

Information Flow Investigations

Michael Carl Tschantz
UC Berkeley

Amit Datta
Anupam Datta
Jeannette M. Wing

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

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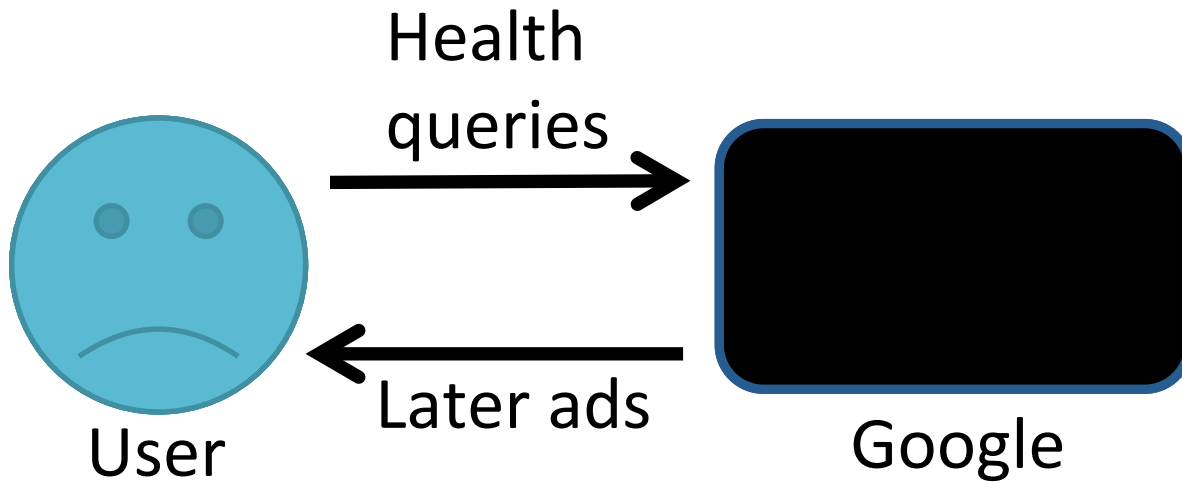
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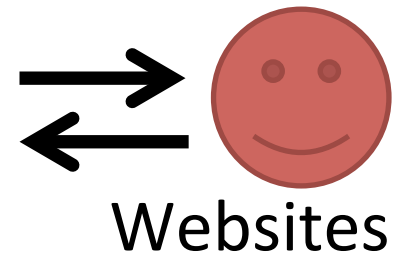
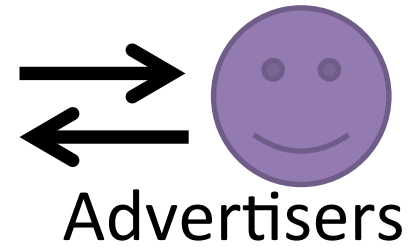
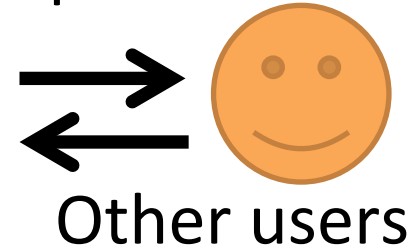
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Health Insurance - Find Affordable Health Insurance Plans and Buy ...

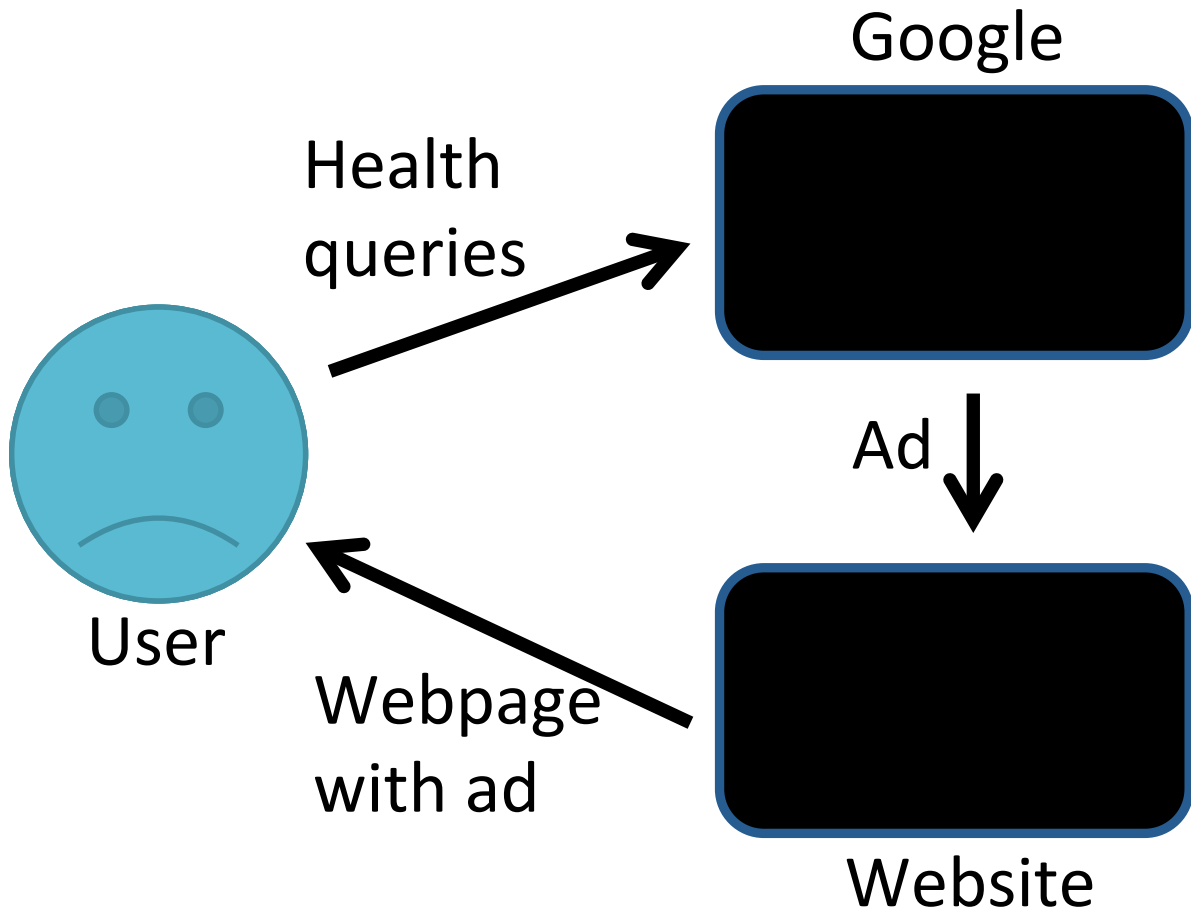
Web Tracking



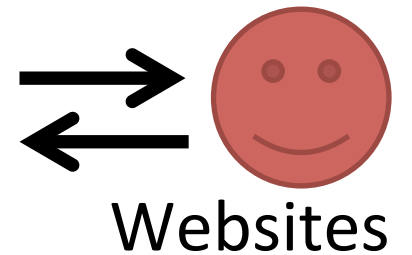
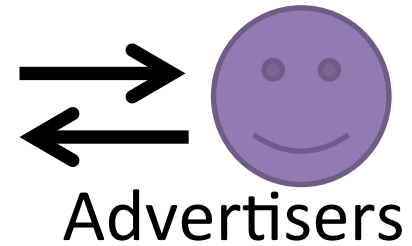
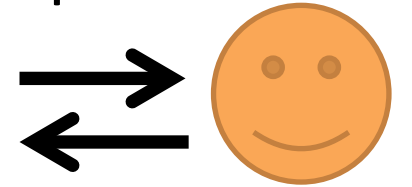
Confounding inputs



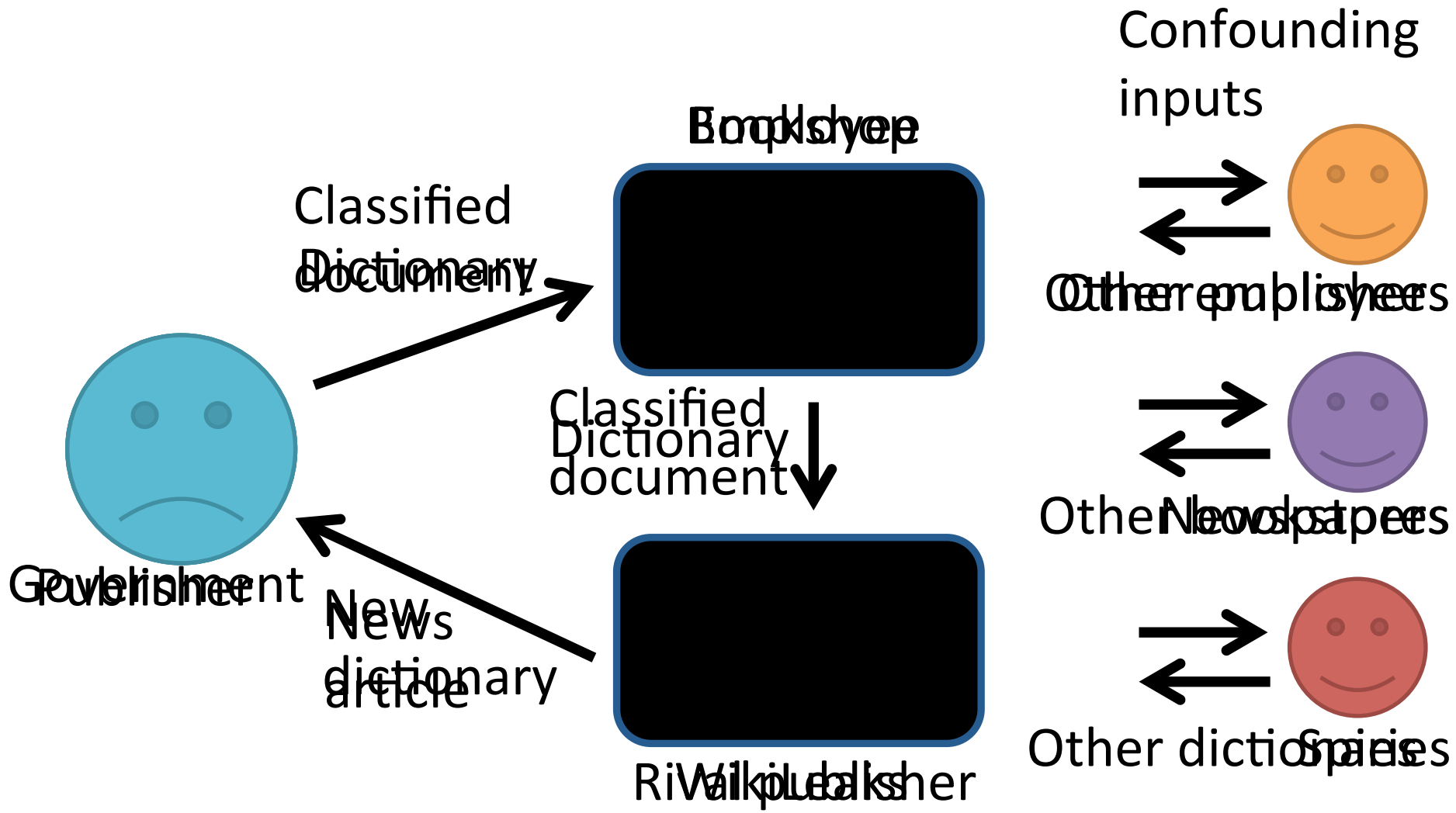
Web Tracking



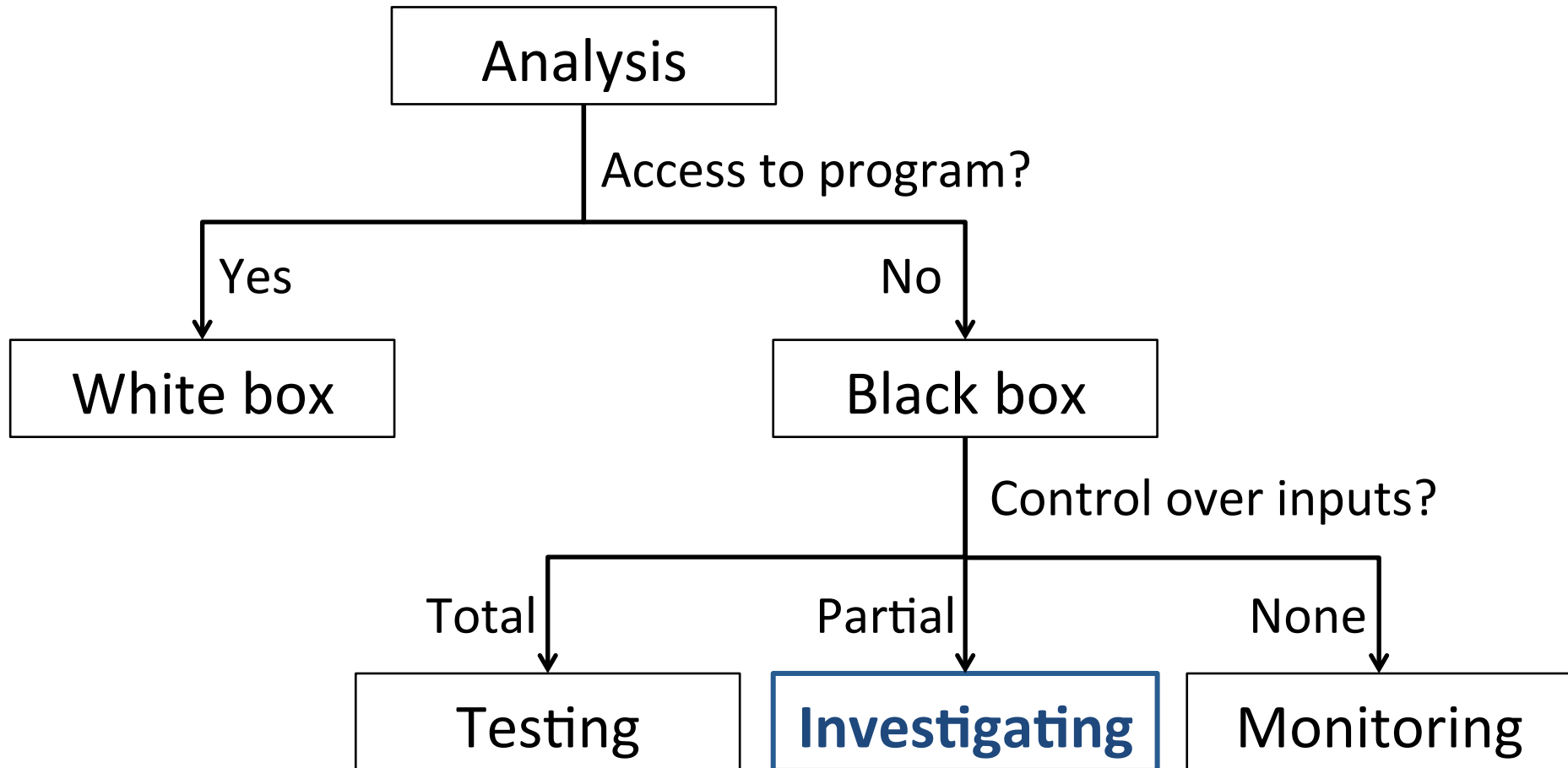
Confounding inputs



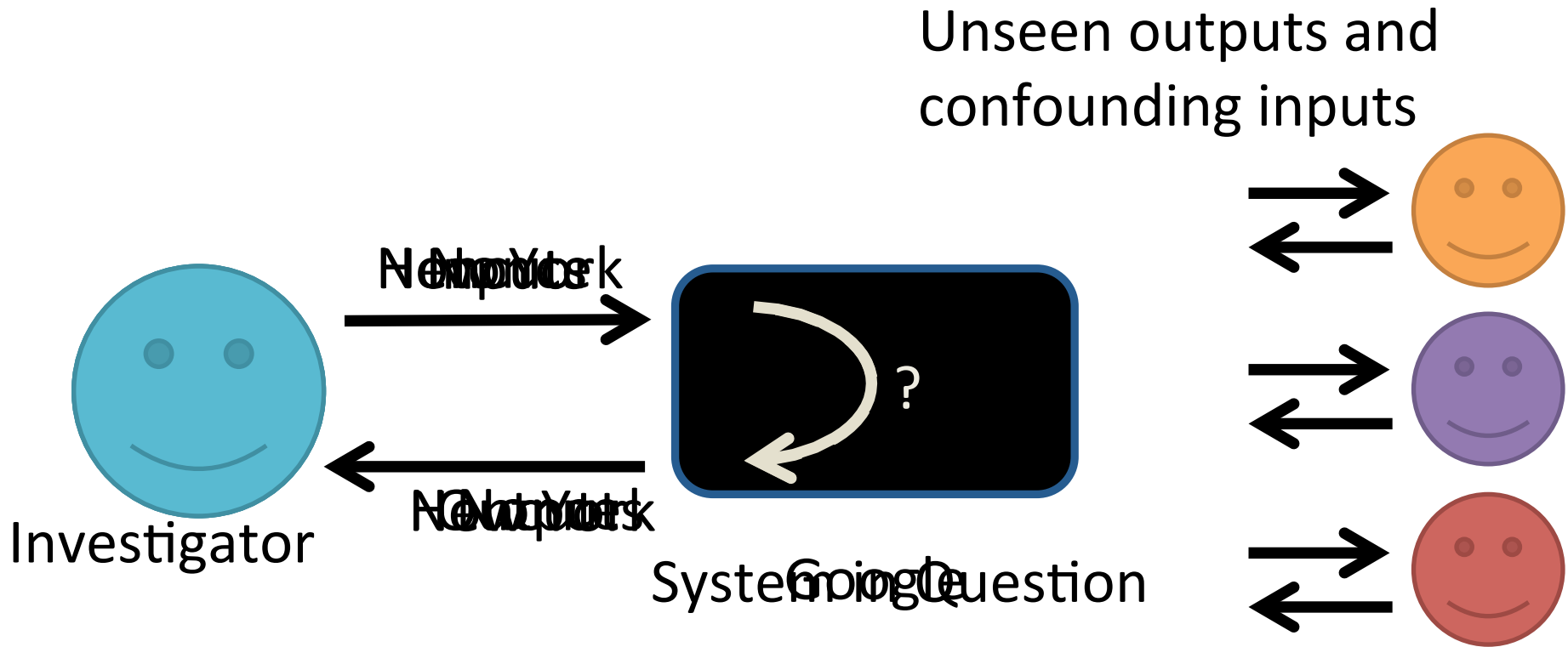
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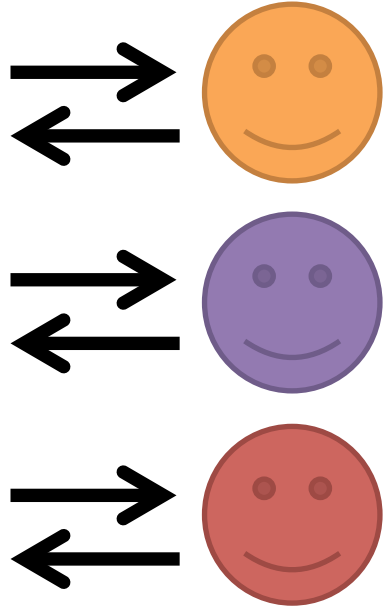
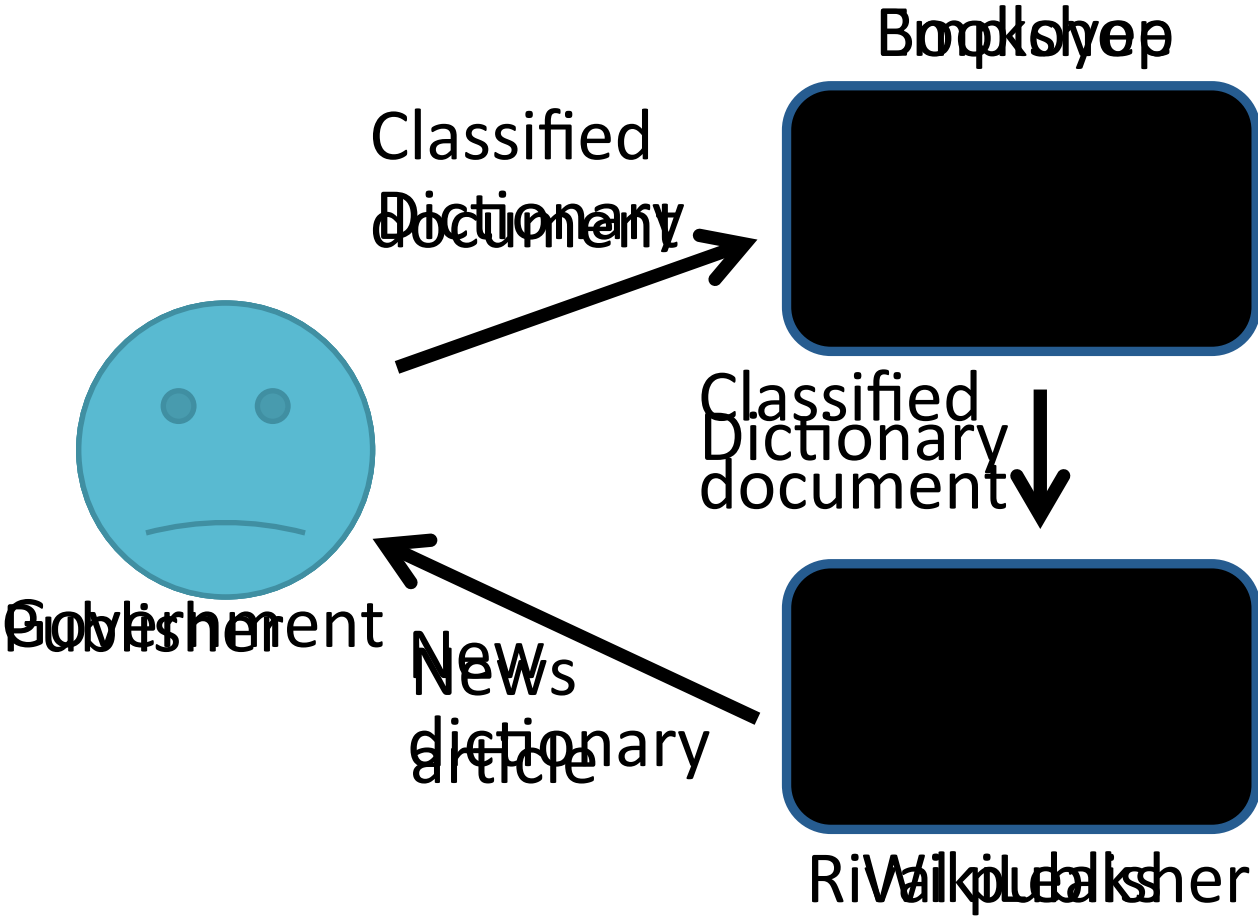
Information Flow Investigations



Information Flow in Investigations



Nonce Sting



Ads related to **Michael Tschantz** ⓘ

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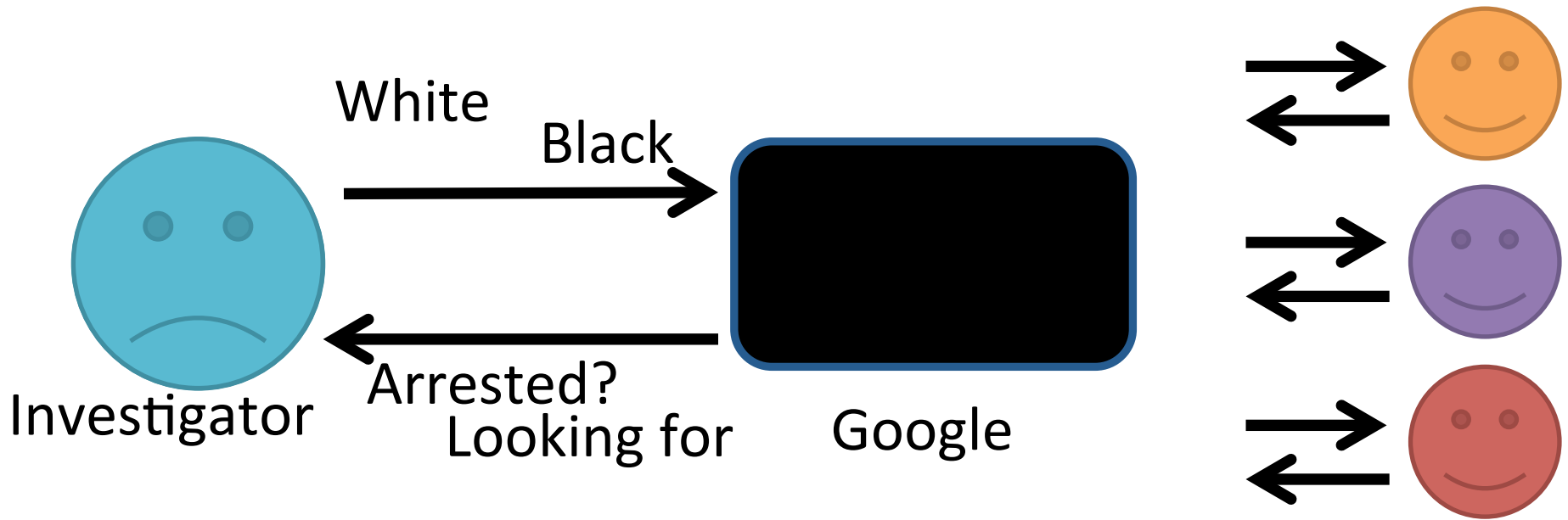
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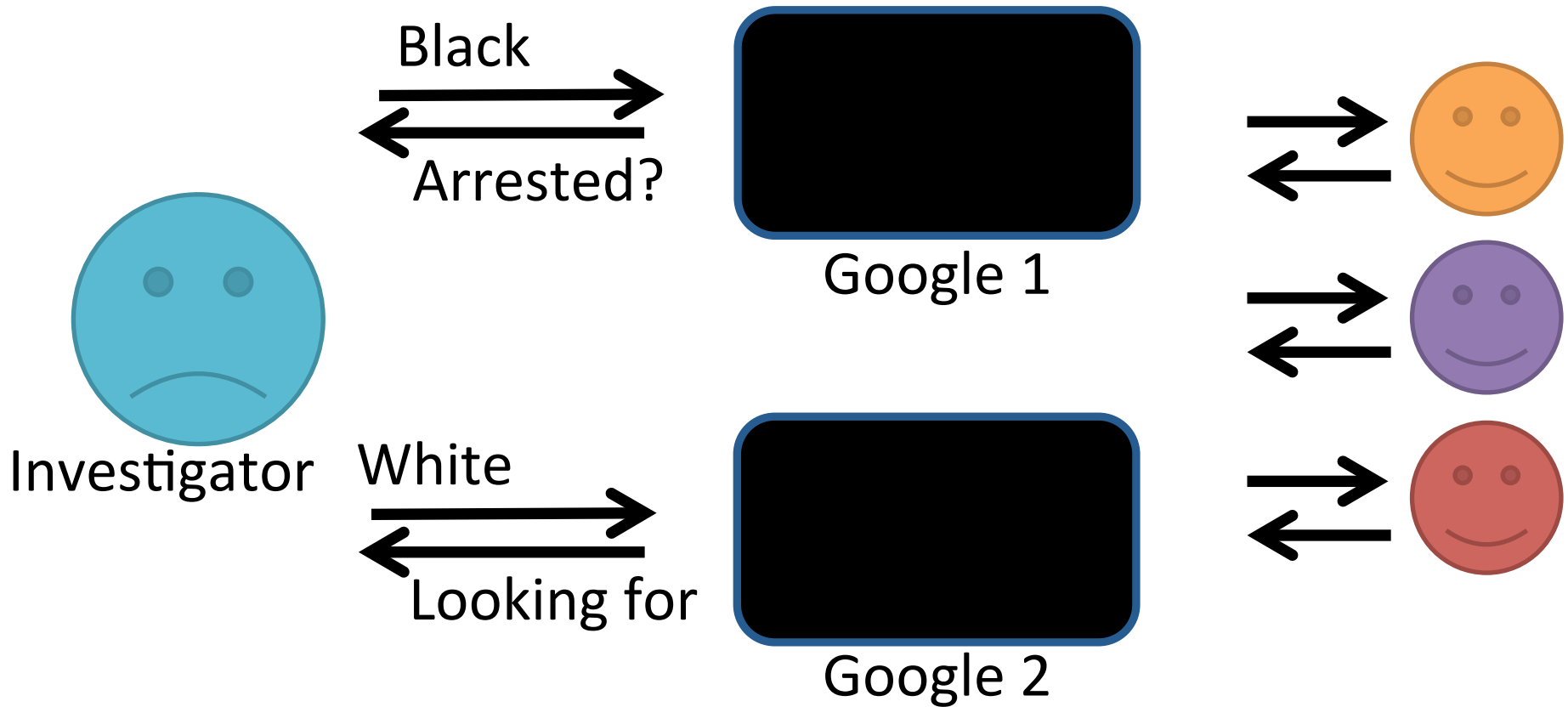
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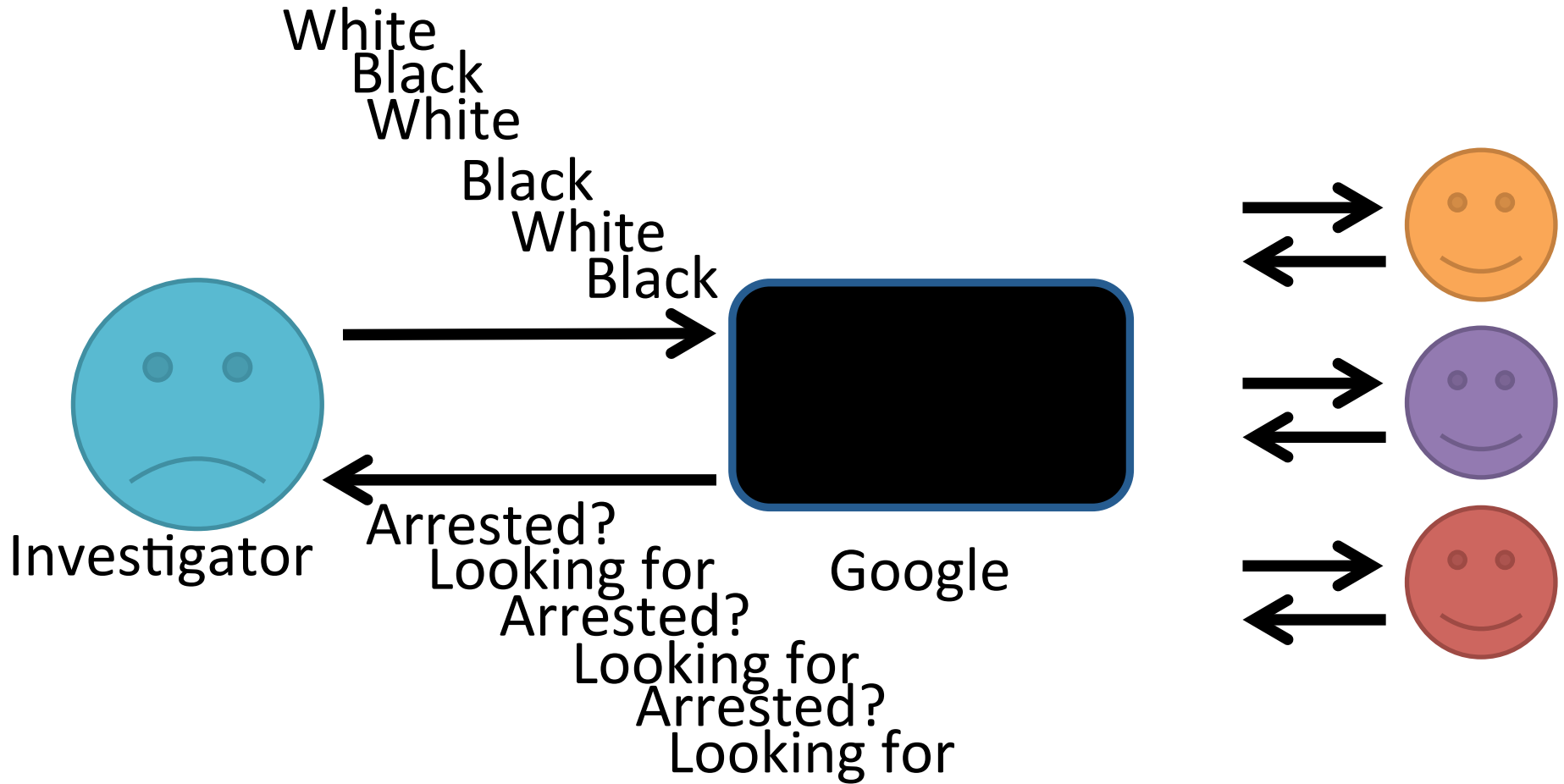
Differencing



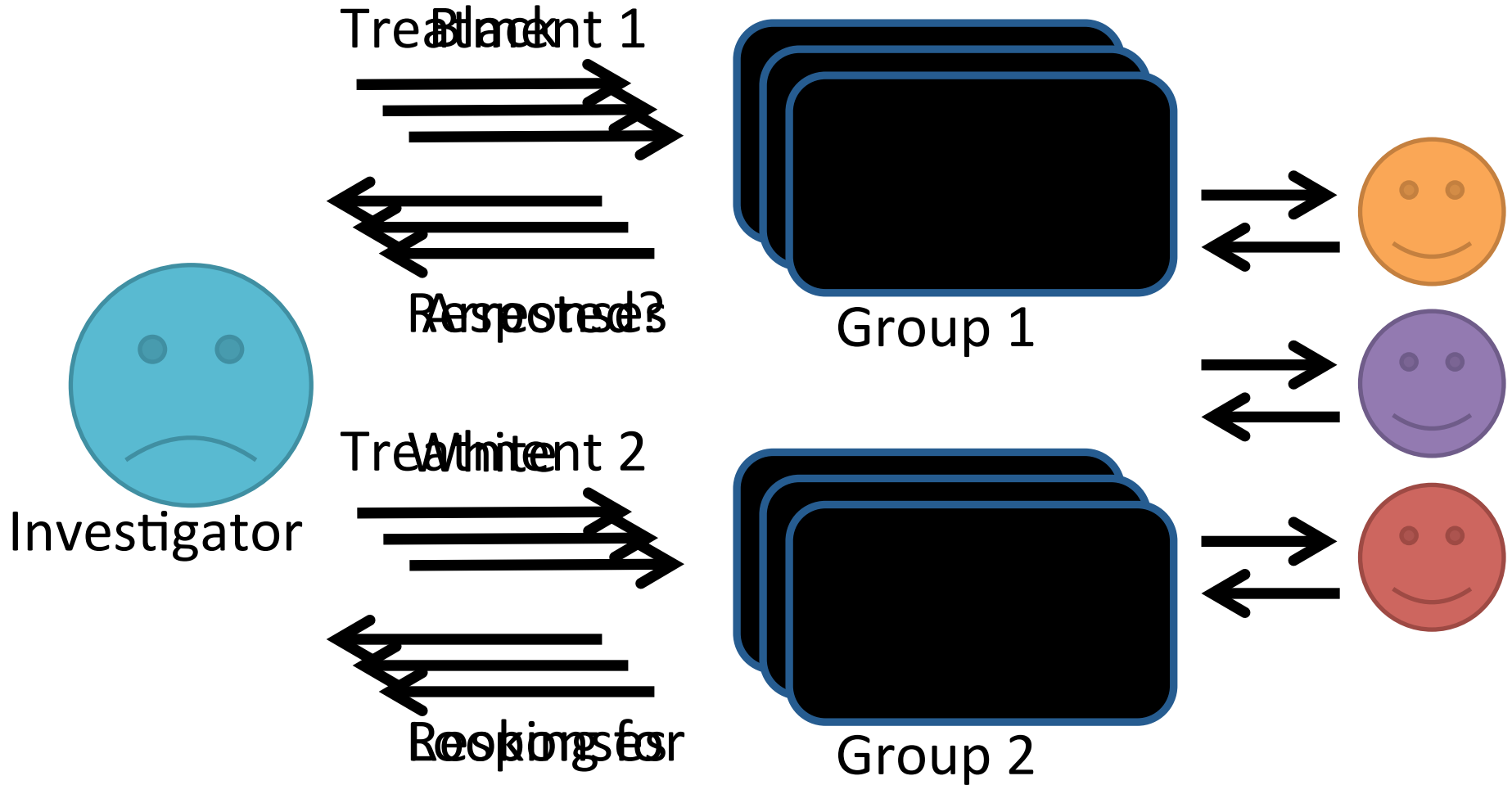
Differencing



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

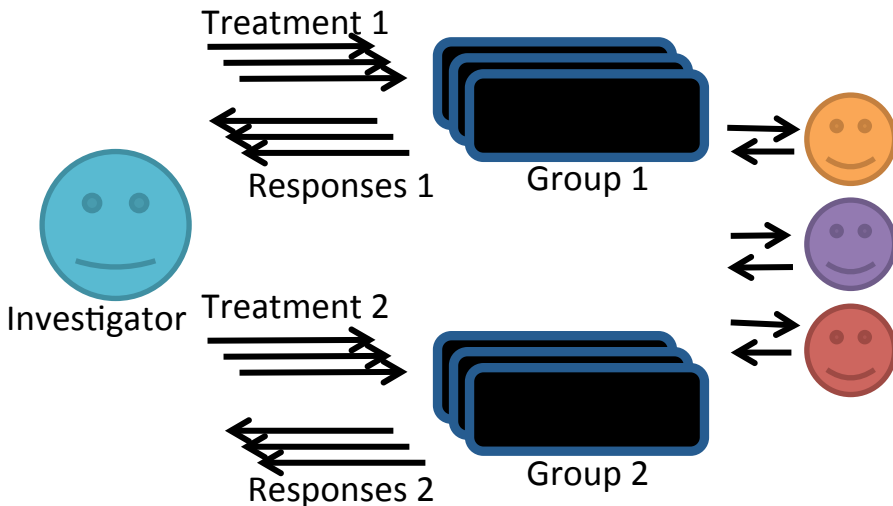
Differences

Experimental Science

Population of units

Treatments across units

Independent units

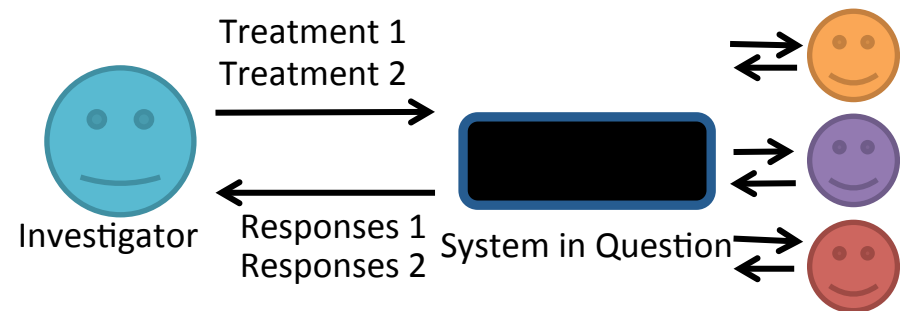


Information Flow

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 (ϵ_1, ϵ_2) -sound
- Experiments

Investigating Google

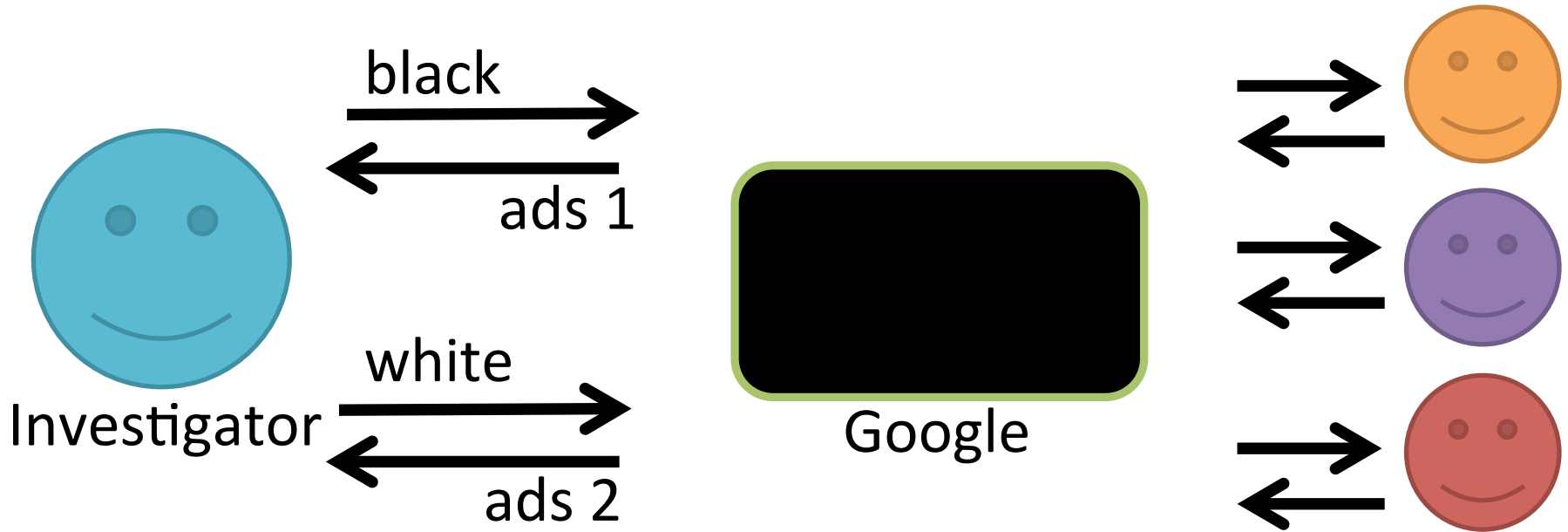
Amit Datta

Michael Carl Tschantz

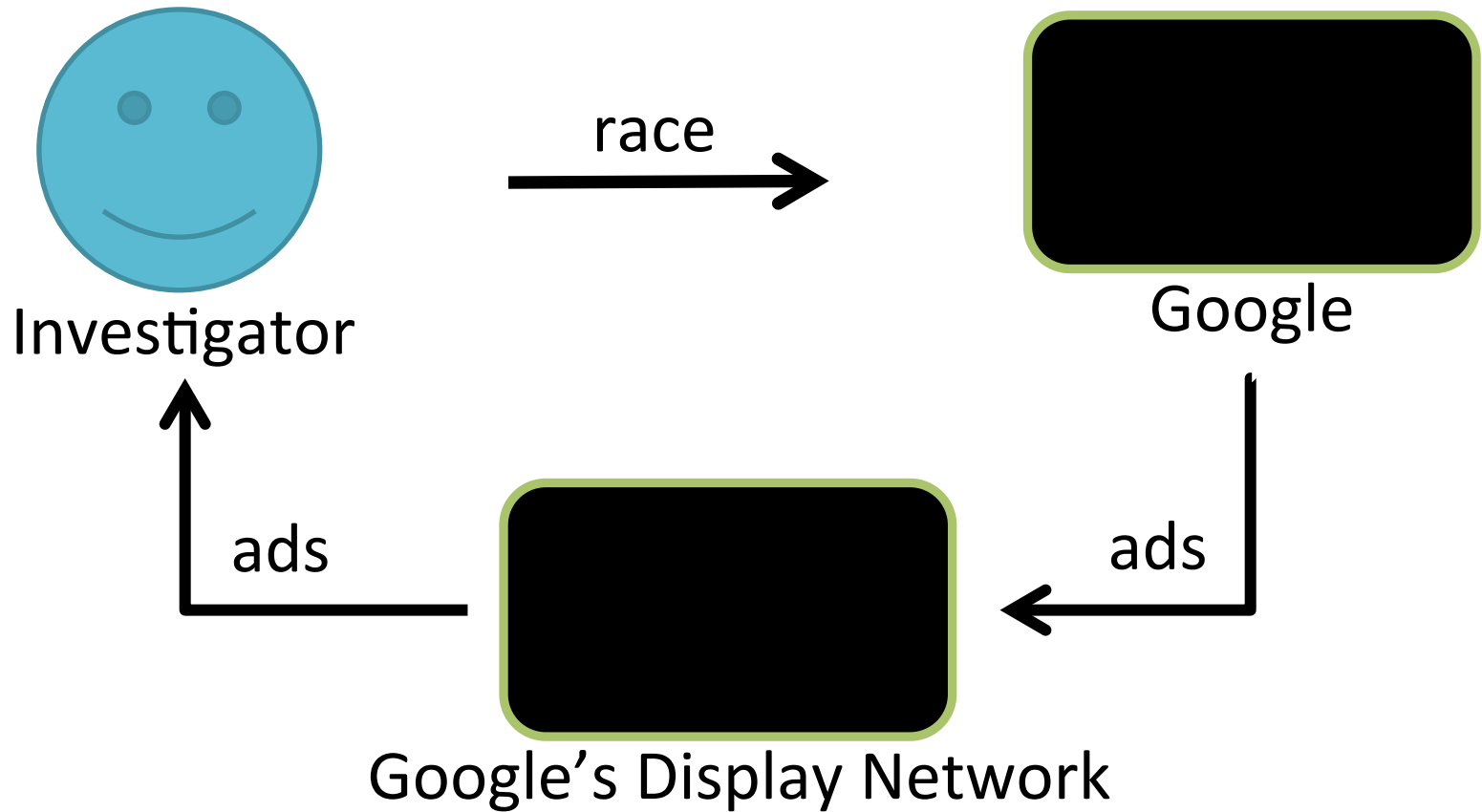
Anupam Datta

Carnegie Mellon University

Differencing: Race



Entities Involved



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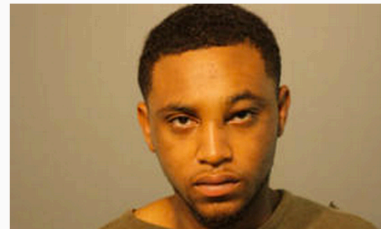
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Police: Suspect said 'I stabbed them all'

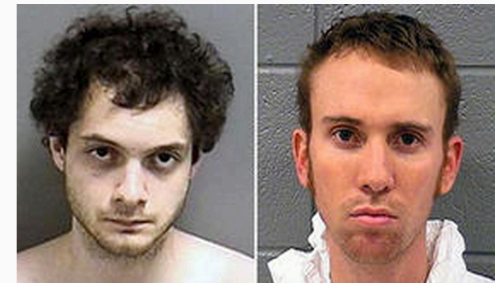
Updated 17 minutes ago

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- [More Austin crime »](#)



MUGS IN THE NEWS



Mugs in the news

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

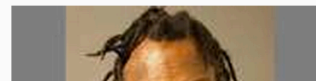
Updated 55 minutes ago

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



Man charged with sexual assault of girl, 12



Rail petitions for better protections

Updated 15 hours ago

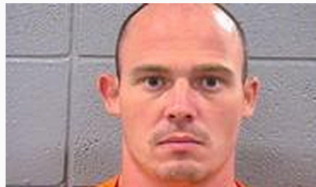
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Sixth person arrested in 2012 Tinley Park mob attack

Updated Jul 12, 2013

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

Metra CEO memo alleges more Madigan influences



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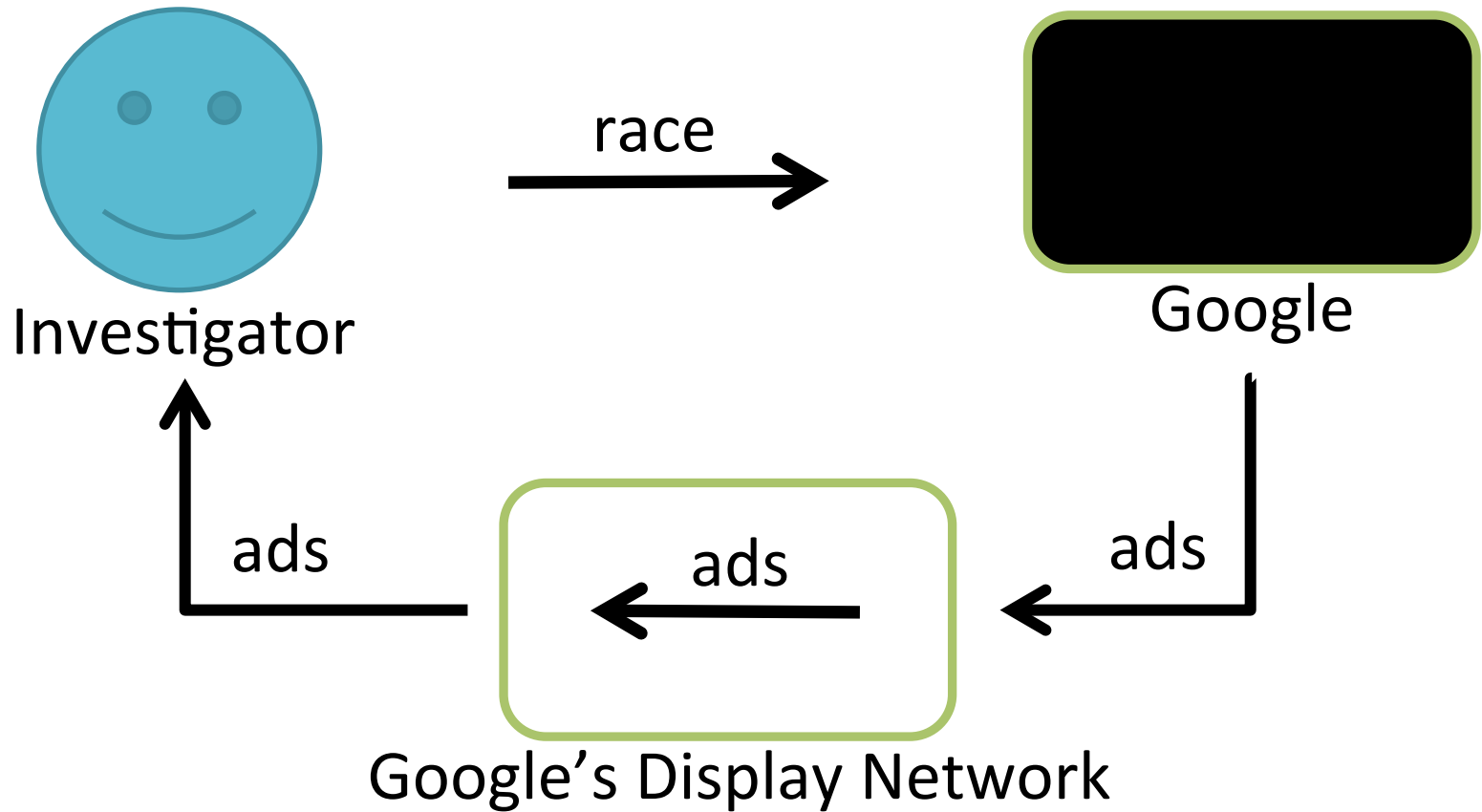
Things to do in Northern Indiana: Cool downtowns



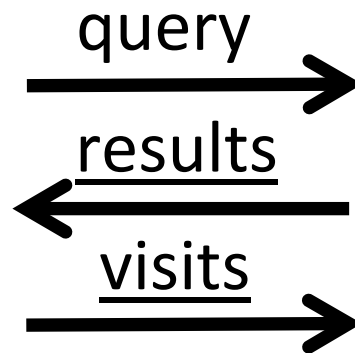
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Keep up with today's auto, home, food and

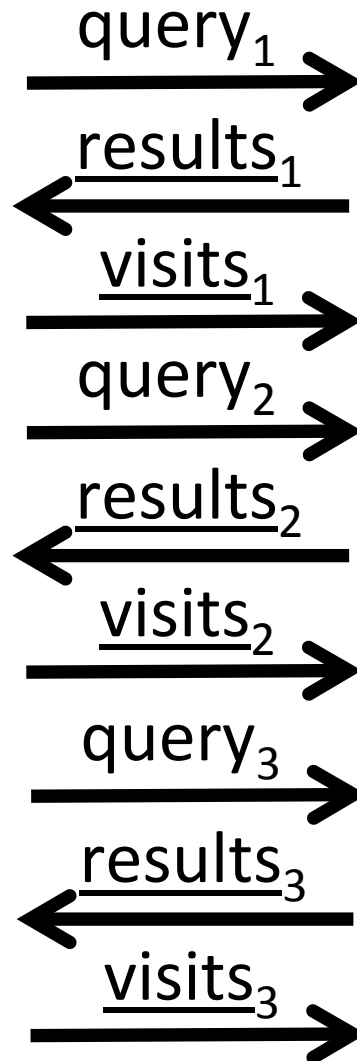
Entities Involved



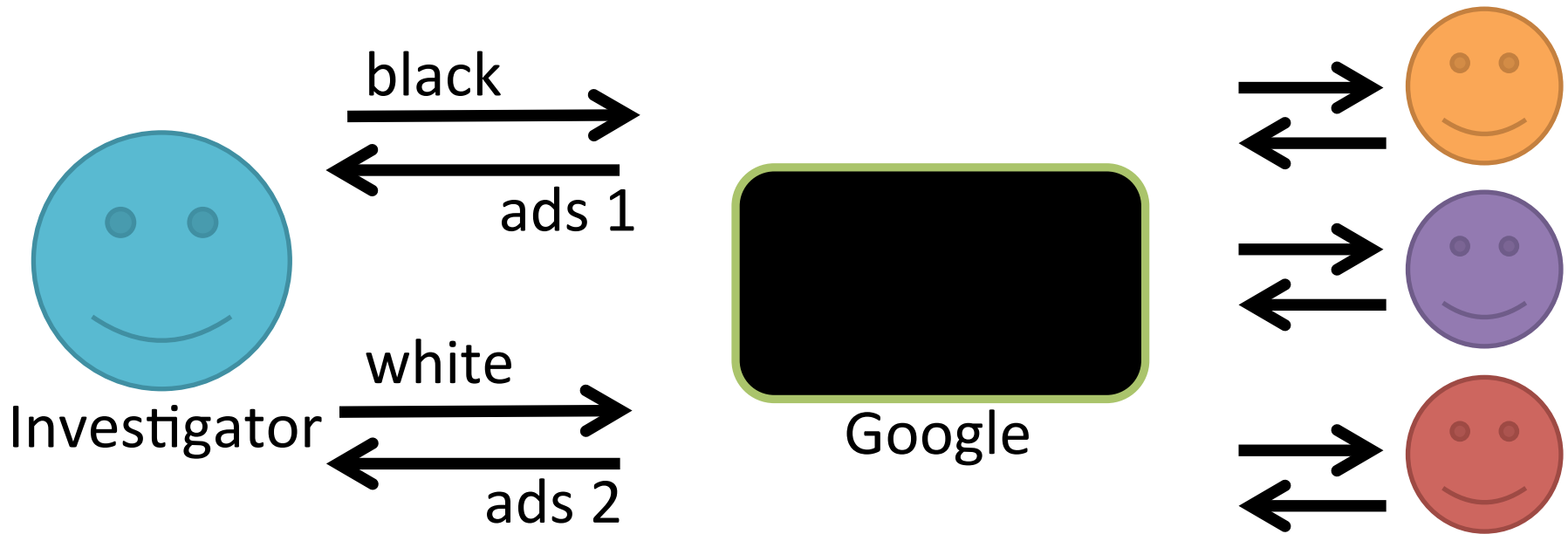
Interaction with Google



Interaction with 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

query₁; results₁; visits₁

query₂; results₂; visits₂

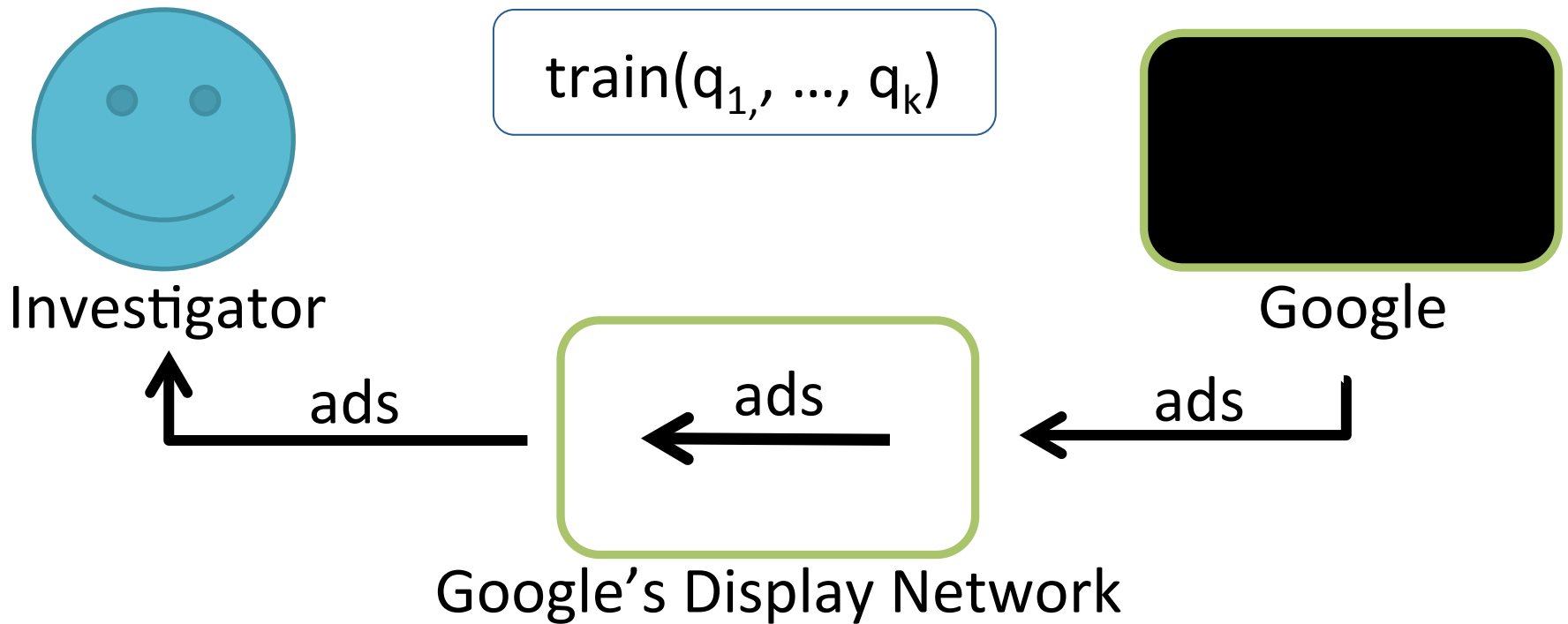
⋮

query_k; results_k; visits_k



Google

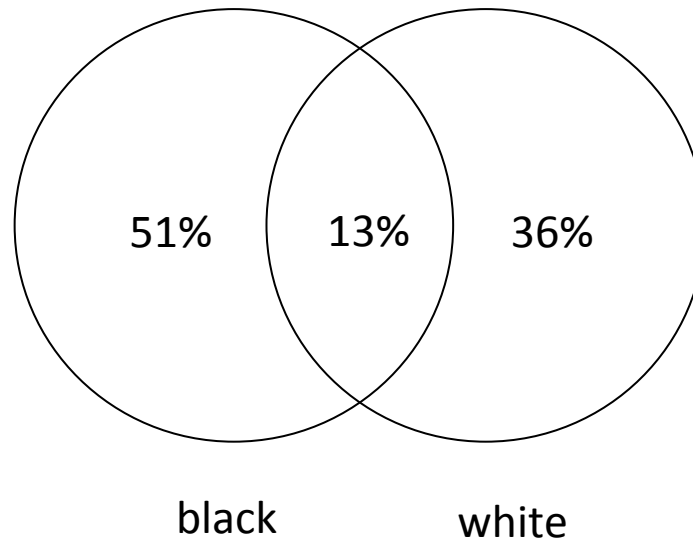
Differencing: Race



Statistics

black	{ads1}
white	{ads2}

Statistics



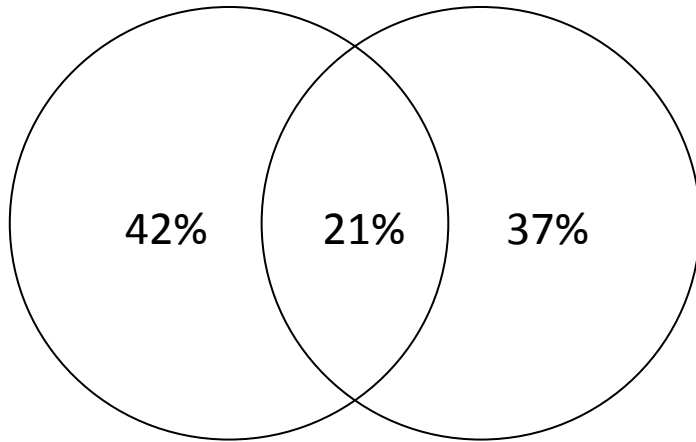
Statistics

black	{ads1}
black	{ads1'}

white	{ads2}
white	{ads2'}

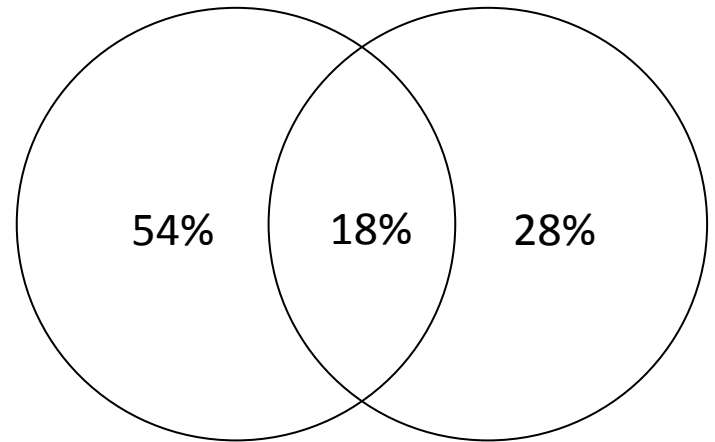
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Statistics



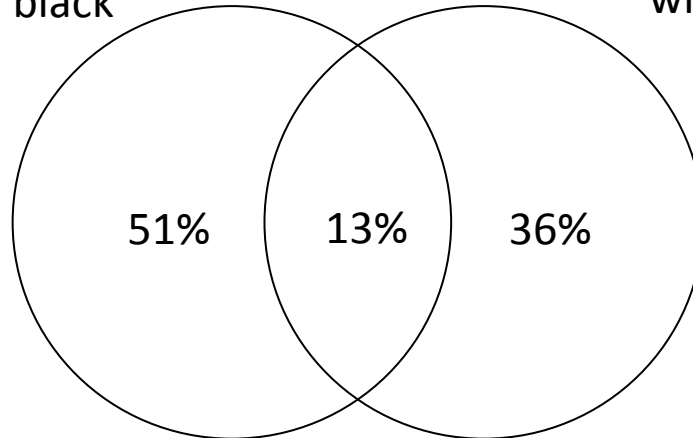
black

black



white

white



black

white

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

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Investigating Google

Amit Datta

Michael Carl Tschantz

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Differencing: Race

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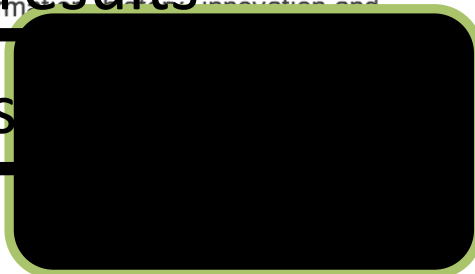
query_{1,1} →

← results

race 1

← vis

ads 1



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Investigator

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[McDonald's](#)

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[McDonald's](#)

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Score: **12** / 30 · 42 Google reviews

[McDonald's](#)

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San Francisco
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C 730 Stanyan St
San Francisco
(415) 668-4445

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

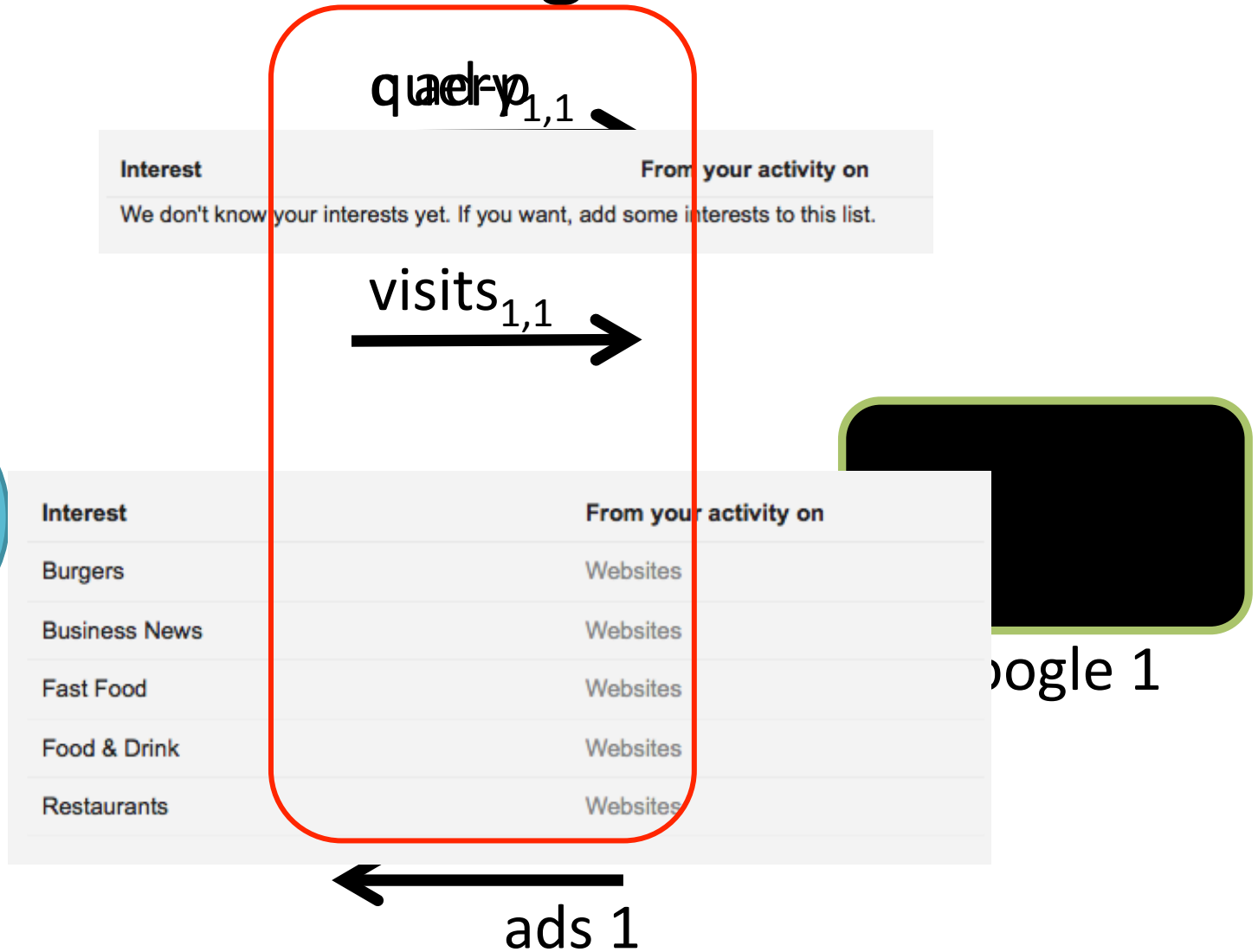
Indie Music

Country music

Chipotle

Real Estate Listings

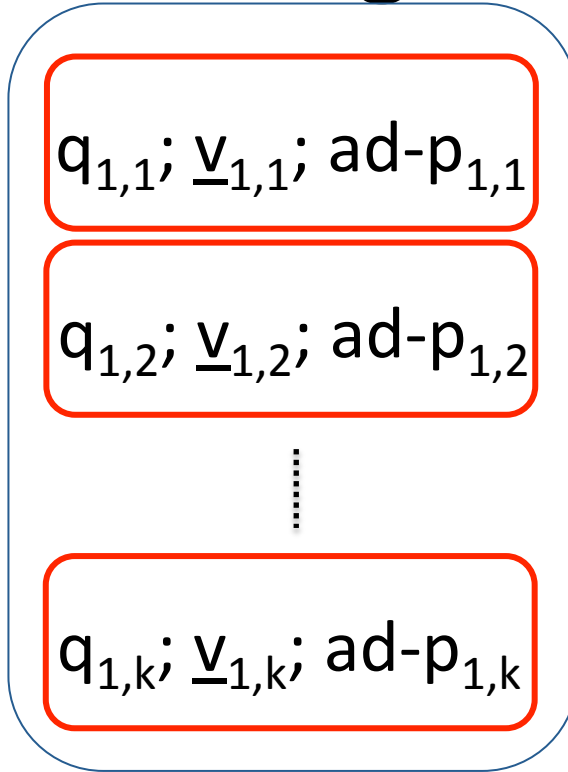
Differencing: Race



Differencing: Race



Investigator



Google 1



Differencing: Race

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



Investigator



Google 1



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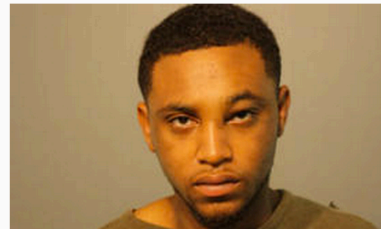
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Police: Suspect said 'I stabbed them all'

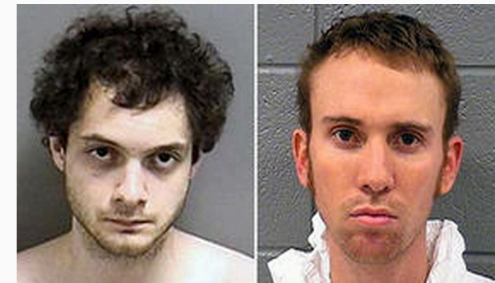
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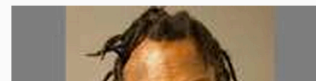
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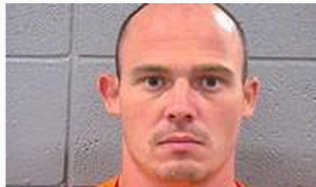
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Metra CEO memo alleges more Madigan influences



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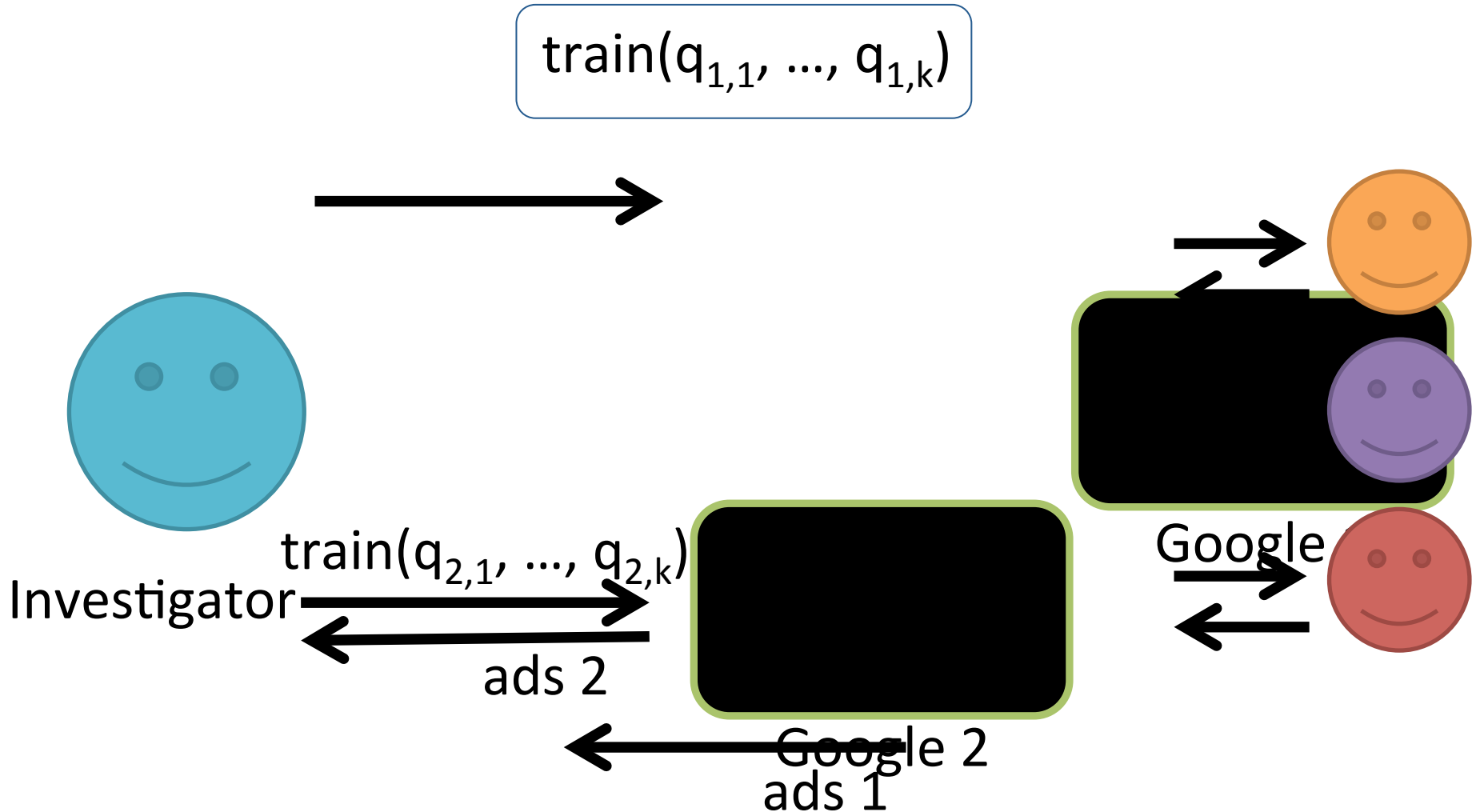
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TRENDS IN CHICAGO

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

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q_{2,5} = Indie Music

q_{2,6} = Country music

q_{2,7} = Chipotle

q_{2,8} = Real Estate Listings

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African American

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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

Investigating Google

Amit Datta

Michael Carl Tschantz

Anupam Datta

Carnegie Mellon University

Variants of training/collection

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



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Video



Advertisements (ads)

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 ncsa.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.

Ad preferences (ad-n)

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TV Commercials

Interference and Causation

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