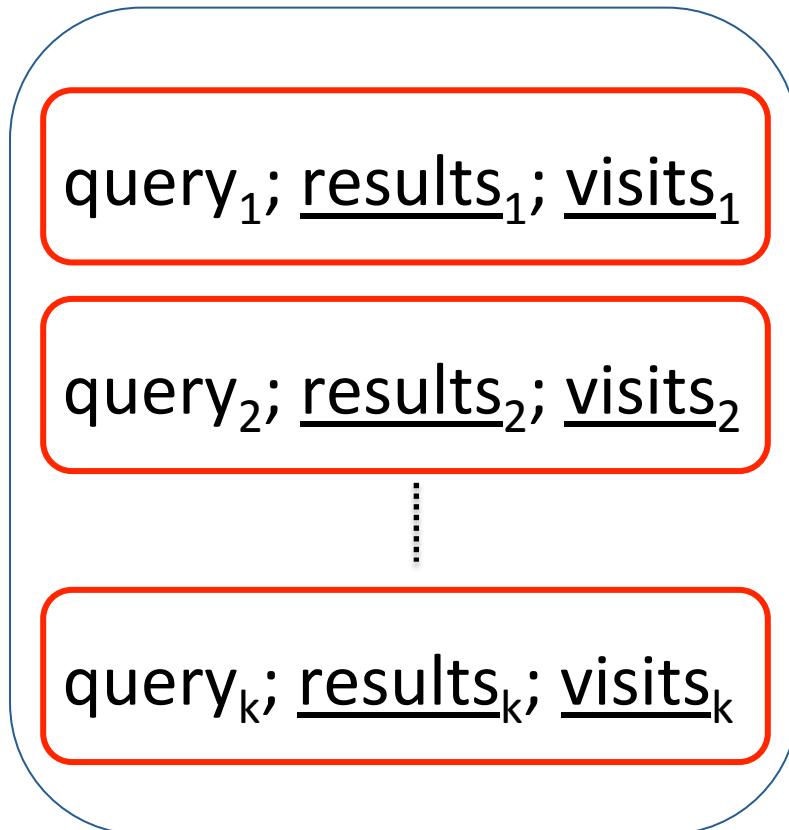
Country music

Chipotle

Differencing: Race

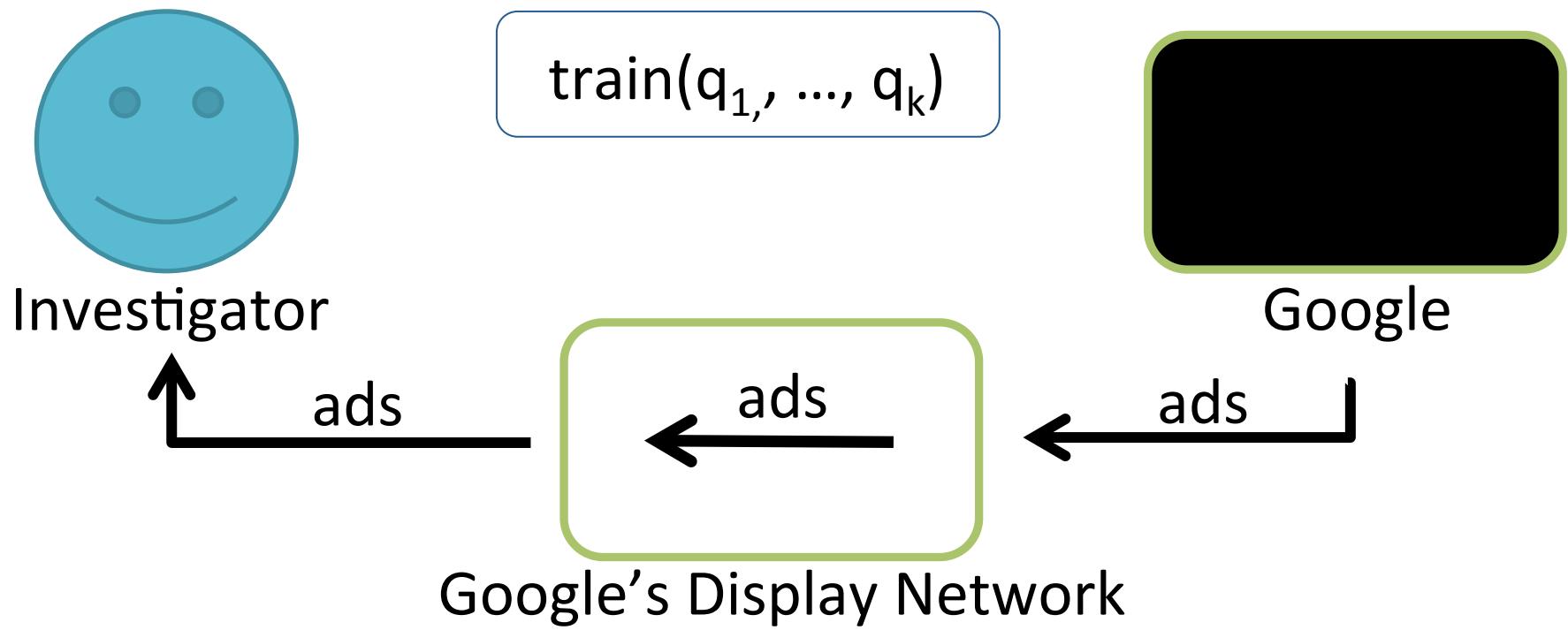


Investigator



Google

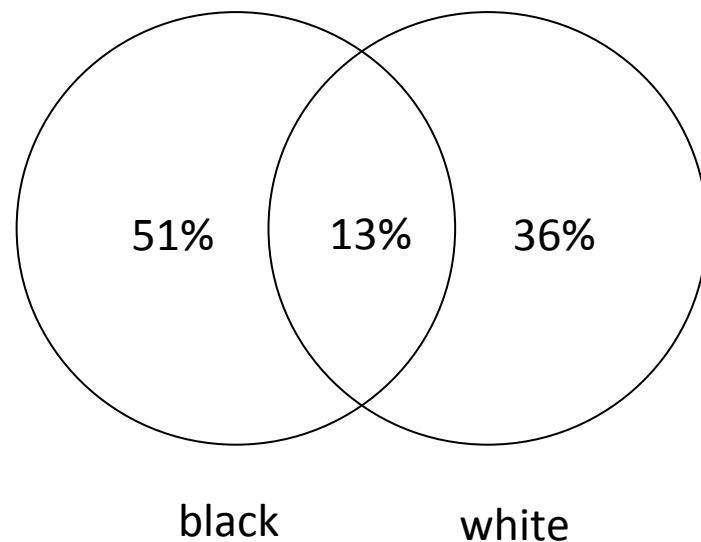
Differencing: Race



Statistics

black	{ads1}
white	{ads2}

Statistics



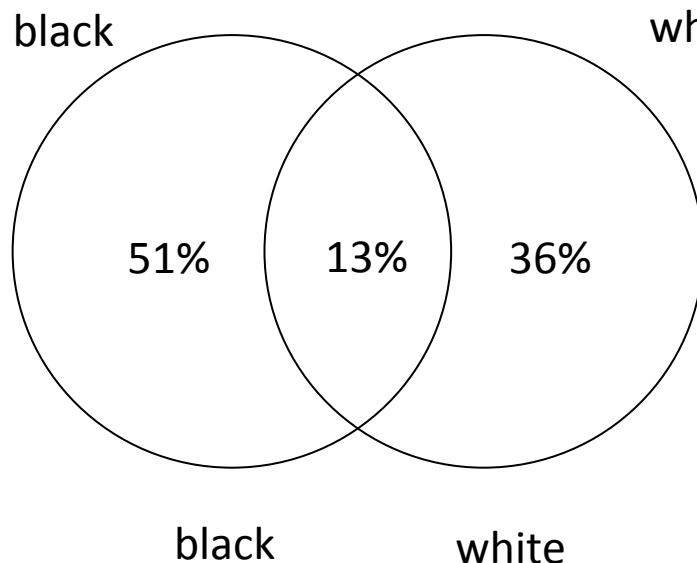
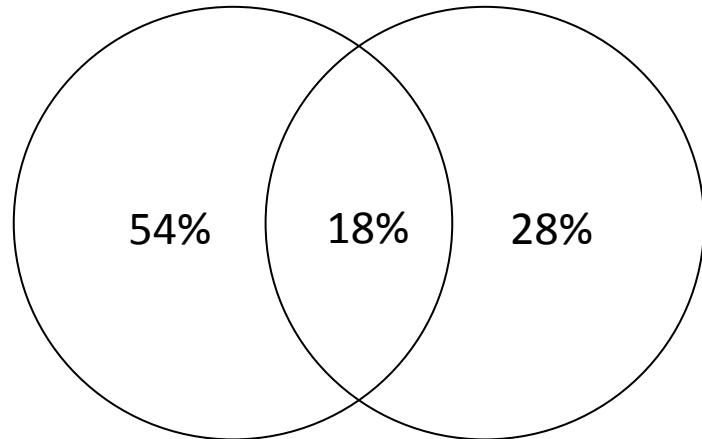
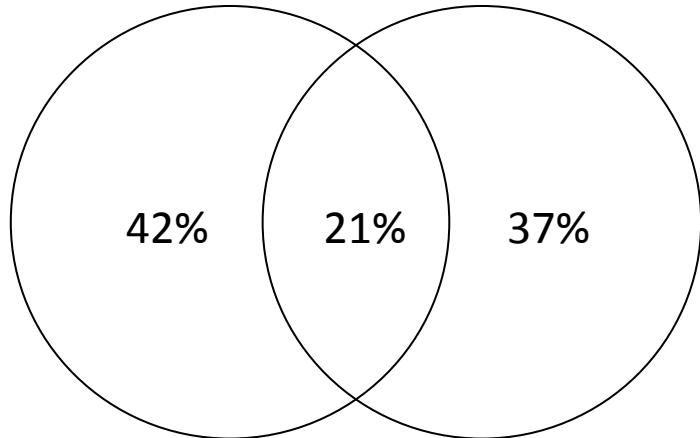
Statistics

black	{ads1}
black	{ads1'}

white	{ads2}
white	{ads2'}

black	{ads1}
white	{ads2}

Statistics



Queries

African American

FUBU

Apple Bottom Jeans

Hpnotiq

Courvoisier

Rap music

Hip-Hop music

McDonalds

Real Estate Listings

Caucasian American

Abercrombie & Fitch

Stella McCartney Jeans

Jim Bean

Remy Martin

Indie music

Country music

Chipotle

Real Estate Listings

Advertisements

African American

Section 8 Houses For Rent

See If You Qualify For 250 Free Minutes/
Month. Learn More Now!

Singing Lessons

OpenVoiceSingingLessons.com

in San Francisco
pop, jazz, blues

Housing related ads

Caucasian American

Home Security Home
Info.com/HomeSecurityHomeSecurity
Security Info. Access 10 Search Engines At Once.

Wireless Home Security

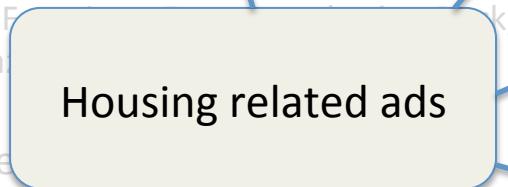
www.WirelessHomeSecurityAlarms.net

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Amit Datta

Michael Carl Tschantz

Anupam Datta

Carnegie Mellon University

Differencing: Race

About 171,000,000 results (0.41 seconds)

[Home :: McDonalds.com](#)

[www.mcdonalds.com/](#) ▾

McDonald's in the USA: Food and nutrition info, franchise opportunities, job and career info, restaurant locations, promotional information, innovation and

[race 1](#)
[Restaurant Locator](#)

Restaurant Locator Share Email
Facebook Twitter Delicious Digg.

[Full Menu Explorer](#)

Full Menu Explorer ::
McDonalds.com.

[Nutrition Choices](#)

Nutrition Choices. Changing.
Together. You told us you're ...

[More results from mcdonalds.com »](#)

query_{1,1}

results

vis

ads 1

Google

[Breakfast](#)

Sizzle, baby, sizzle. Wake up with
our hot, delicious signature ...



Investigator

[mcdonalds near San Francisco, CA](#)

[McDonald's](#)

[www.mcdonalds.com](#)

Score: 15 / 30 · 20 Google reviews



A 1100 Fillmore St
San Francisco
(415) 923-1138

[McDonald's](#)

[www.mcdonalds.com](#)

Score: 12 / 30 · 42 Google reviews



B 701 3rd St
San Francisco
(415) 278-0416

[McDonald's](#)

[www.mcdonalds.com](#)

Score: 10 / 30 · 22 Google reviews



C 730 Stanyan St
San Francisco
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[See results for mcdonalds on a map »](#)

Differencing: Race

African American
race 1

Hpnotiq

Courvoisier

FUBU

Apple Bottom Jeans

Rap music
race 2
Hip-Hop music

McDonalds

Real Estate Listings

drink

clothing

music

fast food

=====

Caucasian American

Jim Bean

Remy Martin

Abercrombie & Fitch

Stella McCartney Jeans

Indie Music

Country music

Chipotle

Real Estate Listings

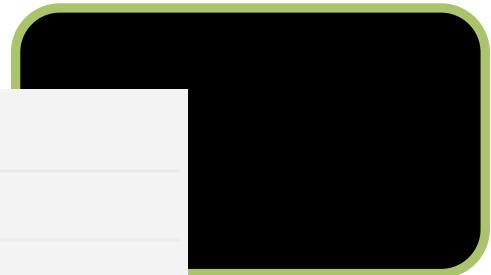
Differencing: Race



Investigator

Interest	From your activity on
We don't know your interests yet. If you want, add some interests to this list.	
query _{1,1}	
visits _{1,1}	→
Interest	From your activity on
Burgers	Websites
Business News	Websites
Fast Food	Websites
Food & Drink	Websites
Restaurants	Websites

← ads 1

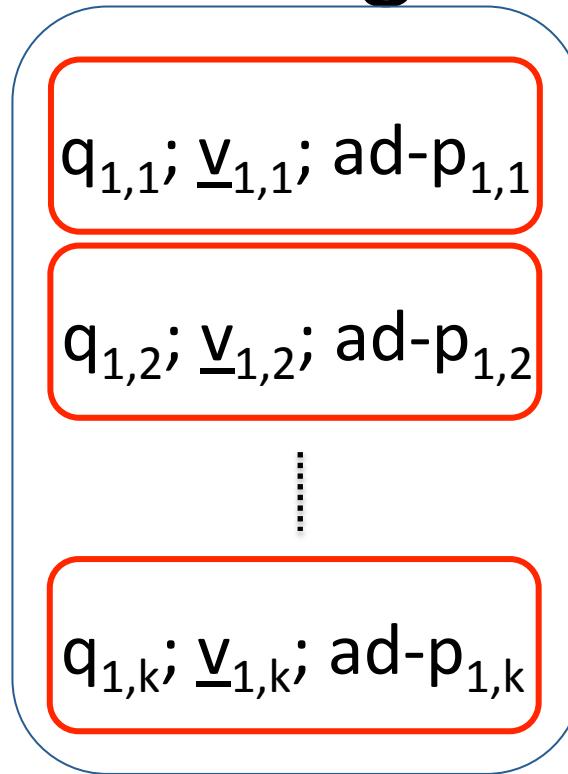


Google 1

Differencing: Race



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Google 1

←
ads 1

Differencing: Race

train($q_{1,1}, \dots, q_{1,k}$)



Investigator



Google 1

←
ads 1

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Updated 17 minutes ago

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- [More Austin crime »](#)



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Updated 55 minutes ago

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MUGS IN THE NEWS



Mugs in the news

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Updated 15 hours ago

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Updated 24 hours ago

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- **Zorich has negative net worth, his lawyer says**



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Updated Jul 12, 2013

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- **10 injured in attack at Tinley Park restaurant**



Metra CEO memo alleges more Madigan influences



Maps & Apps:
Data you can use



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Volunteer for Charitable Non-Profit Join to build kids future in India
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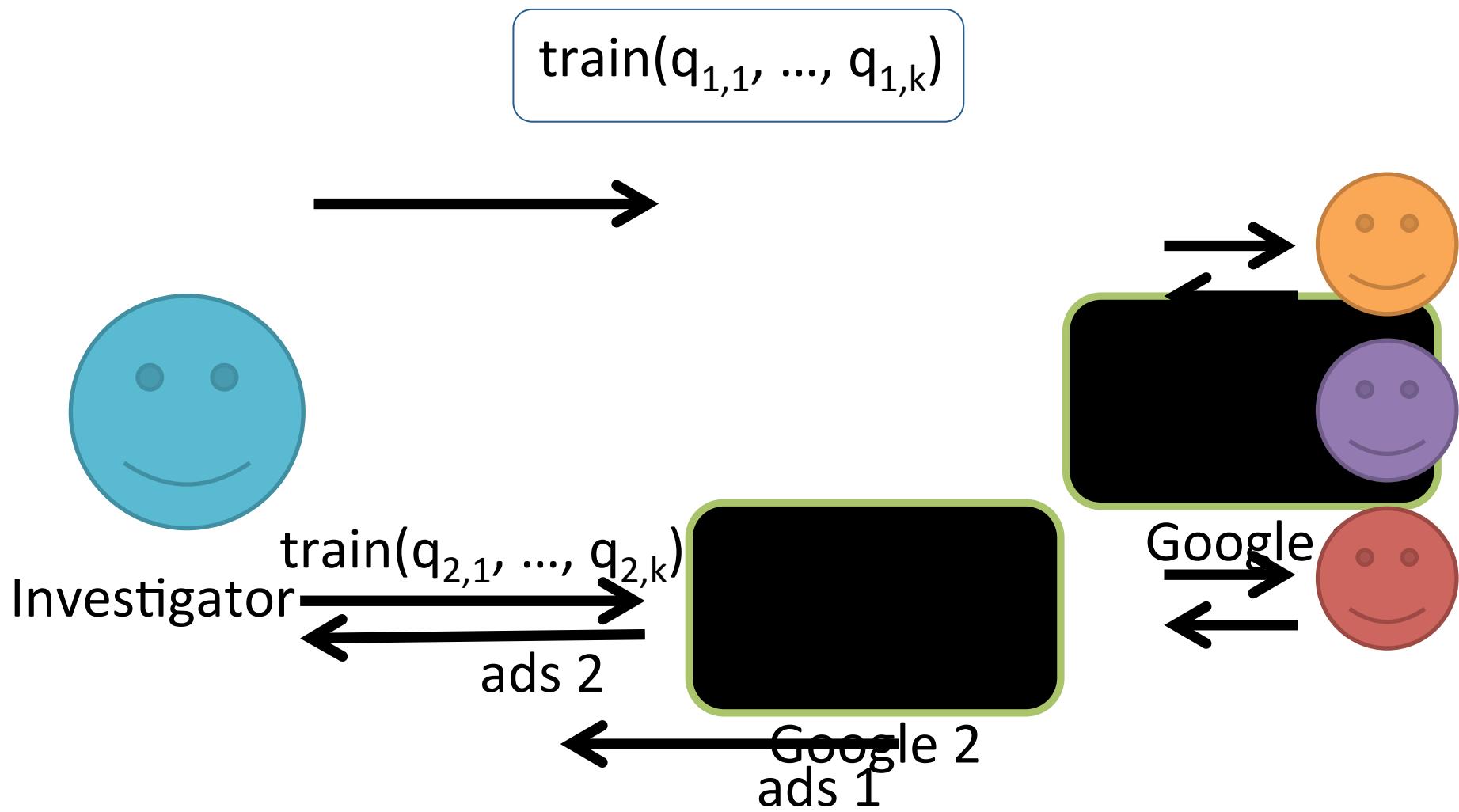
Things to do in Northern Indiana: Cool downtowns



TRENDS IN CHICAGO

Keep up with today's auto, home, food and

Differencing: Race



Querying (q)

African American

$q_{1,1}$ = Hpnotiq

$q_{1,2}$ = Courvoisier

$q_{1,3}$ = FUBU

$q_{1,4}$ = Apple Bottom Jeans

$q_{1,5}$ = Rap music

$q_{1,6}$ = Hip-Hop music

$q_{1,7}$ = McDonalds

$q_{1,8}$ = Real Estate Listings

Caucasian American

$q_{2,1}$ = Jim Bean

$q_{2,2}$ = Remy Martin

$q_{2,3}$ = Abercrombie & Fitch

$q_{2,4}$ = Stella McCartney Jeans

$q_{2,5}$ = Indie Music

$q_{2,6}$ = Country music

$q_{2,7}$ = Chipotle

$q_{2,8}$ = Real Estate Listings

Ad preferences (ad-p)

African American

Apparel
Arts & Entertainment
Burgers
Food & Drink
Gossip & Tabloid News
Music & Audio
Rap & Hip-Hop
Real Estate Listings
Urban & Hip-Hop
Women's Clothing

Caucasian American

Air Travel
Apparel
Arts & Entertainment
Business & Industrial
Casual Apparel
Celebrities & Entertainment News
Children's Clothing, Country Music
Fashion & Style, Fiber & Textile Arts
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pop, ja

Housing related ads

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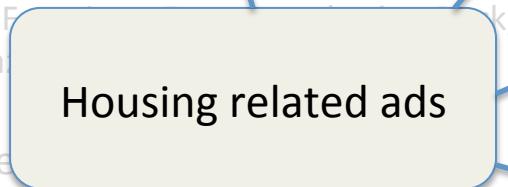
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Open Questions

- Narrow in on difference-inducing interests
- How ads relate to ad-preferences
- Ranking of ad-preferences
- Hidden ad-preferences

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Amit Datta

Michael Carl Tschantz

Anupam Datta

Carnegie Mellon University

Variants of training/collection

- $[q_i; \underline{v}_i; ad-p]_{i=1}^k; ads$
- $[q_i; [v_i^j; ad-p]_{j=1}^t]_{i=1}^k; ads$
- $[q_i; \underline{v}_i; ad-p; ads]_{i=1}^k$

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Proof of Eligibility: You must provide proof of program participation or proof of income.

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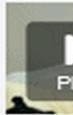


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Section 8 (housing)

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Section 8 of the Housing Act of 1937 ([42 U.S.C. § 1437f](#)), often simply known as **Section 8**, as repeatedly amended, authorizes the payment of rental housing assistance to private landlords on behalf of approximately 3.1 million **low-income households**. It operates through several programs, the largest of which, the Housing Choice Voucher program, pays a large portion of the rents and utilities of about 2.1 million households. The U.S. Department of Housing and Urban Development manages the Section 8 programs.^[1]

The **Housing Choice Voucher Program** provides "tenant-based" rental assistance, so a tenant can move from one unit of at least minimum housing quality to another. It also allows individuals to apply their monthly voucher towards the purchase of a home, with over \$17 billion going towards such purchases each year (from ncsha.org analysis). The maximum allowed voucher is \$2200 a month.

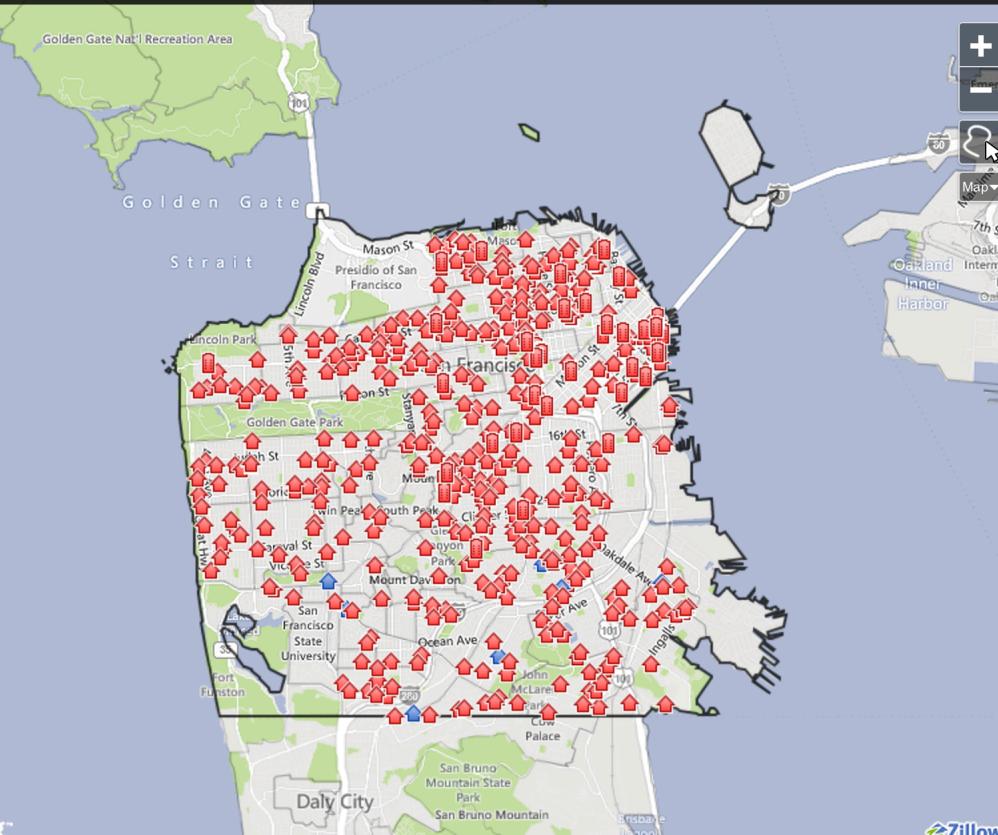
Section 8 also authorizes a variety of "project-based" rental assistance programs, under which the owner reserves some or all of the units in a building for low-income tenants, in return for a Federal government guarantee to make up the difference between the tenant's contribution and the rent for 1 cent in the owner's contract with the government. A tenant who leaves a subsidized project will lose access to the project-based subsidy.

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Interference

A system S has interference from input channel H to output channel L iff exist i_1 and i_2 , $S_L(i_1) \neq S_L(i_2)$ where i_1 and i_2 differ only in inputs on channel H

Causation

In a system S , C is a cause of E iff the $S_E(i_1) \neq S_E(i_2)$ where i_1 and i_2 differ only in whether C holds