

# Machine Learning and Predictive Marketing

Reality, Pitfalls & Potential

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dstillery

# Programmatic Advertising

The screenshot shows the New York Times homepage from July 17, 2012. Two red boxes highlight programmatic advertisements for the Cadillac XTS. The first box is on the top left, containing the text "THE ALL-NEW CADILLAC XTS" with the Cadillac logo. The second box is on the top right, showing a black Cadillac XTS driving on a road. A third red box is at the bottom right, featuring a video player with the text "INTRODUCING THE ALL-NEW CADILLAC XTS" and a "CLICK FOR SOUND" button. The main content area includes a large article titled "Fiscal Crisis in States Will Last Beyond Slump, Report Warns" by Mary Williams Walsh and Michael Cooper, and a "TimesCast" video player showing a man sitting on a chair reading a book. Other visible elements include a navigation menu, a search bar, and various market and opinion sections.

**THE ALL-NEW CADILLAC XTS**

## The New York Times

Tuesday, July 17, 2012 Last Update: 1:35 PM ET

Search **ING DIRECT** Follow Us [f](#) [t](#) [+](#) Subscribe to Home Delivery | Personalize Your Weather

**WORLD**  
**U.S.**  
**POLITICS**  
**NEW YORK**  
**BUSINESS**  
**DEALBOOK**  
**TECHNOLOGY**  
**SPORTS**  
**SCIENCE**  
**HEALTH**  
**ARTS**  
**STYLE**  
**OPINION**

Autos  
Blogs  
Books  
Cartoons  
Classifieds  
Crosswords  
Dining & Wine  
Education  
Event Guide  
Fashion & Style  
Home & Garden  
Jobs  
Magazine  
Movies  
Music  
Obituaries  
Real Estate  
Sunday Review  
T Magazine  
Television  
Theater

### Fiscal Crisis in States Will Last Beyond Slump, Report Warns

By MARY WILLIAMS WALSH and MICHAEL COOPER 11:00 AM ET

Long after the economy rebounds, states will face financial problems that include rising health care costs and underfunded pensions, a task force of budget experts said.

[Post a Comment](#) | [Read \(119\)](#)

### Unity Government in Israel Disbanding Over Draft Dispute

By JODI RUDOREN and RICK GLADSTONE 36 minutes ago

The head of the centrist Kadima Party said it had "no choice" but to pull out because of differences over a proposed universal draft.

[Post a Comment](#) | [Read \(11\)](#)

### Cautious on Growth, Bernanke Offers No Hint of New Action

By BINYAMIN APPELBAUM 40 minutes ago

Ben S. Bernanke, the

### TimesCast

[PLAY TIMESCAST](#)

Evan Vuoci/Associated Press

### TimesCast Politics: Running Mate Speculation

The latest hints. | Trying to break the story. | Christie out of the running. | Campaign ad sniping goes on. | A report from a gathering of Mormons.

[TimesCast Archive](#)

**CAMPAIGN 2012**

### Mormons' First Families Rally Behind Romney

By JIM RUTENBERG

Descendants of Mormons who made the great trek to Utah in the 1840s have turned out in strength to back Mitt Romney.

[FiveThirtyEight: Is Romney Overreacting? 7:37 AM ET](#)

[Post a Comment](#) | [Read \(277\)](#)

### Inside the Romney No. 2 Hunt: First, Do No Harm

By ASHLEY PARKER and MICHAEL BARBARO 10:32 AM ET

Mitt Romney is conducting a search designed to avoid anything like the kind of rushed and risky choice of Sarah Palin that bedeviled John McCain in 2008.

### OPINION »

**OP-DOCS**  
**Islamic School for Girls**  
At a Koran school in Syria, girls learned about both Islam and women's rights.

**Brooks: Capitalism Debate**  
**Bruni: A Civic Vacuum**  
**Editorial: The Power of Anonymity**  
**Taking Note: Look Over Here!**  
**Warren Rudman, Chuck Hagel: We Need Disclosure**

### MARKETS »

At 2:00 PM ET

S.&P. 500	Dow	Nasdaq
1,362.46	12,806.98	2,908.90
+8.82	+79.77	+11.96
+0.65%	+0.63%	+0.41%

**GET QUOTES** [My Portfolios »](#)  
Stock, ETFs, Funds

**The New York Times**  
**TRY IT NOW**  
**4 WEEKS FOR 99¢**  
[CLICK HERE](#)

**INTRODUCING THE ALL-NEW CADILLAC XTS**

[CLICK FOR SOUND](#)

[LEARN MORE »](#)

300 Million (US) consumer



Interacting with brand sites

Using Digital Devices

Measurement

Conversion



If we win an auction we serve ad of brand

100 ms to bid

Work with Brand



100 Billion bid requests per day

dstillery

# Machine Learning & Predictive Modeling: Algorithms that Learn from Data

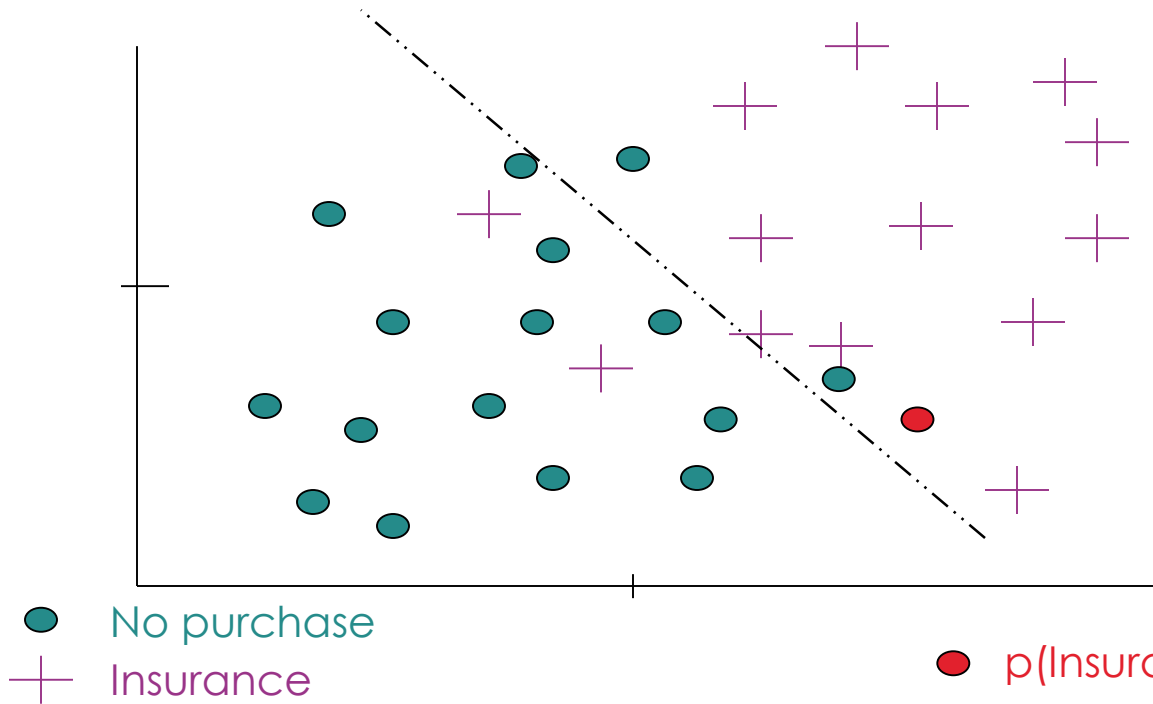
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0.798285720814701 0.00034831487664849 1962 20
0.540374430975371 0.00141733796704089 891 20
0.724142820274877 0.00111803594088993 1734 20
0.420231281165794 0.000683473608154817 1755 10
1.63577343467107 0.00229268808860358 1546 10
0.2501293492083 0.00843852618368423 1065 10
2.13146775632401 0.000785093522820787 779 10
0.819076913250702 0.00818205576664053 1473 20
0.779888840620191 0.0120380305675224 891 20
1.04225917097729 0.00314198703840882 1969 20
1.74645754395112 0.00165522594785467 703 10
0.677900040859134 0.001502845274448034 1236 10
1.05657287551612 0.0382022935590516 1912 20
0.74167007811735 0.0169101519222402 1830 20
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3.22319651310187 0.00956306677658697 916 10
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0.851249341944925 0.055344262295082 1473 10
1.08403941502146 0.00160579161489708 1830 20
0.786523498700205 0.0432004773760777 1775 20
0.193594514913282 0.000495734011303755 596 10
```



# Historical Data is the Input for Predictive Modeling

Income	Age	Buy
123,000	30	<b>Yes</b>
51,100	40	<b>Yes</b>
68,000	55	<b>No</b>
74,000	46	<b>No</b>
23,000	47	<b>Yes</b>
100,000	49	<b>No</b>

# Machine Learning: Who will buy?



Logistic Regression

$$p(+|x) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x)}}$$

$$\beta_0 = 3.7$$
$$\beta_1 = 0.00013$$

# To whom should we show an Mercedes ad?



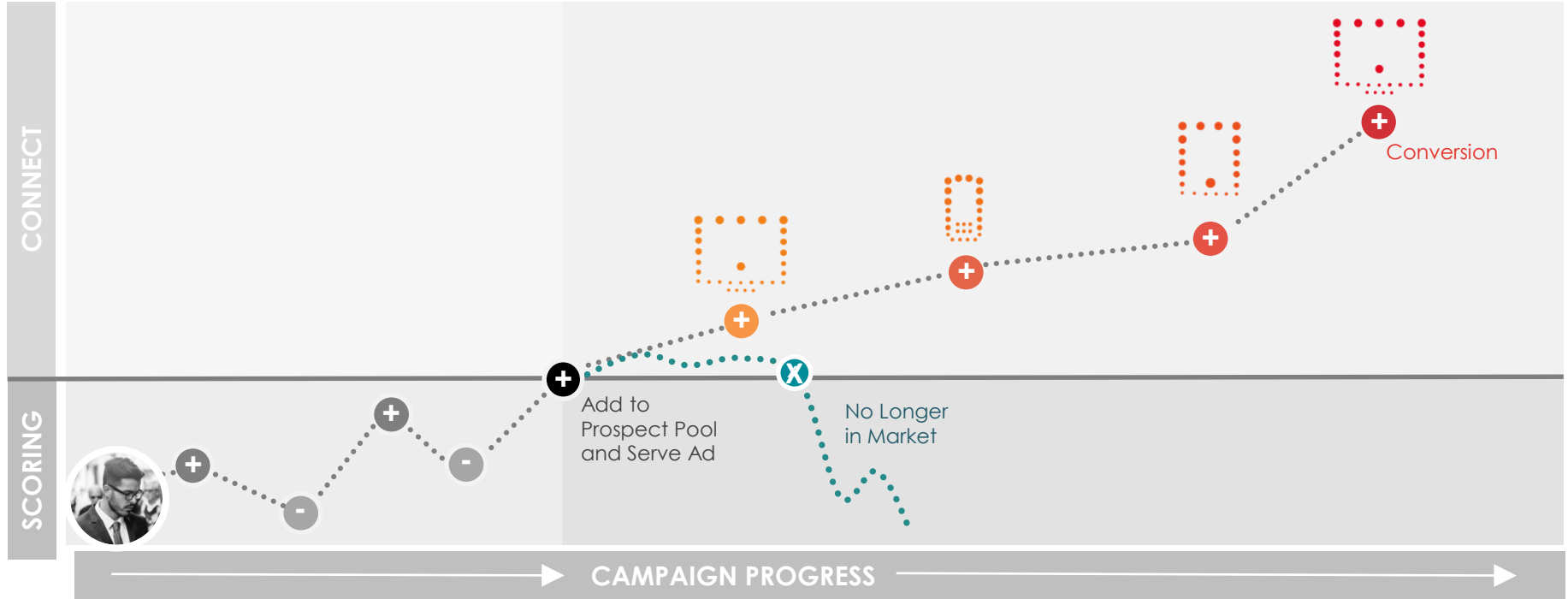
Whatever metric the marketer chooses is what I will teach the machine to predict ...





# Bid on individuals with high predictions by the model

Only reach audiences that consistently demonstrate interest in your brand.



# Predict who will click on the ad

Mercedes-Benz Finance & Credit Services



Men talk about women, sports and cars.  
Women talk about men inside sports cars.



# Predict who will sign up for a test drive



**Mercedes-Benz WEEKEND TEST DRIVE is Back!**

Epiwalk Kuningan, 3-5 Februari 2017, 10.00 – 22.00 WIB.

# Predict who looks up a dealer location

## Mercedes-Benz Locations

Q 10549





Browse All

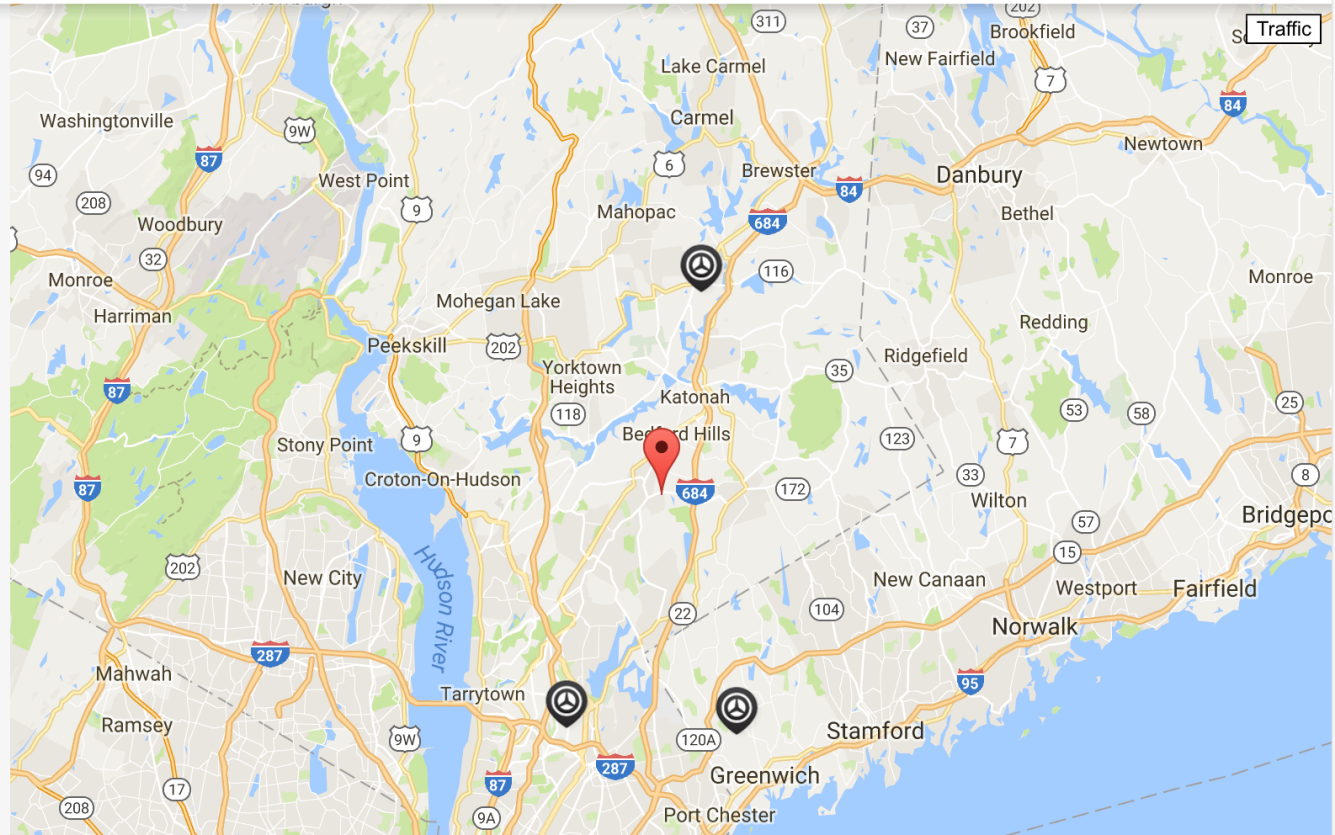
Dealers

Certified Collision Centers

### Nearby Dealerships (within 25 mi)

-  **Estate Motors, Inc.** 9.58 mi  
Goldens Bridge, NY, 10526
-  **Mercedes-Benz of Greenwich** 16.15 mi  
Greenwich, CT, 06830
-  **Mercedes-Benz of White Plains** 16.54 mi  
White Plains, NY, 10606
-  **Mercedes-Benz of New Rochelle** 23.78 mi  
New Rochelle, NY, 10801

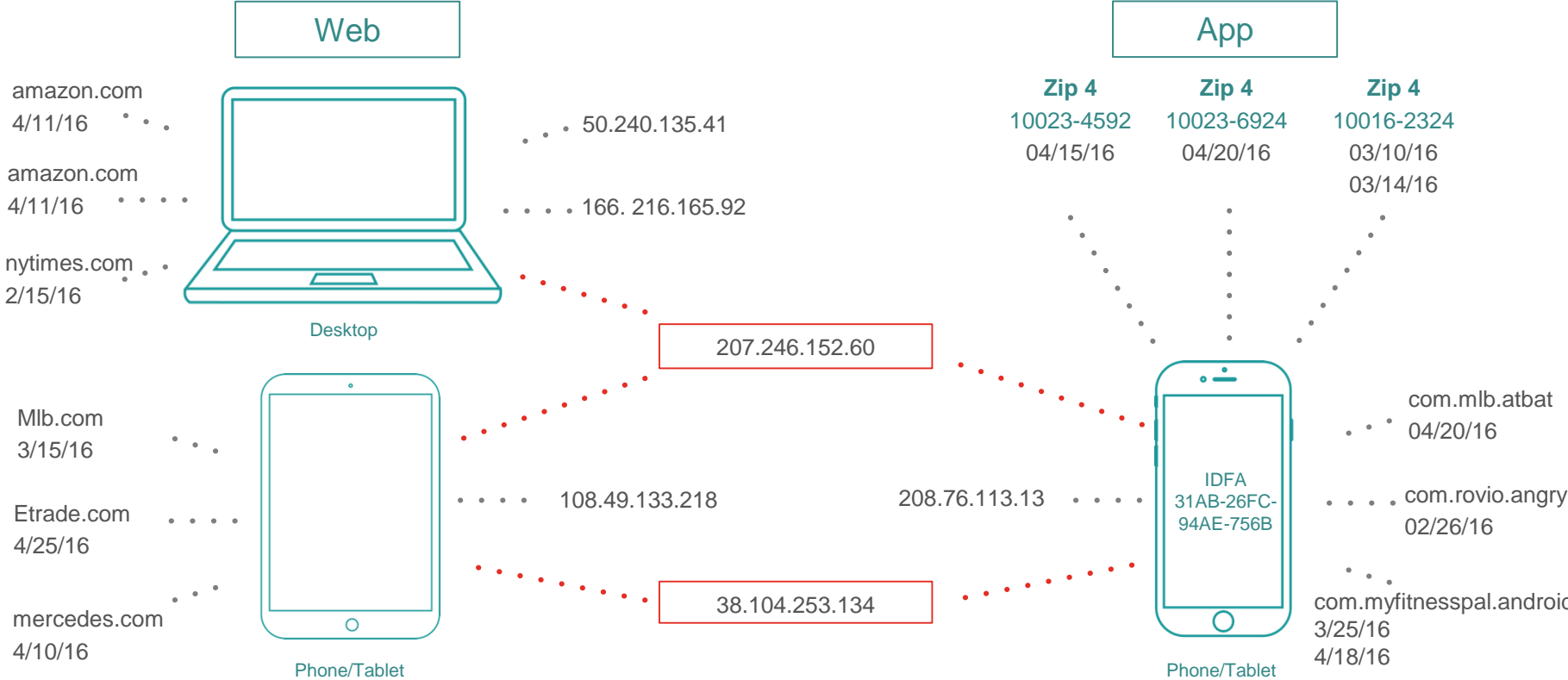
See Dealerships within 50 miles



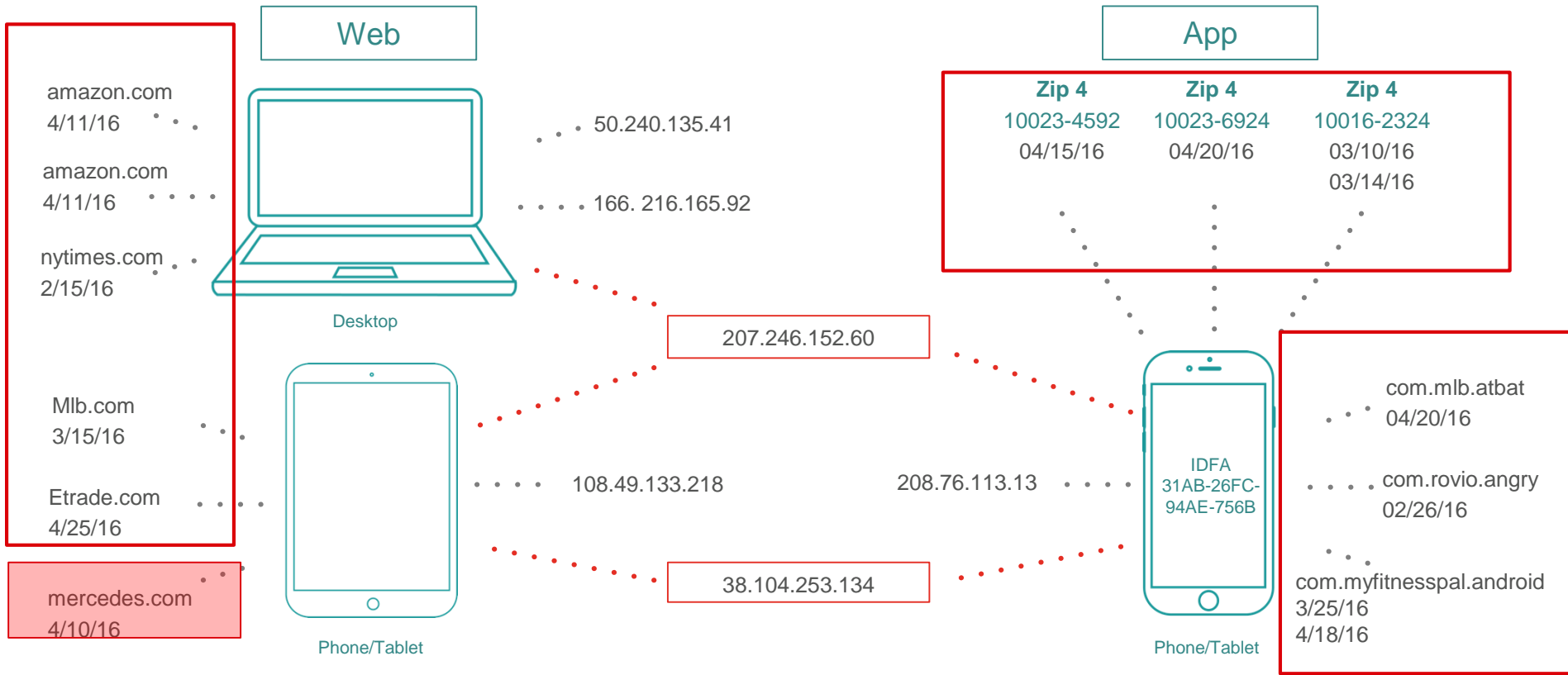
# Data in Programmatic Advertising ?

Income	Age	Buy
123,000	30	<b>Yes</b>
51,100	40	<b>Yes</b>
68,000	55	<b>No</b>
74,000	46	<b>No</b>
23,000	47	<b>Yes</b>
100,000	49	<b>No</b>

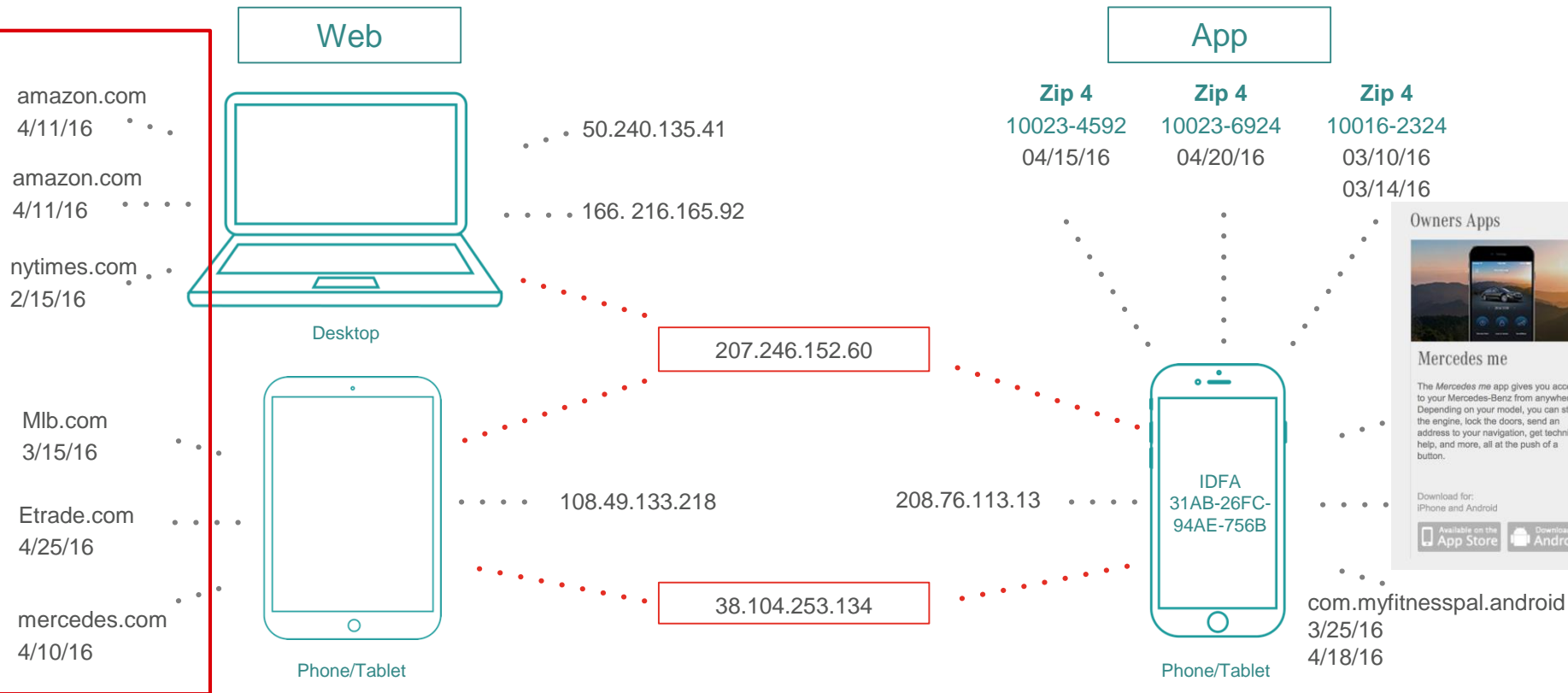
# Digital traces of everything: 100 Billion events per day (US)



# Predict actions to be taken on site base on all else ...

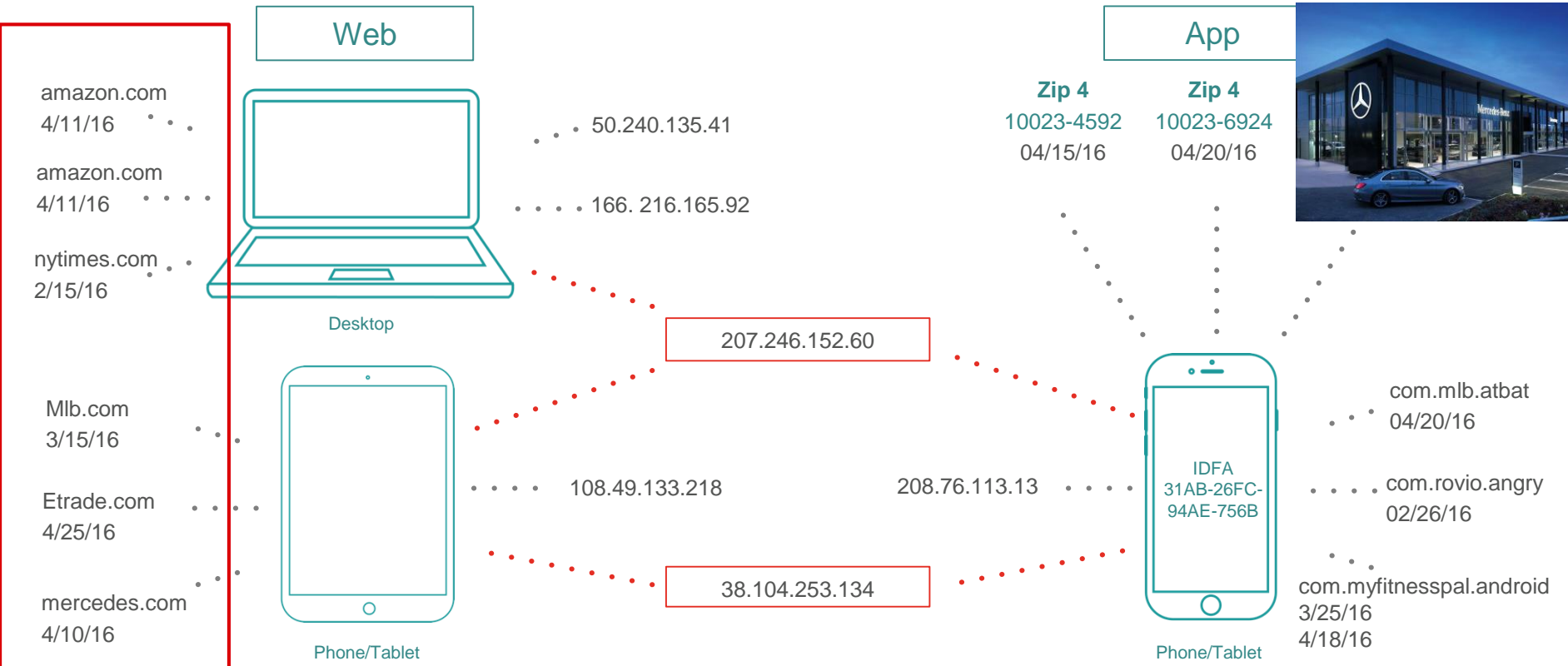


# Predict who will use an app

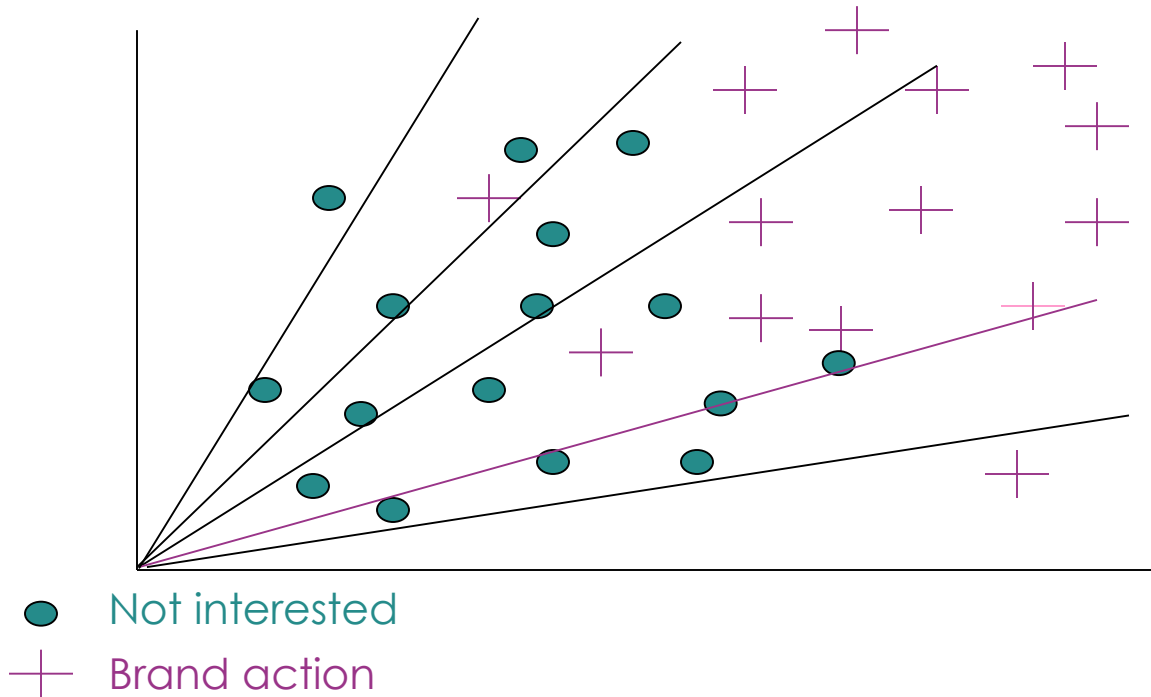




# Predict who will go to the dealership



# Machine learning with 'Big Data' ...



Logistic Regression

$$p(sv|x) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x + \dots)}}$$

$$\beta_0 = 0.54$$

$$\beta_1 = 0.13$$

...

$$\beta_{10000000} = -0.82$$

# URL's indicating a visit of Mercedes dealership



URL	Logistic Parameter
<a href="http://www.mercedesremotestart.com">www.mercedesremotestart.com</a>	2.97
<a href="http://www.girardtoyota.com">www.girardtoyota.com</a>	2.92
<a href="http://www.bluelineprop.com">www.bluelineprop.com</a>	2.91
<a href="http://www.toyotaoflaredo.com">www.toyotaoflaredo.com</a>	2.70
<a href="http://www.pikespeakacura.com">www.pikespeakacura.com</a>	2.44
<a href="http://www.motorcarsacura.com">www.motorcarsacura.com</a>	2.39
<a href="http://www.hobsonrealtors.com">www.hobsonrealtors.com</a>	2.35
<a href="http://www.fayettevillencmls.com">www.fayettevillencmls.com</a>	2.35
<a href="http://www.coast2coastmixtapes.com">www.coast2coastmixtapes.com</a>	2.28
<a href="http://www.fwproperties.com">www.fwproperties.com</a>	2.26
<a href="http://www.dealeron.com">www.dealeron.com</a>	2.25
<a href="http://www.smartfitnesscoach.com">www.smartfitnesscoach.com</a>	2.23
<a href="http://www.pearsonlongman.com">www.pearsonlongman.com</a>	2.21
<a href="http://www.pattersonauto.com">www.pattersonauto.com</a>	2.14
<a href="http://www.acuraofmodesto.com">www.acuraofmodesto.com</a>	2.11
<a href="http://www.f2it.co.uk">www.f2it.co.uk</a>	2.10
<a href="http://www.keyeshyundai.com">www.keyeshyundai.com</a>	2.09
<a href="http://www.stevenscreekhyundai.com">www.stevenscreekhyundai.com</a>	2.06
<a href="http://www.columbusrealtors.com">www.columbusrealtors.com</a>	2.05
<a href="http://www.whitmanathletics.org">www.whitmanathletics.org</a>	2.05
<a href="http://www.napletonautosales.com">www.napletonautosales.com</a>	2.02
<a href="http://www.dealerelite.net">www.dealerelite.net</a>	2.00
<a href="http://www.valuinsight.com">www.valuinsight.com</a>	1.99
<a href="http://www.travel-shows.com">www.travel-shows.com</a>	1.98
<a href="http://www.gorealestateagents.com">www.gorealestateagents.com</a>	1.98

# 'In the market' signal



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<a href="http://www.toyotaoflaredo.com">www.toyotaoflaredo.com</a>	2.70
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<a href="http://www.coast2coastmixtapes.com">www.coast2coastmixtapes.com</a>	2.28
<a href="http://www.fwproperties.com">www.fwproperties.com</a>	2.26
<a href="http://www.dealeron.com">www.dealeron.com</a>	2.25
<a href="http://www.smartfitnesscoach.com">www.smartfitnesscoach.com</a>	2.23
<a href="http://www.pearsonlongman.com">www.pearsonlongman.com</a>	2.21
<a href="http://www.pattersonauto.com">www.pattersonauto.com</a>	2.14
<a href="http://www.acuraofmodesto.com">www.acuraofmodesto.com</a>	2.11
<a href="http://www.f2it.co.uk">www.f2it.co.uk</a>	2.10
<a href="http://www.keyeshyundai.com">www.keyeshyundai.com</a>	2.09
<a href="http://www.stevenscreekhyundai.com">www.stevenscreekhyundai.com</a>	2.06
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<a href="http://www.valuinsight.com">www.valuinsight.com</a>	1.99
<a href="http://www.travel-shows.com">www.travel-shows.com</a>	1.98
<a href="http://www.gorealestateagents.com">www.gorealestateagents.com</a>	1.98

# Real Estate



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<a href="http://www.mercedesremotestart.com">www.mercedesremotestart.com</a>	2.97
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<a href="http://www.fayettevillencmls.com">www.fayettevillencmls.com</a>	2.35
<a href="http://www.coast2coastmixtapes.com">www.coast2coastmixtapes.com</a>	2.28
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# High-end fitness ..



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<a href="http://www.gorealestateagents.com">www.gorealestateagents.com</a>	1.98

# Insights from models: BMW vs. Audi

## LUXURY SHOPPER

## CAR & MOTORCYCLE ENTHUSIASTS

## FAMILY-ORIENTED

## MUSIC FANS

## TECH-SAVVY

- Luxury Retail Researchers
- High End Camera
- Jewelry & Watch

- Motorcycle Enthusiasts
- Aftermarket Accessories

- Military Families
- Working Parents
- Family Values Advocates

- Country Music
- Hip Hop
- Streaming Radio Listeners

- IT Professionals
- Mac & PC Shoppers



## HEALTH CONSCIOUS

## HOME DECORATOR

## THRIFTY SHOPPERS



## SPORTS FANS

- Nutrition Conscious Eaters
- Heartburn Suffers
- Food Allergies Researchers

- Furniture Shoppers
- HDTV Shoppers
- Energy Savers
- Lawn & Garden Enthusiasts

- Prepaid Smartphone Shoppers
- Budget Wireless Shoppers
- Holiday Deals Shoppers
- Sweepstakes Enthusiasts

- MLB Fans
- NBA Fans
- Soccer Fans
- NFL Fans
- NCAA Fans

## Pitfalls:

Things we can predict but should not!



# Good prediction can be harmful in an industry focused on bad metrics

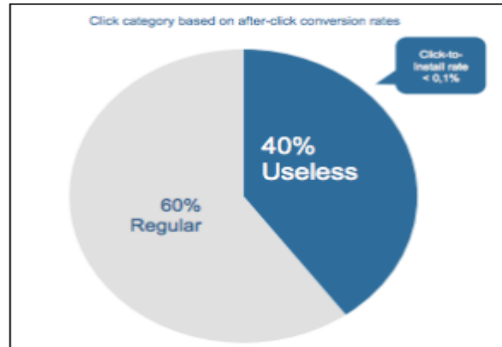


*'They really need to rethink this new Incentive Plan.'*

## Report: 40% Of Clicks On Mobile Ads Are Fraudulent Or Accidental

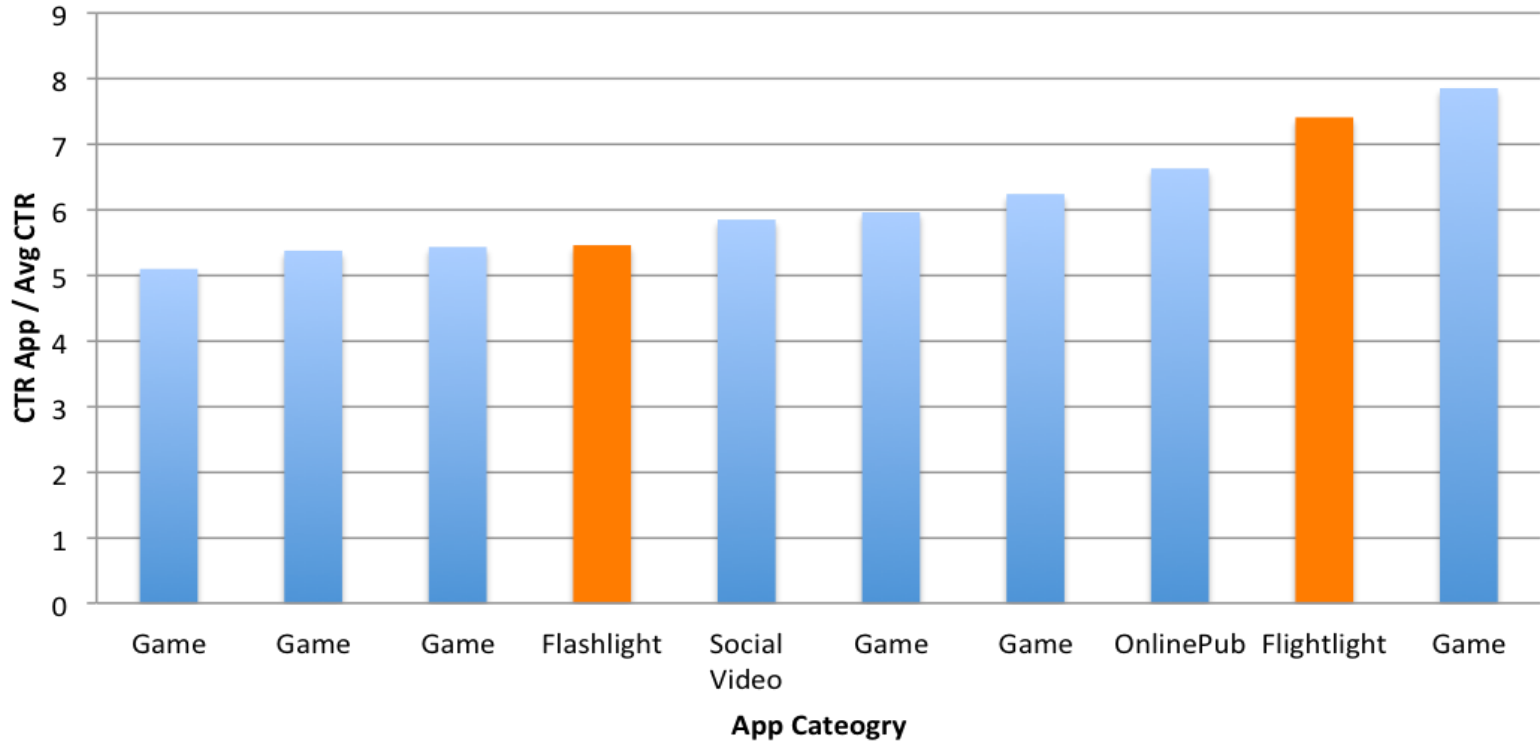
Pamela Parker on September 5, 2012 at 5:42 pm

Mobile advertising may still be in its infancy, but if [a new study](#) by Trademob is correct, click fraud on mobile ads is already quite well developed. The mobile app marketing company conducted research that showed that 40% of mobile ad clicks are either accidental or fraudulent.

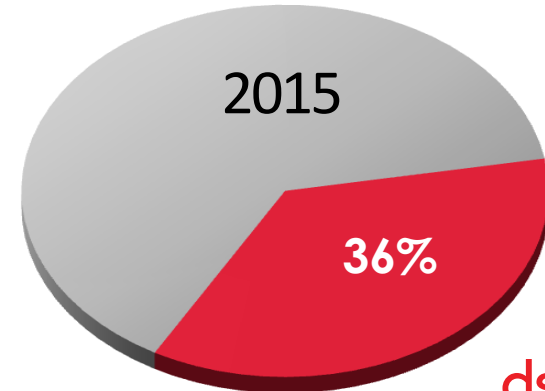
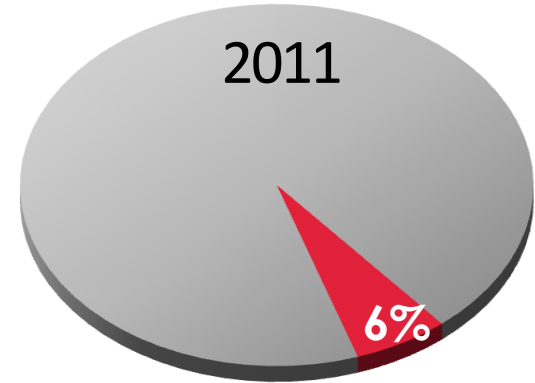


# Model learned when people click accidentally: Fumbling in the dark ...

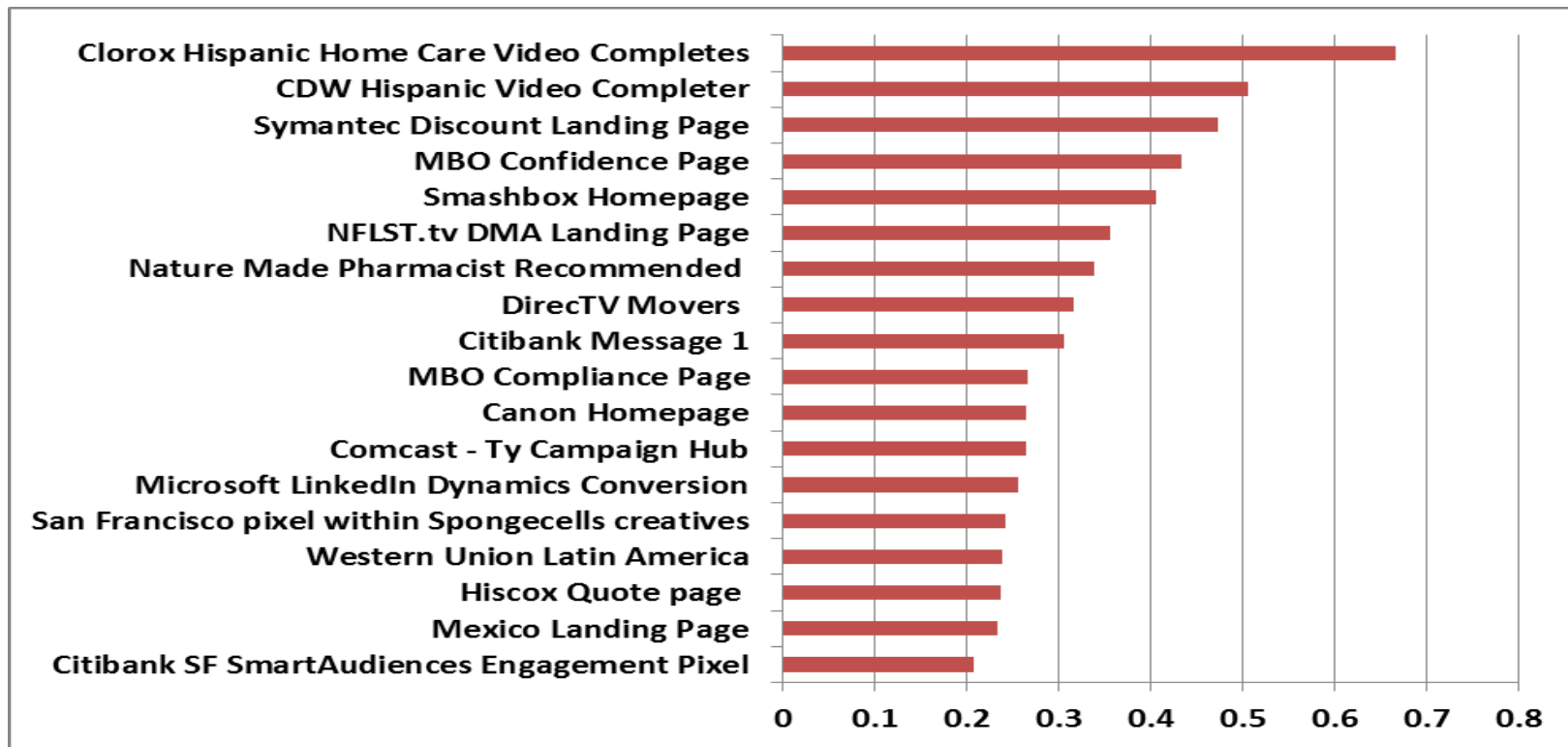
Top 10 Apps by CTR



# Bots/ 'Non-Human traffic'



# Anything that can be faked will be faked: bot penetration




# Viewability?



525 horses working in a way that animal rights associations could complain about.


SL 63 AMG. A different fast.



AMG Mercedes-Benz


Fuel consumption (combined, extra urban, urban): 13.9/9.5/21.4 l/100 km; CO<sub>2</sub> emissions (combined): 293 g/km.  
www.mercedes-amg.com

A Daimler Brand. [www.mercedes-amg.com](http://www.mercedes-amg.com)



## Seven gears and seven sins. Coincidence?

SL 63 AMG. A different fast.



AMG Mercedes-Benz

Fuel consumption (combined, extra urban, urban): 13.9/9.5/21.4 l/100 km; CO<sub>2</sub> emissions (combined): 330 g/km.  
The figures are not based on an individual vehicle and do not constitute part of the product offer; they are provided solely for purposes of comparison between different vehicle models.

# Potential

Programmatic as the new digital focus  
group!

# Linking digital and purchase behavior



Web

App

amazon.com

4/11/16

amazon.com

4/11/16

nytimes.com

2/15/16

Mlb.com

3/15/16

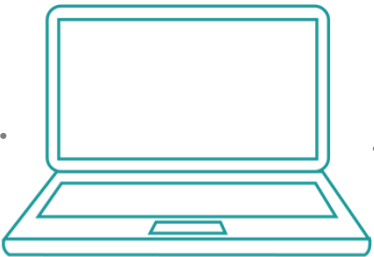
Etrade.com

4/25/16

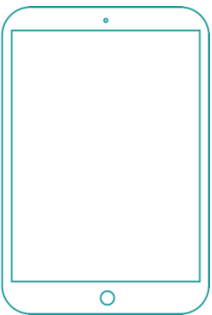
mercedes.com

4/10/16

32



Desktop



Phone/Tablet

50.240.133.41

166.216.165.92



108.49.133.218

208.76.113.13

Zip 4

10023-4592

04/15/16

Zip 4

10023-6924

04/20/16

Zip 4

10016-2324

03/10/16

03/14/16



Phone/Tablet

com.mlb.atbat

04/20/16

com.rovio.angry

02/26/16

com.myfitnesspal.android

3/25/16

4/18/16

dstillery



# Measuring incremental impact by creative

# CHOBANI®



-0.8%

0.0%

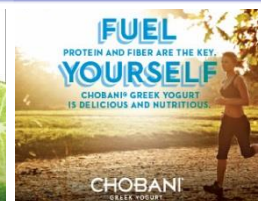
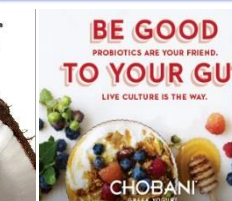
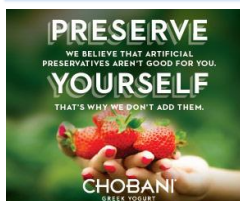
3.5%

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4.3%

6.7%

9.1%



11.4%

12.8%

14.0%

15.6%

16.4%

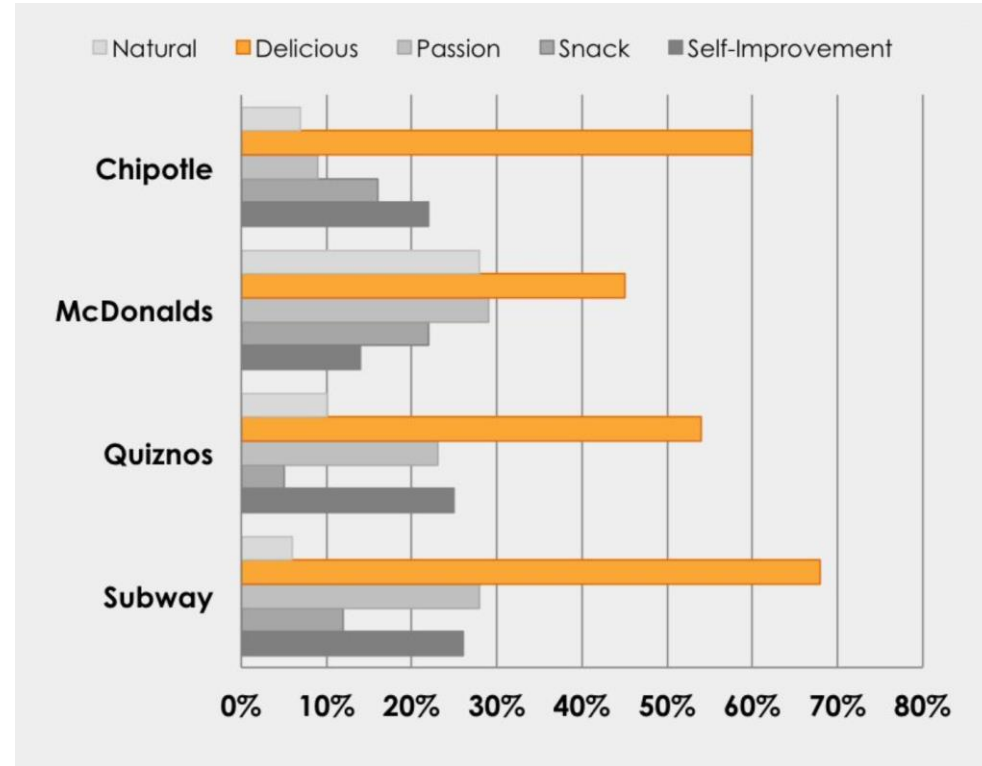
16.4%

18.5%

20.4%

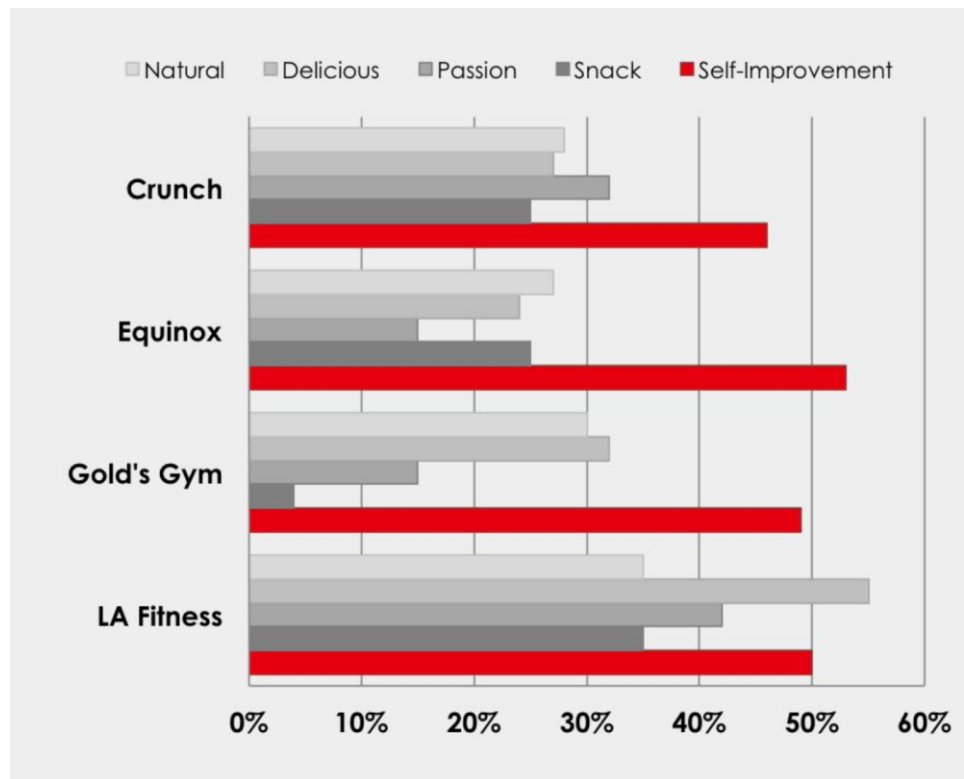
# Use Predictive modeling to 'look under the hood': People who go to Fast Food restaurants

Delicious:

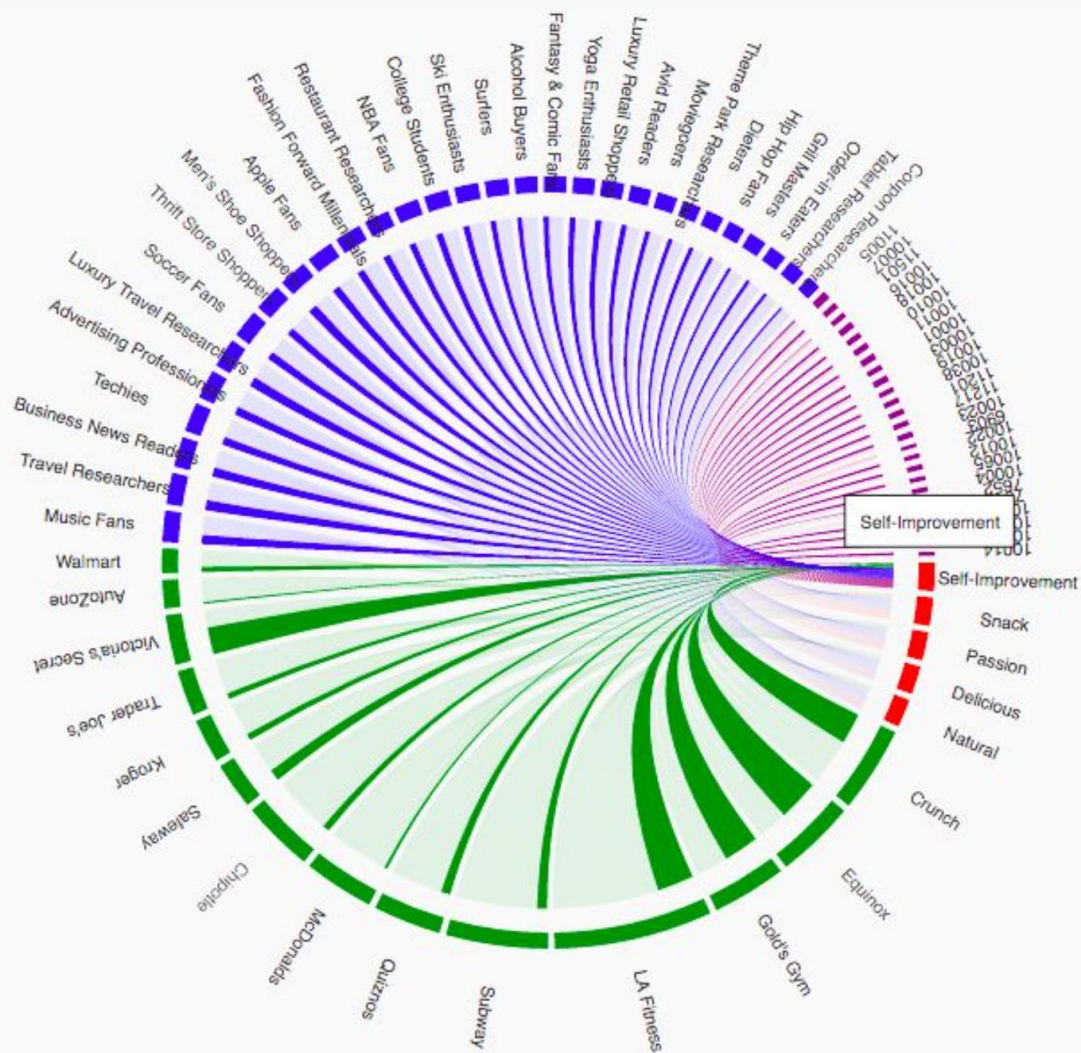


# Use Predictive modeling to 'look under the hood': Gym rats

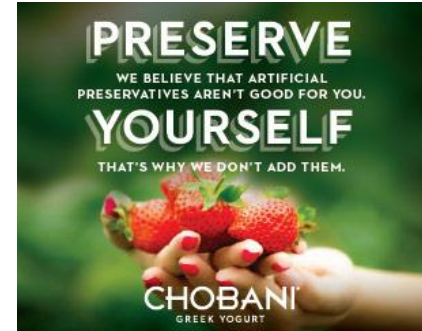
Self-improvement:



# Deep view into self improvement



# I can predict which creative is most effective for YOU!



@Claudia\_Perlich