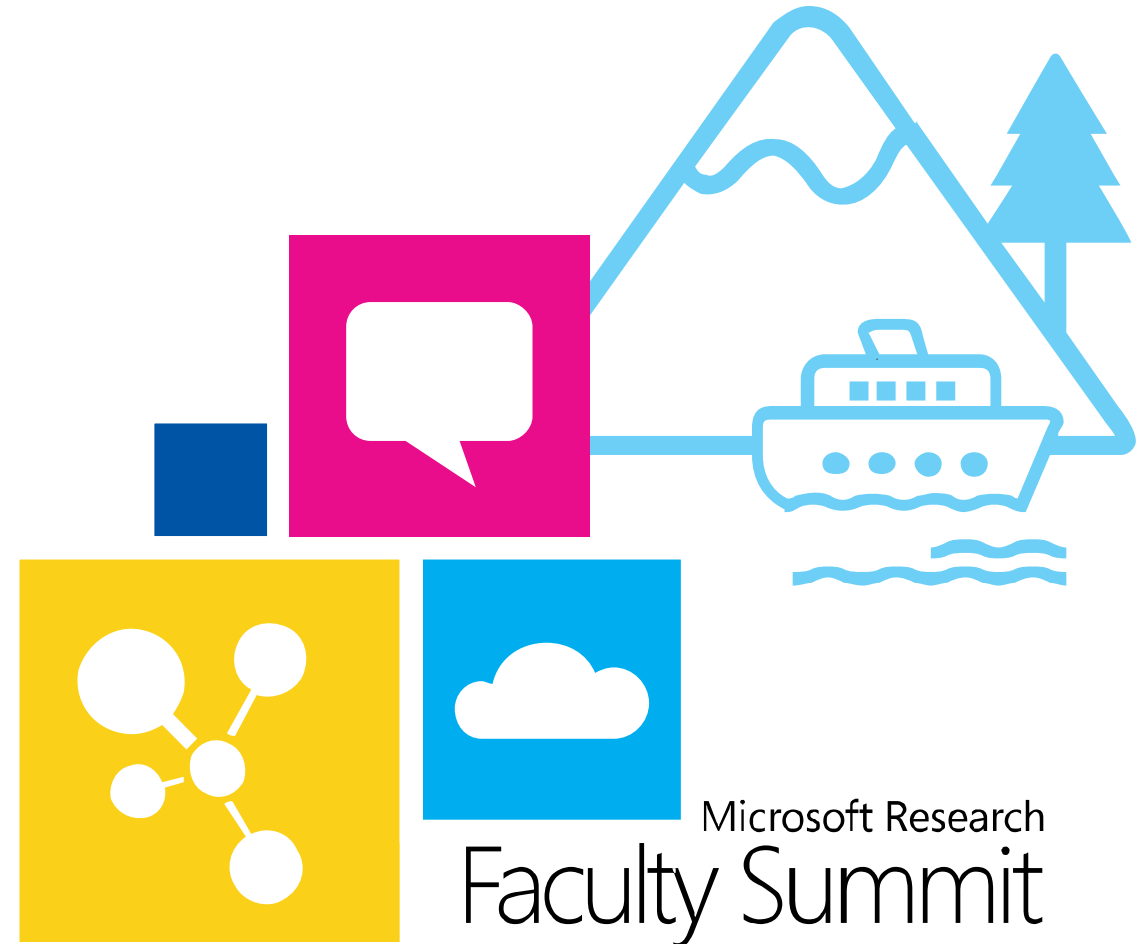




Catching Click Fraud

Vacha Dave, Saikat Guha
Microsoft Research India



Internet Advertising Today

Online advertising is a 37 billion dollar industry

15% year-on-year growth

Publishers can monetize traffic

Blogs, News sites, Syndicated search engines

Revenue for content development

Pay-per-click advertising

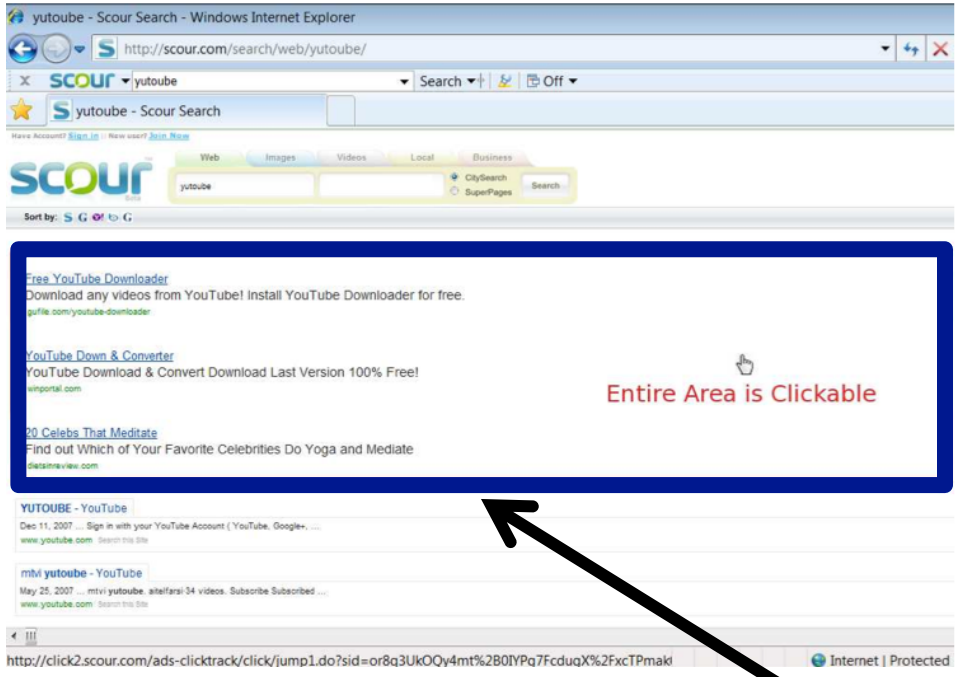
Advertisers pay per-click to ad networks

Publishers make a 70% cut on each click on their site

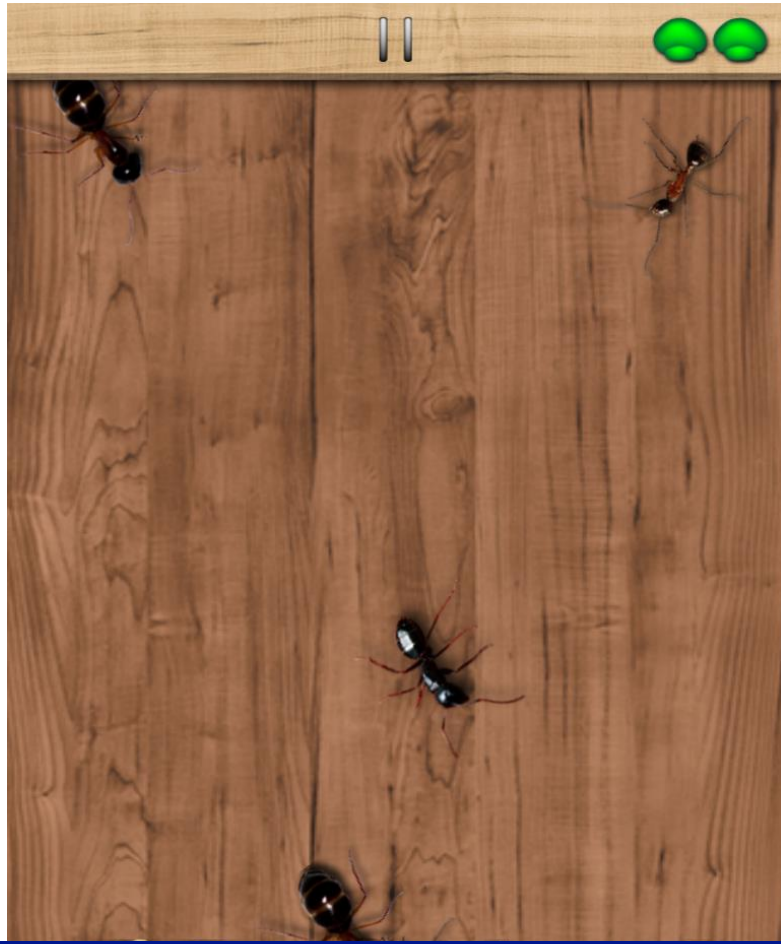
*Based on Interactive Advertising
Bureau Report, a consortium of
Online Ad Networks



Click-Fraud vs. Click-Spam



Ads



Click-Spam Problem

No ground truth

Almost impossible to know if particular click is genuine

Need to guess the intent of user

No reliable information from industry

Ad networks: security by obscurity

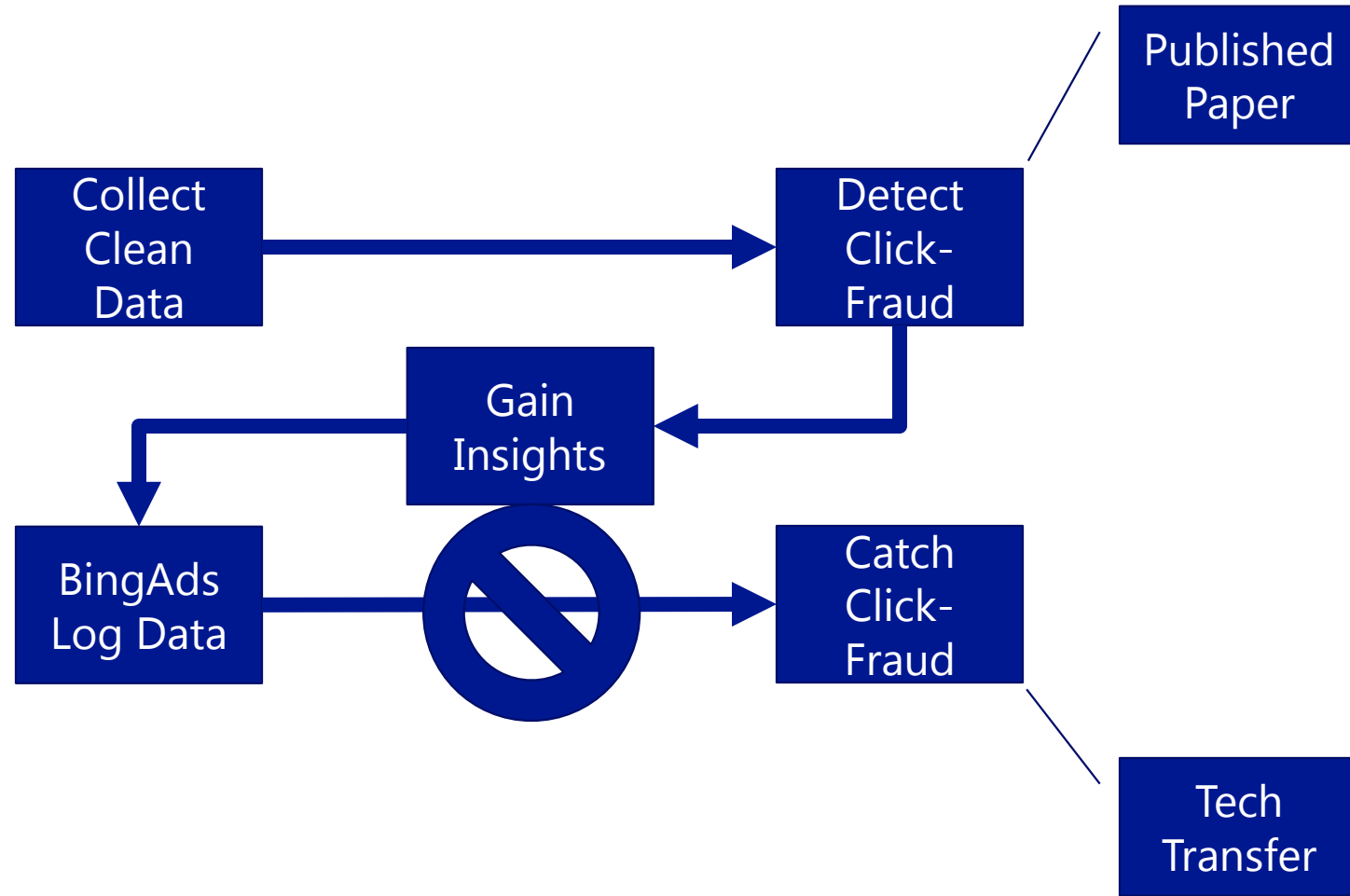
Third parties: proprietary heuristics contested by ad networks

No research in academia

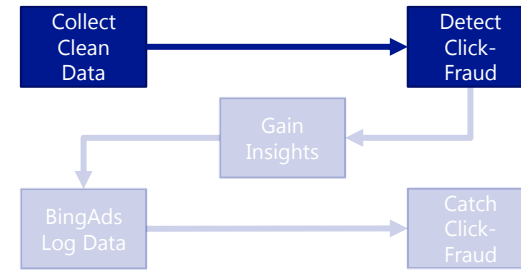
Researchers lack real attack data



Research Process



Research Contributions



First method to **independently estimate** click-spam

As an advertiser, research, anybody.

For specific keywords. No heuristics.

Test across ten ad networks

Search, contextual, social and mobile ad networks

Demonstrate and quantify that click-spam is an **open (research) problem**

Especially for Mobile and Social ad networks

Discover **six classes** of sophisticated attacks

Why simple heuristics don't work

Release data for researchers

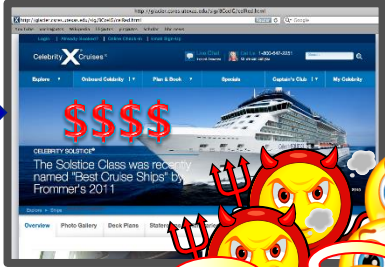


Active Measurements

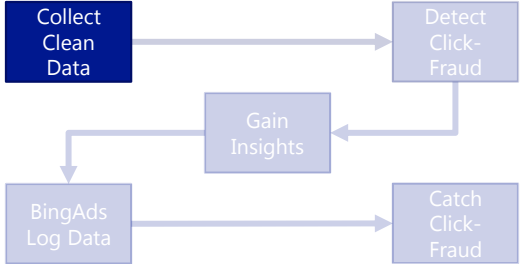
Celebrity Cruise
Be Recognized, Celebrated, And
Indulged Aboard Celebrity Cruises



Lots of clicks



Lots of visits



How many ?

$$x = \frac{g_d \left(l_i - l'_i \frac{d}{d'} \right)}{n_d g_i}$$

Celebrity Cruise
Be Recognized, Celebrated, And
Indulged Aboard Celebrity Cruises



Random sample



Black Box



Fewer visits



Testing Ad Networks

Sign up as advertisers for ten ad networks

Search, Contextual, Mobile and Social
Google, Bing, AdMob, InMobi, Facebook and others

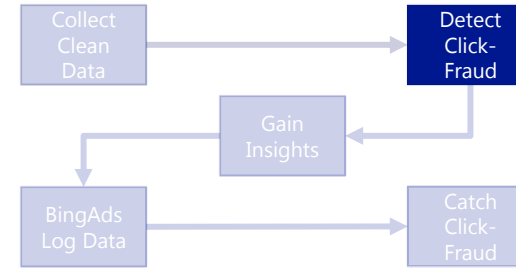
240 Ads

Keywords: Celebrity, Yoga, Lawnmower
Hurdles: Click to continue, 5 sec wait

50,000 Clicks

30,000 bait ad clicks

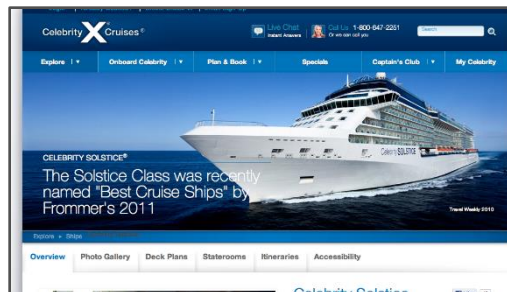
Cost: \$1500



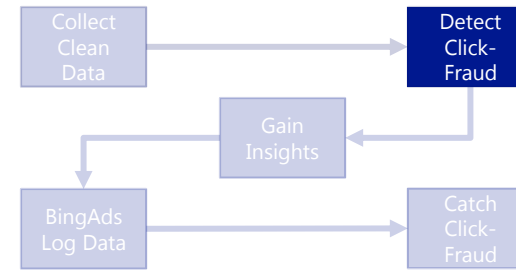
Celebrity Cruise
Be Recognized, Celebrated, And Indulged Aboard Celebrity Cruises
cruisewithceleb.com

Gentle Yoga for Beginners
No pretzel poses...just easy yoga for beginners. Award-winning DVDs.
gentleyogaforbeginners.com

Buy Any Zero Turn Mower
Get Free S&H +Pay No Tax \$2,079.99
CALL or Shop Online 4 Lowest Prices
zeroturnlawnmowers.com

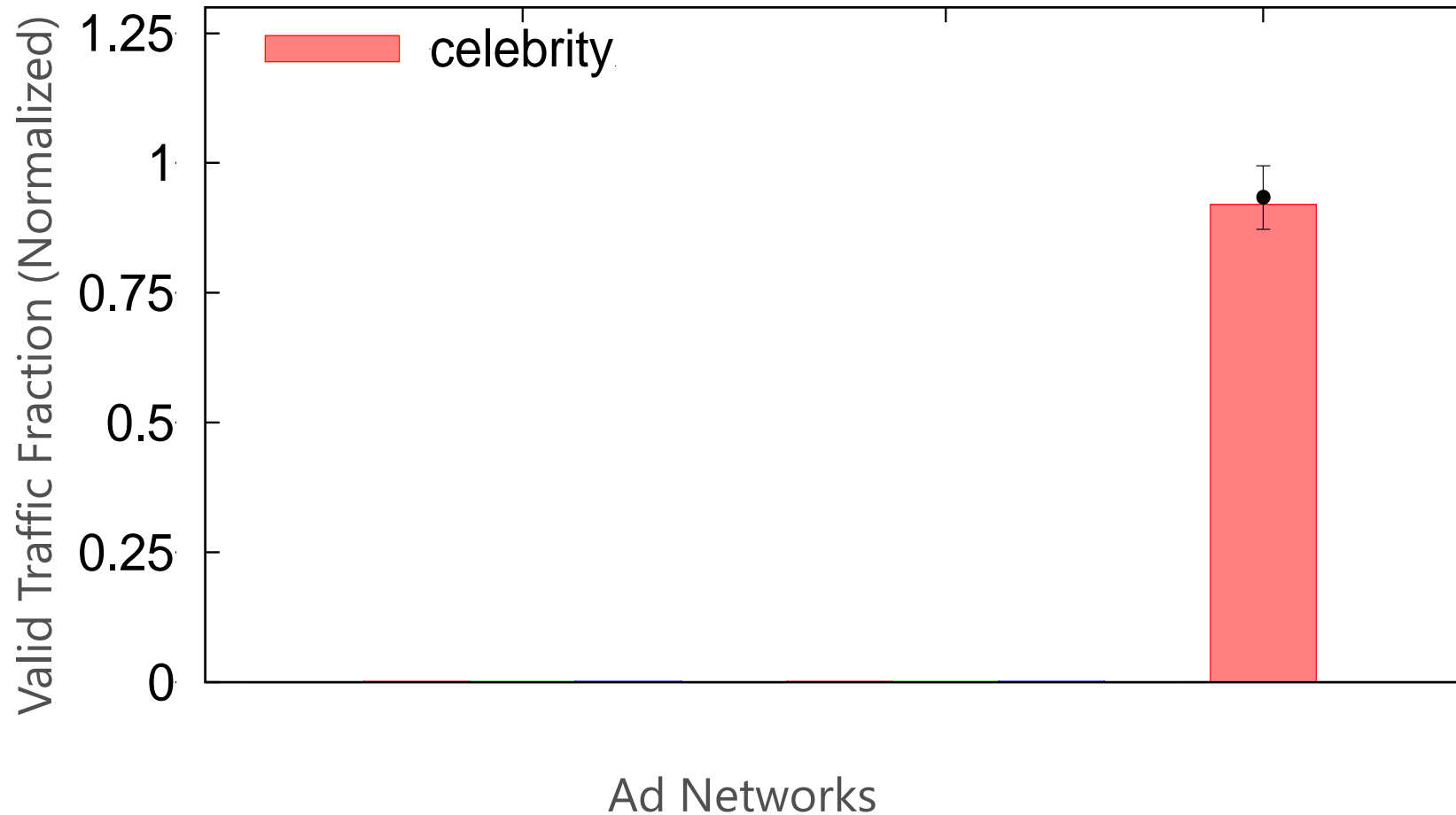


Validation and Results



Ad Network's Estimate

• Our Estimate



Where from?

Analyze bait ad clicks

Publishers: Strong motive

Instead of clicks/users

Manual Investigation

Challenge: Scale

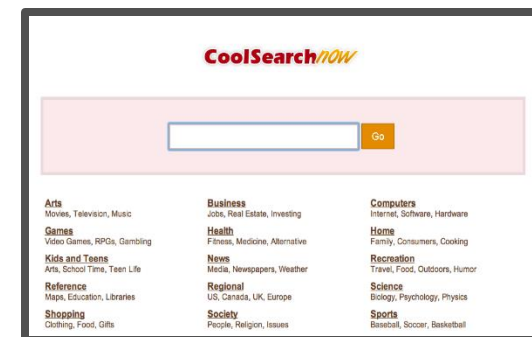
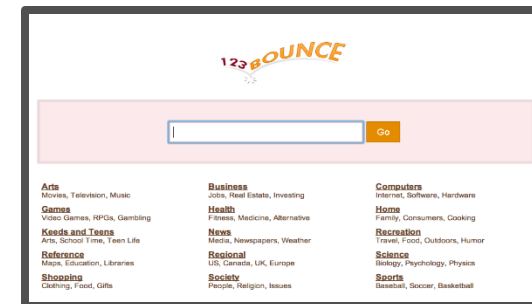
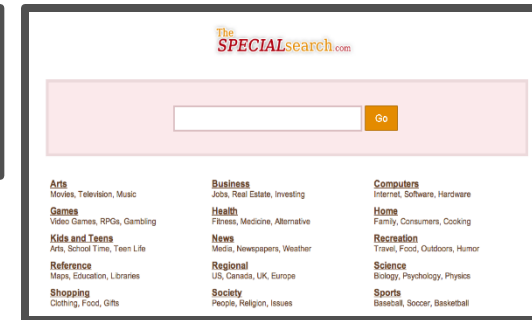
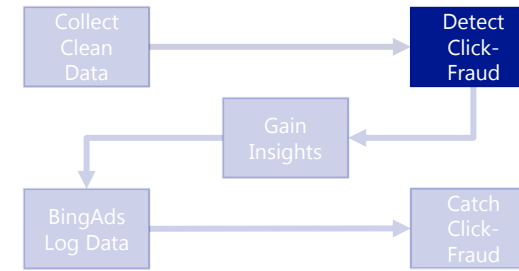
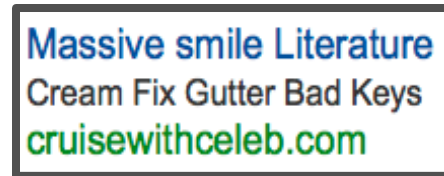
3000+ publishers, 30,000 Clicks

Identical sites!

Cluster on cosine similarity

Feature vector

WHOIS , IP Address/Subnet, HTTP parameters





The **SPECIAL**search.com

CoolSearchNOW

Tempest.com network solutions
This Page is Under Construction - Coming Soon!
Why am I seeing this 'Under Construction' page?

Motorhomes for Sale Personal Classifieds Used Cars

Craigslist Search
Search Tempest
Cars for Sale
Local Classifieds
Boats for Sale
Find Jobs
Motorcycle Classif

Deansplanet.com network solutions
This Page is Under Construction - Coming Soon!
Why am I seeing this 'Under Construction' page?

Entertainment News Celebrity Style Gay Personals

Celeb Photos
Bikini Models
Hot Celebrities
Celebrity Scandal
Kim Kardashian
Celebrity Videos
Beyonce Knowles

Popular Links
Hot Celebrities Kim Kardashian
Bikini Models Celeb Photos

What are you looking for?

DoTellAll
Real People. Real Results.

Search Restaurants, Shopping, etc. GO

Find and Share
your favorite local spots
DoTellAll is the first truly local community where members help you make informed decisions.

Living Frugal
Start a Goal Q&A My Goals Log In
e.g. 401K, investing, etc...

Plan for your retirement with
Create a goal for your retirement, share it, and cheer others on!

service MOUNTAIN Start your search here search Log In

Need a local expert? start here!
Ask a Service Question Below
Enter question here
ASK NOW >>

Service Guides

How To Find A Residential Painter
A residential painter is a person who can come in and paint your home, inside and out, so that it looks brand new again. You may be surprised by the amount of difference that a co... [Read More](#)
rated by 683 users

How To Do slab Leak Repair
A slab leak is something that all homeowners dread for a number of

Service Mountain Coupon Book

Malware
Arbitrage
Parked
Adult

Case Study 1 – Malware

Responsible Malware: TDL4

Validation: Run malware in VM

Browser specific filtering doesn't work

Can intercept and redirect all browser requests

Timing analysis doesn't work

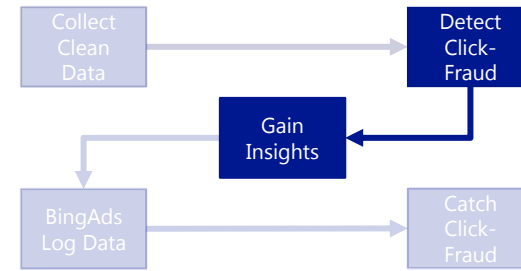
Mimics real user behavior

Threshold based filtering doesn't work

Only 1 click per IP address per day

Signature

Large number of users, Small number of clicks (per day), Sustained clicks over multiple days



Case Study 2 – Arbitrage

Discussion Forum

Low page-rank, not malicious, no ads

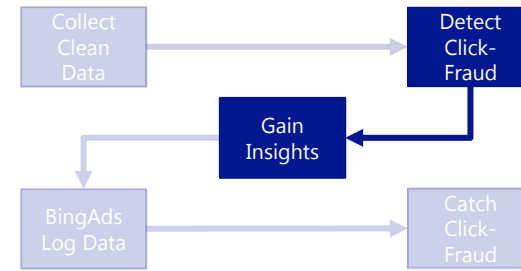
No typos, no dates

Periodically reset

Cheap Ads!

Page now full of (expensive) ads

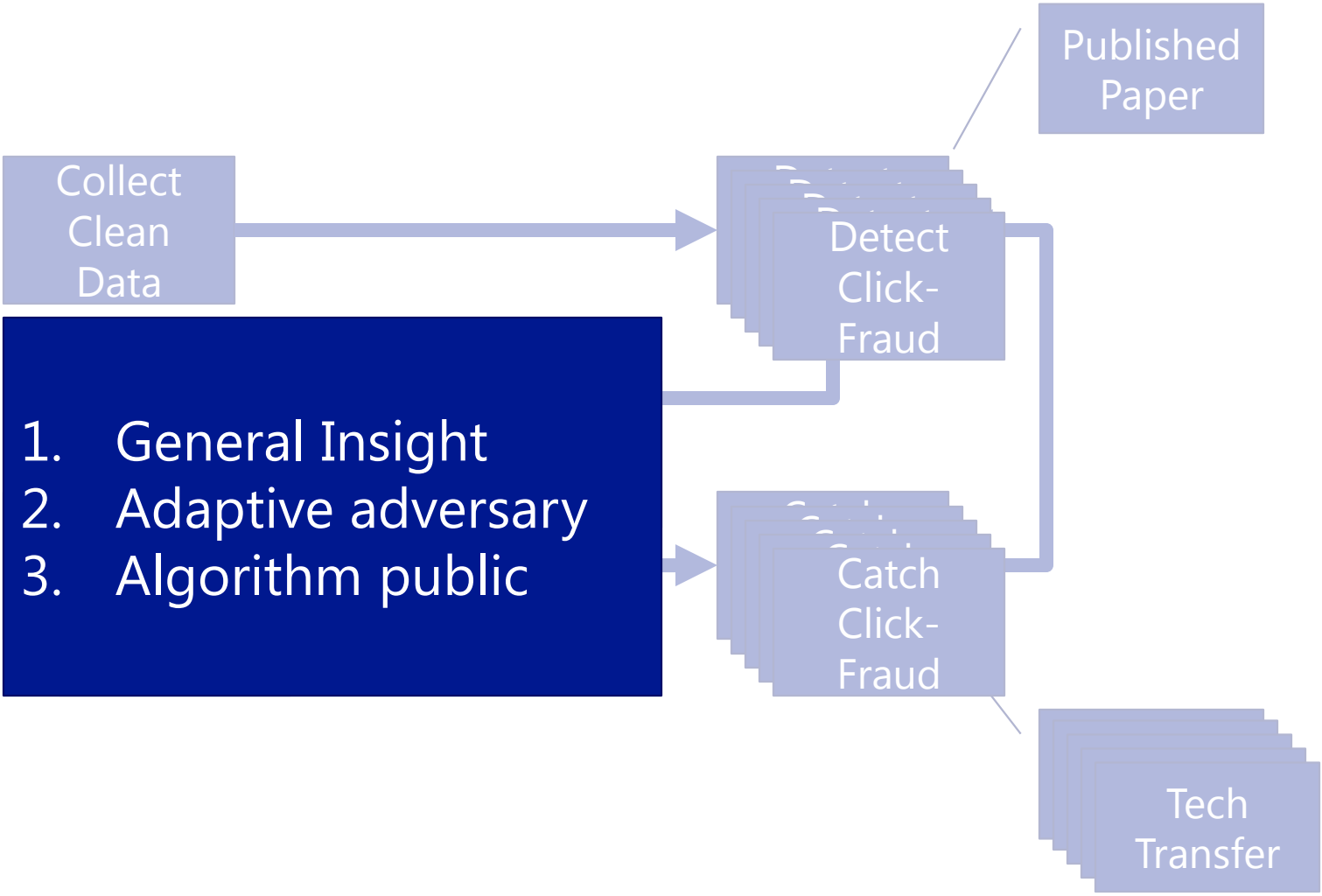
Confused user clicks



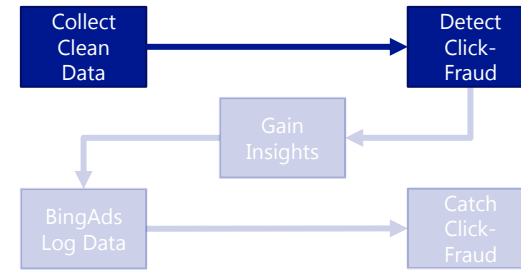
Work From Home-Now Hiring
3 Positions Available - \$17-21/Hour Based On Experience. Apply Now!
DoTellAll.com/Apply



Ongoing Tech Transfer and Research



Research Contributions



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