

Predictive Analytics Applied: Marketing and Web

***Brought to you by
Prediction Impact and
World Organization of
Webmasters (WOW)***

Eric Siegel, Ph.D.
Prediction Impact, Inc.
eric@predictionimpact.com
(415) 683 - 1146

Training Program Outline

- 1. Introduction**
- 2. How Predictive Analytics Works**
- 3. App: Customer Retention**
- 4. App: Targeting Ads**
- 5. Summary and take-aways**

About the speaker: Eric Siegel, Ph.D.

- President of Prediction Impact, Inc.
- Training and services in predictive analytics
- Former computer science professor at Columbia University
- Before Prediction Impact, cofounded two software companies

Eric Siegel, Ph.D.
Prediction Impact, Inc.
eric@predictionimpact.com
(415) 683 - 1146

Predictive Analytics:

Business intelligence technology that produces a predictive score for each customer or prospect



Learn from *Organizational Experience*

Data is a core strategic asset –
it encodes *your business' collective experience*

It is imperative to:

Learn *from your data.*

Learn *as much as possible* *about your customers.*

Learn *how to treat each customer individually.*

Predictive Analytics:

Your organization learns
from its collective experience

Collective experience: Sales records, customer profiles, ...

Learn: Discover strategic insights and business intelligence
Discover something that makes business decisions
automatically
Discover business rules

...and puts this knowledge to action.

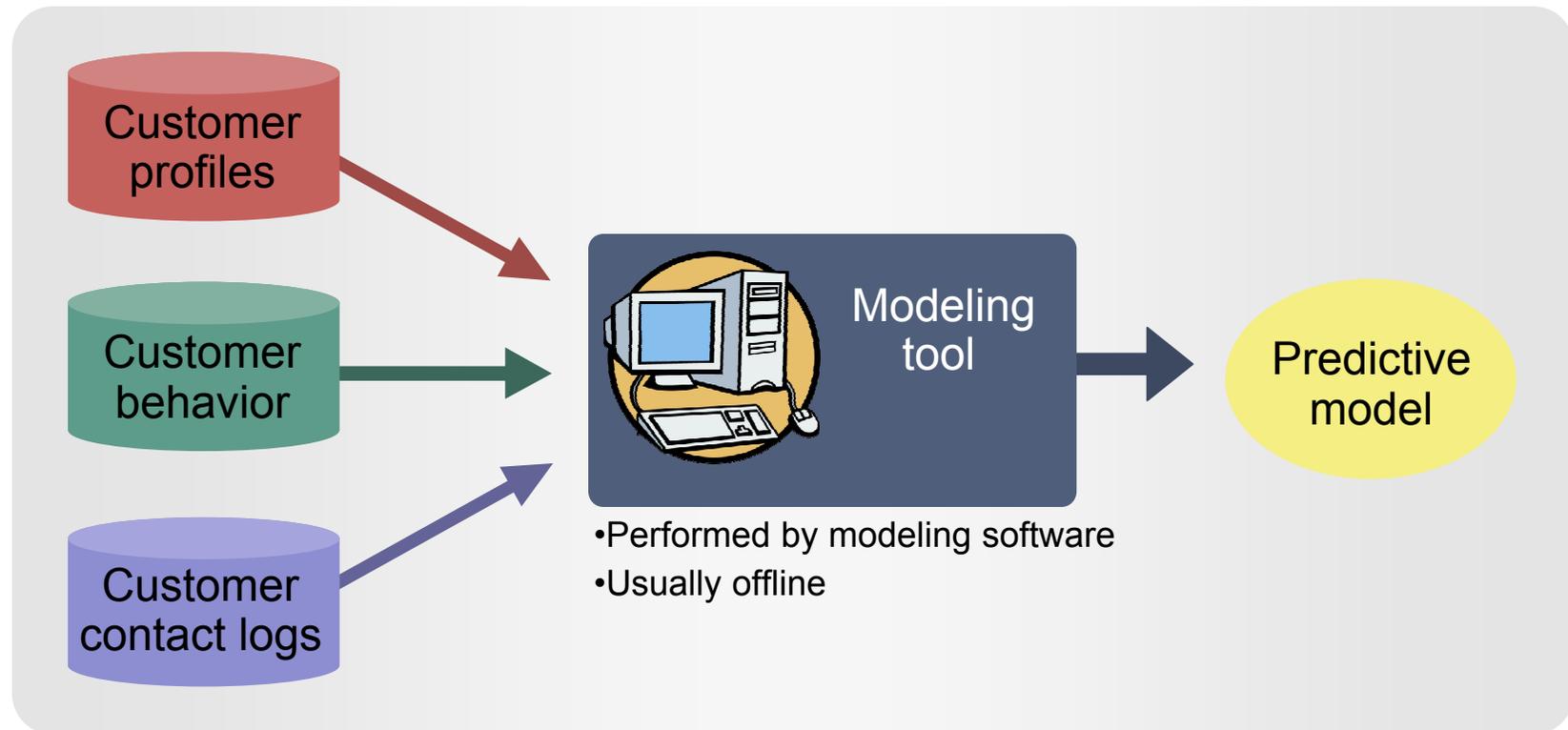
How Predictive Analytics Works

Building and Deploying Predictive Models

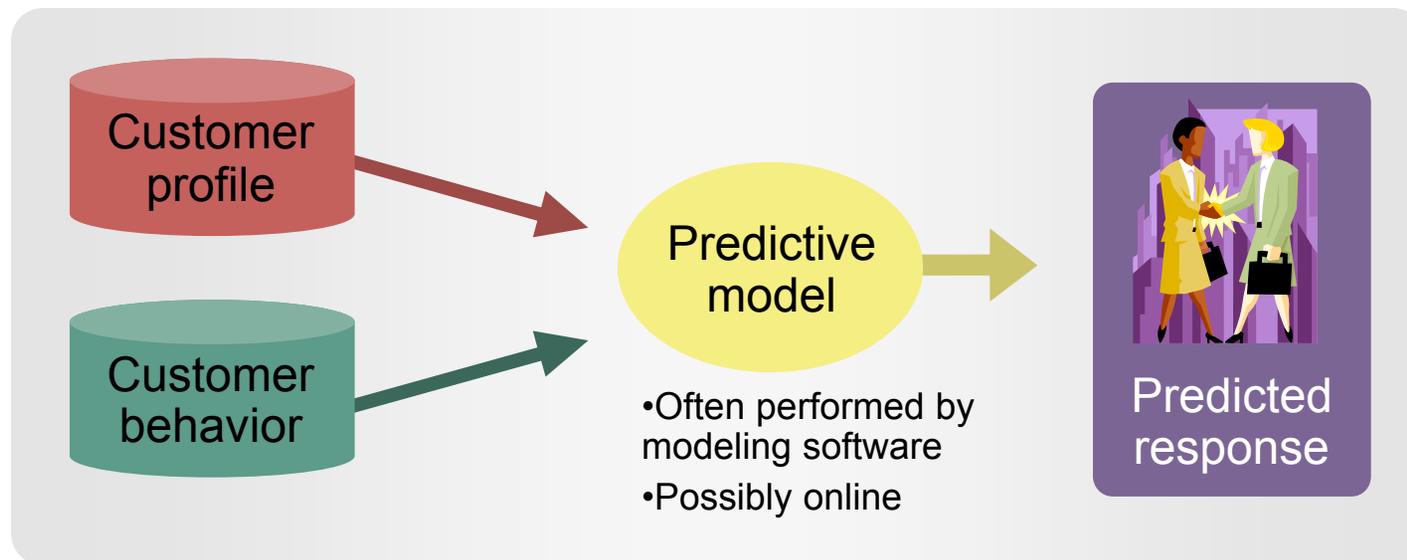
Eric Siegel, Ph.D.
Prediction Impact, Inc.
eric@predictionimpact.com
(415) 683 - 1146

Predictive Analytics for Business, Marketing and Web

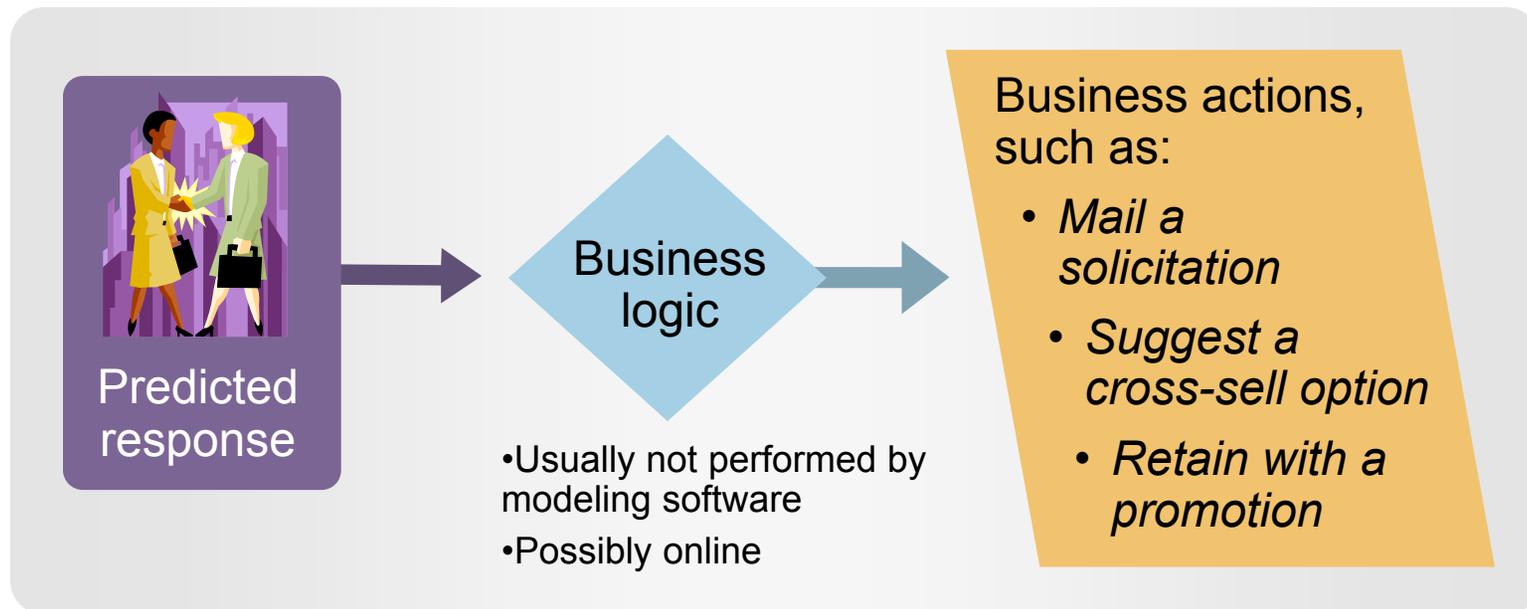
Wisdom Gained: A Predictive Model is Built



Applying a Model to Score a Customer



Deploy to Take Business Action



Fine-Tuned Models for Your Business

Predictive models are created automatically *from your data*

So, they're generated according to your:

- Product
- Prediction goal
- Business model
- Customer base

This means customer intelligence *specialized for your business*

- *Customized business rules*
- *Unique, proprietary mailing lists*
- *Insights only your organization could possibly gain*

Predictors: Building Blocks for Models

- *recency* – How recent was the last purchase?
- *personal income* – How much to spend?

Combine predictors for better rankings:

recency + personal income

2_recency + personal income

If the customer is rural,
and her monthly usage is high,
then the customer will probably renew.

If the customer is urban,
and new feature exploration is high,
then the customer will probably *not* renew.

Training Data Is a Flat Table

Number purchases:	Last purchase:	Gender:	Income:	Likely to buy:
7	shoes	M	high	gloves
3	gloves	F	medium	hat
1	hat	M	high	shoes
46	gloves	F	low	piano

This is the required form for training data; one record per customer.

Why Not Memorize The Training Examples?

To learn from history is to remember history.

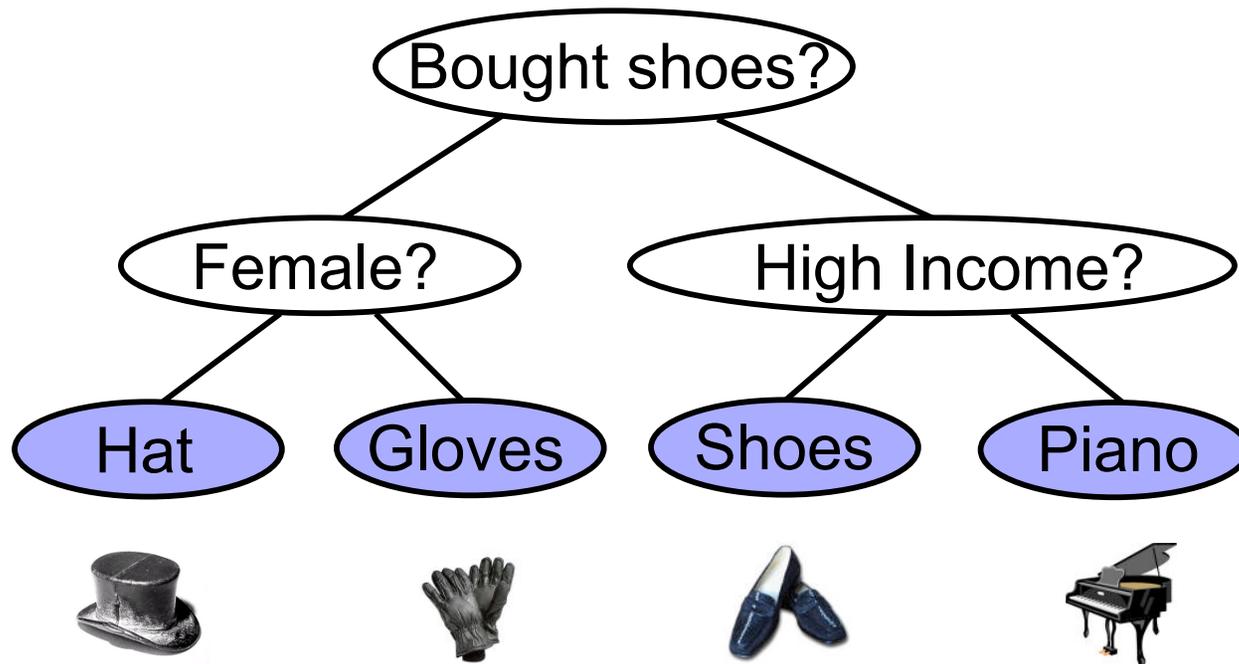
So, we could just keep a lookup table and compare new cases to old ones.

Answer: There are too many possible rows of data.

That is, *each customer is unique!*



Decision Tree for Cross Sell



Decision Trees

- Non-linear
- Specialized
- Precise

If they bought shoes **and** they're not female **then** sell gloves.

If they didn't buy shoes **and** they're high income **then** sell shoes.

Response Modeling for Direct Marketing

Lower campaign costs and increase response rates

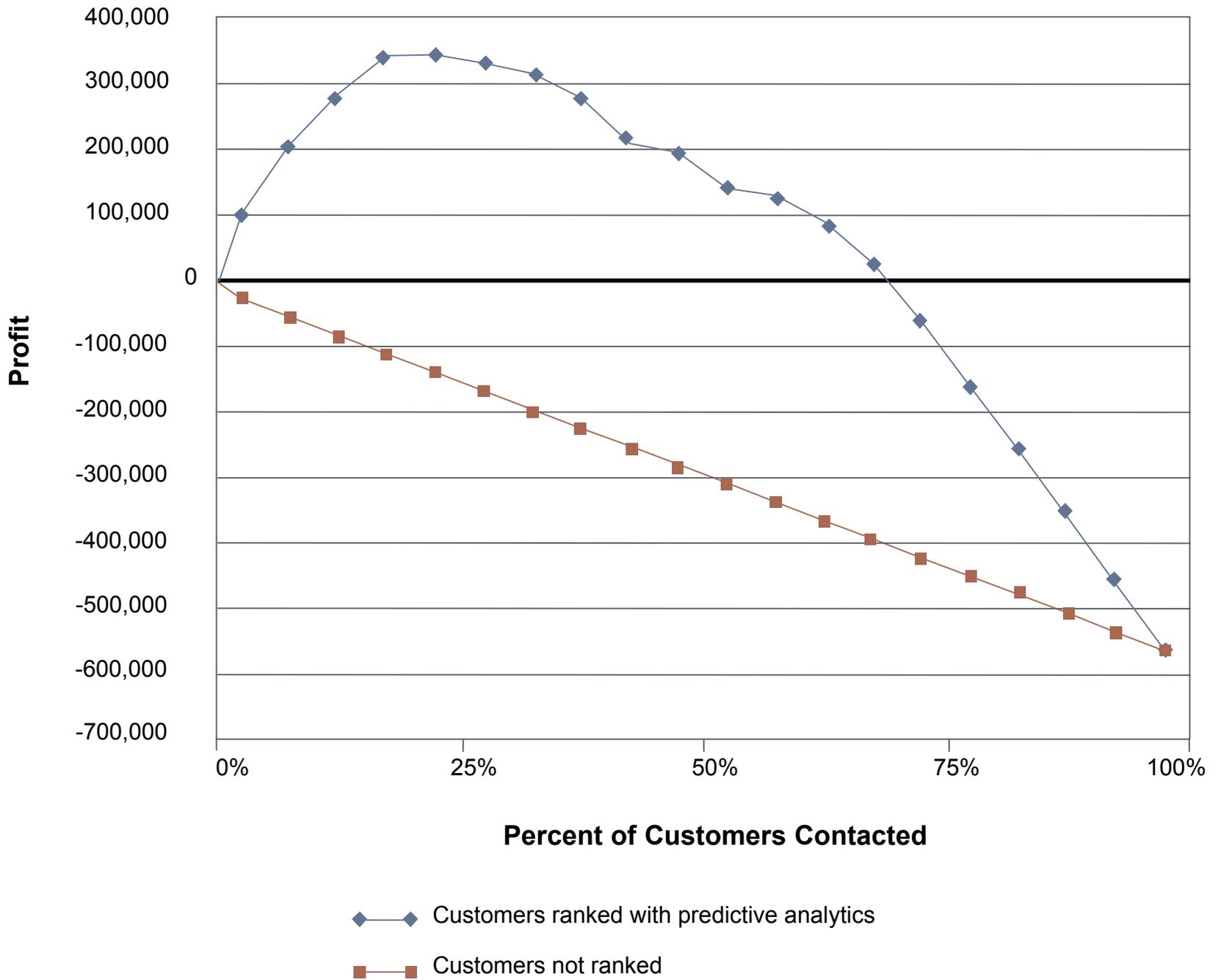
- **Make campaigns more targeted** and more selective
- **Identify segments** five or more times as responsive
- **Achieve 80% of responses** with just 40% of mailing
- **Increase campaign ROI & profitability**

Predictive Models Score Each Customer

- Each customer is *scored* with a response *probability*
- The customers are listed in order of prediction score
- The highest-scoring customers are targeted first

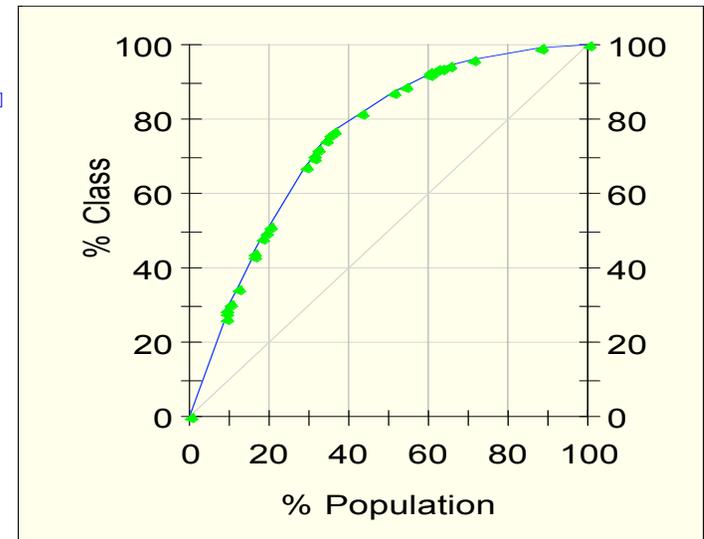
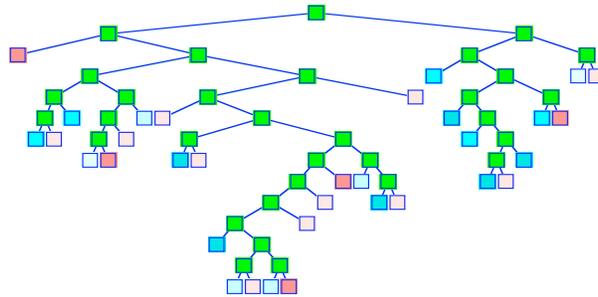
ID number:	Name:	Score:	Response:
429	E. Siegel	35%	Yes 😊
528	D. Leong	31%	No 😞
256	G. Clooney	22%	Yes 😊
674	T. Mitchel	14%	No 😞

Campaign Profit Curve



Lift Chart

9.3 → 30.6
16.4 → 43.5
20.3 → 51.1
32.4 → 70.1
44.0 → 80.2



- 50,000 customers 3 times as likely to buy
- 200,000 customers 2 times as likely to buy

Example Business Rule

New customers who come to the website off organic search results, buy more than \$150 on their first transaction, are male, and have an email address that ends with “.net” are **three times as likely to be return customers.**

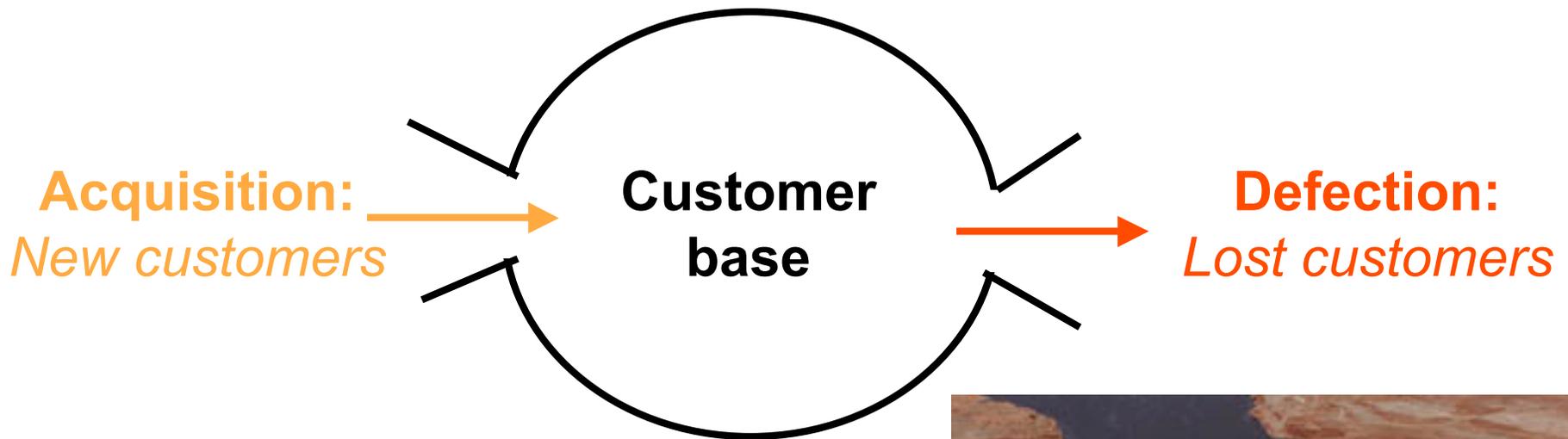
App: Customer Retention

Retain Customers by Predicting Who Will Defect

Eric Siegel, Ph.D.
Prediction Impact, Inc.
eric@predictionimpact.com
(415) 683 - 1146

Predictive Analytics for Business, Marketing and Web

Growth = Acquisition - Defection

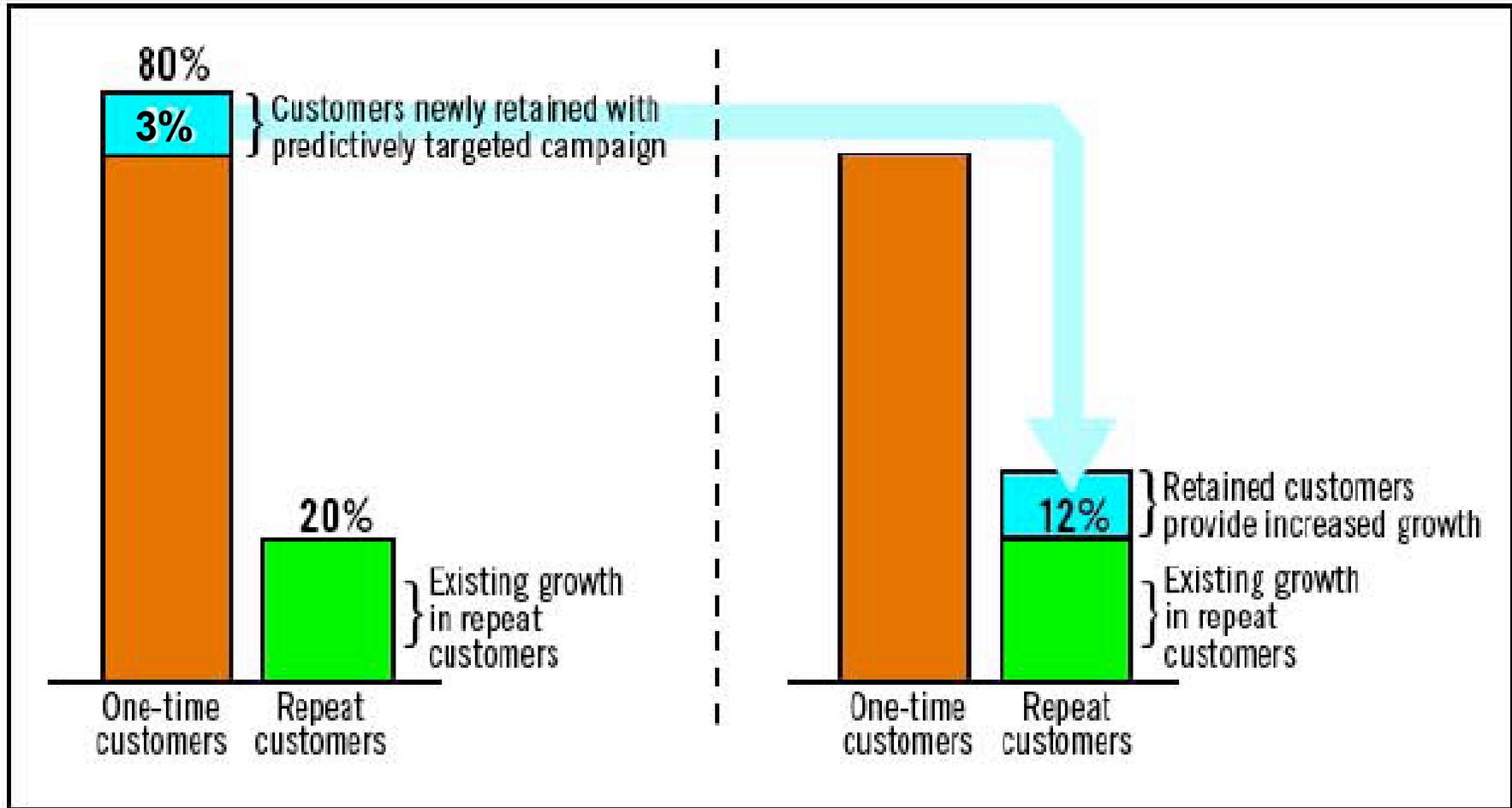


Which is the best way to increase growth?

- 1. Increase acquisition***
- 2. Decrease defection***



Increase retention by 3% and boost growth by 12%



Predictor Variables

- *Age of membership*
- *External acquisition source*
- *U.S. state of residence*
- *Willing to receive postal mailing (opt-in)*
- *Num days since last failed login attempt*
- *Num days between logins*

At-Risk Segment

- SOURCE_COBRAND\$ == chat
- SUBSCR_AGE <= 237.819
- LOGIN_DAYSSINCELAST_F > 1.85344
- LOGIN_DAYSSINCELAST_F <= 22.6578

Churn rate: **33.5%** (vs. 20% average)

Loyal Segment

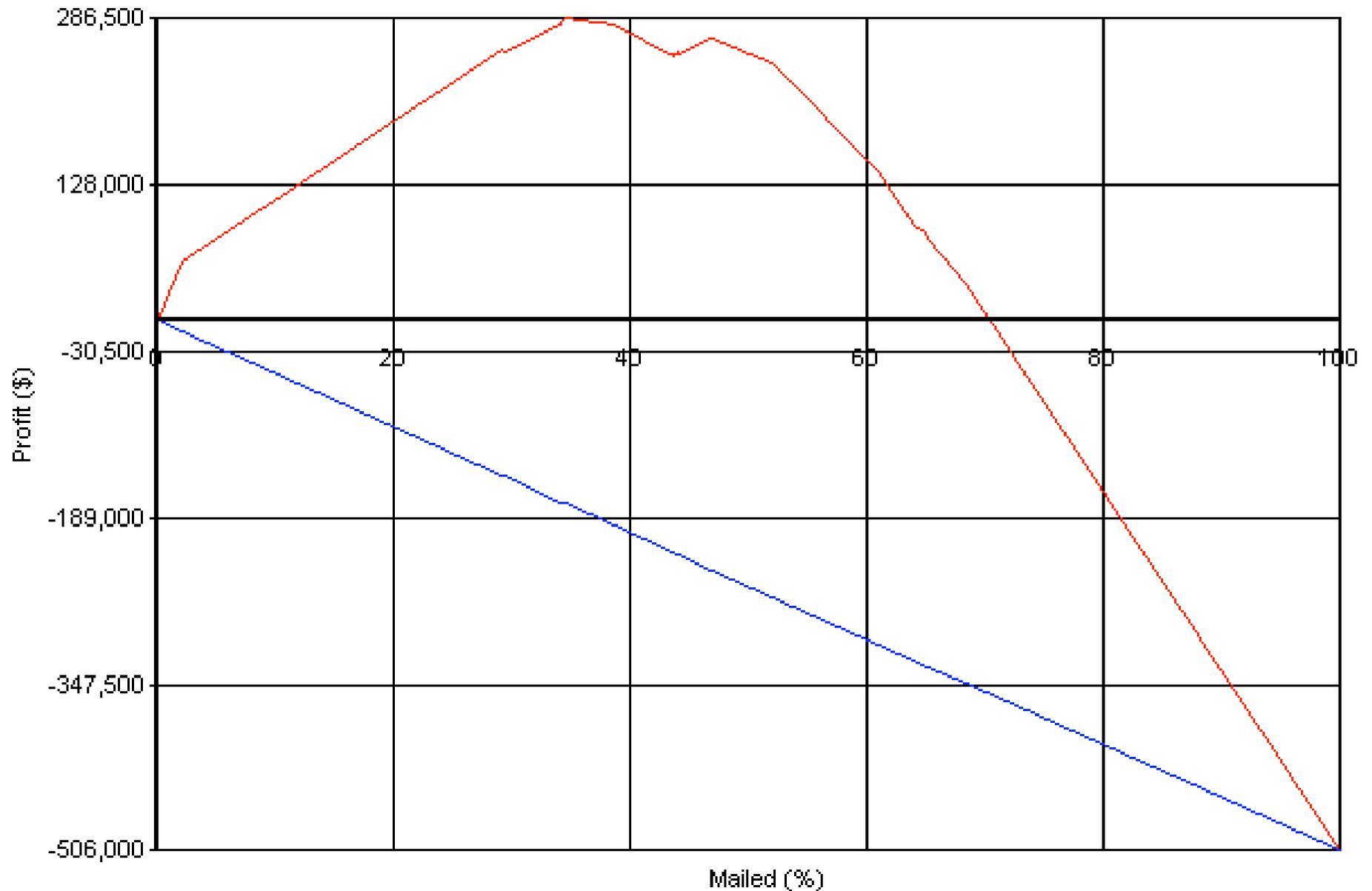
- STATE is one of many, including ME, NE, NH, NS, QC, SK, WY
- SOURCE_COBRAND\$ == chat
- SUBSCR_AGE > 237.819
- TIME_SINCE_JOINED <= 535.456
- LOGIN_DAYSSINCELAST_F > 99.6539
- LOGIN_DAYSSINCEFIRST_F > 112.003
- LOGIN_DAYSSINCELAST_S > 131.45

Churn rate: **6.5%** (vs. 20% average)

Very loyal

Small segment

Forecasted Profit of Retention Campaign



Cost per mailing: \$25. ave profit: \$100. num subscribers: 100.000

Loyal Segment: Online Retail

- ITEM_QTY > 2.5
- TAX_SHIP <= 8.78
- 19% will return (versus 10% average)

App: Targeting Ads

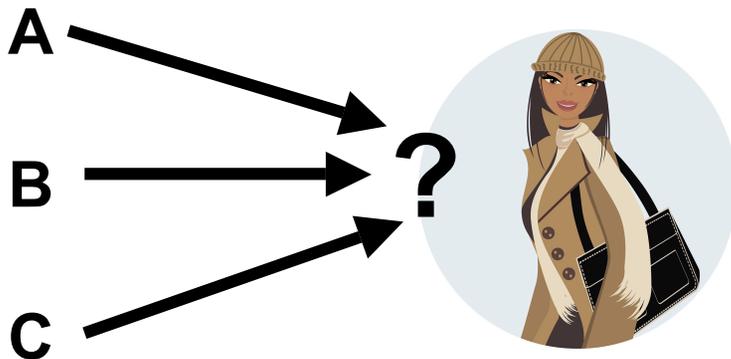
Predictively Modeling Which Promotion Each Customer Will Accept

Eric Siegel, Ph.D.
Prediction Impact, Inc.
eric@predictionimpact.com
(415) 683 - 1146

Learn *More* From AB Testing: “Dynamic AB Selection”

Target content

- Landing page
- Featured product
- Color of product displayed
- Promotion or advertisement



Based on:

- Customer behavior profile
 - *Browsers vs. hunters*
- Time of day
- Geographical location
- Pages
- Where they came from
 - Ad that clicked them through
 - Site they came from
 - Search query they were on
 - ***Profile, when available***

Dynamic AB Selection

offline | online

Trials of A



Modeling tool

Predictive model for A

Predictive score:
What's the chance Mary responds to A?

Trials of B



Modeling tool

Predictive model for B

Predictive score:
What's the chance Mary responds to B?

Mary's profile

Selecting Between 291 Sponsored Promotions

Client: A leading student grant and scholarship search service

Sponsors include:

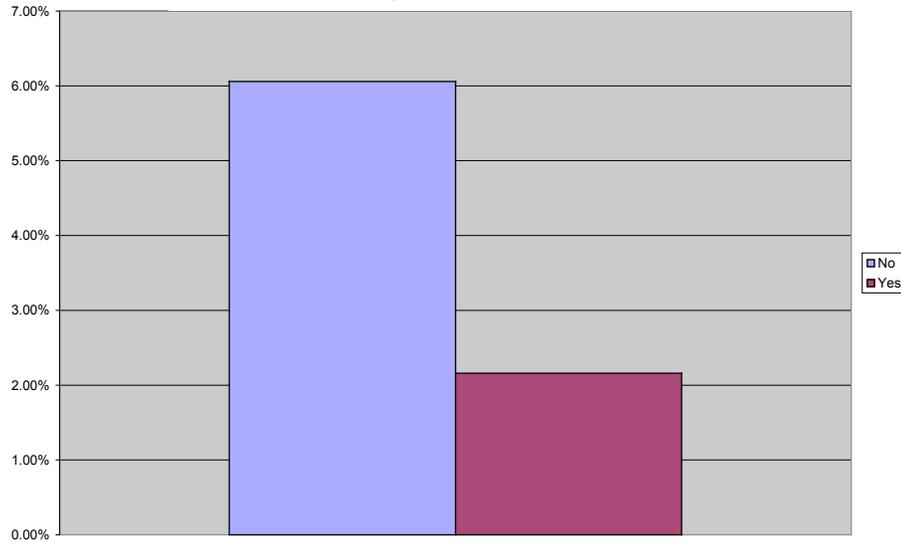
- Universities
- Student loans
- Military recruitment
- Other misc.



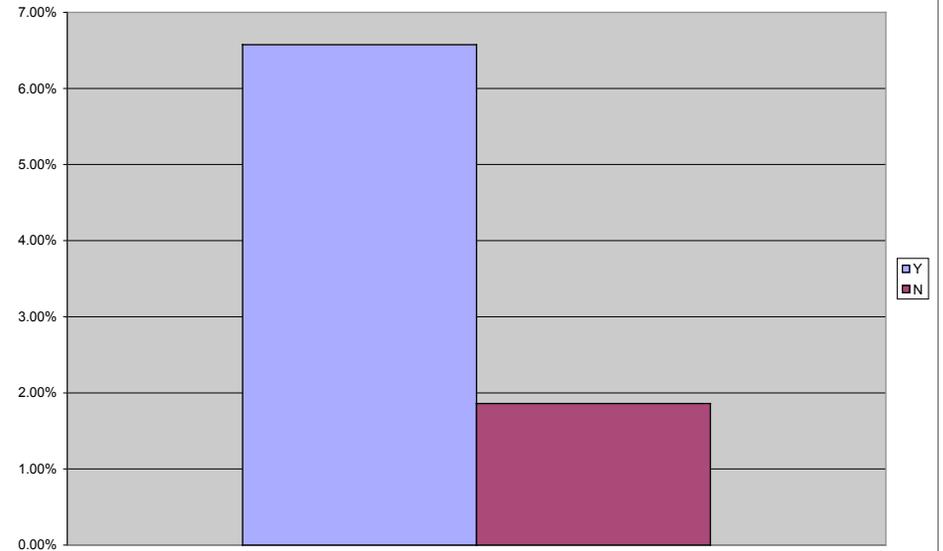
The Business: Great Potential Gain

- **High bounties**, up to \$25 per acceptance
- **High acceptance rates**, up to 5%, due to general relevancy of the promotions
- **Big Data: *Wide and Long***
 - Rich user profiles volunteered for funds eligibility
 - Over 50 million training cases: 01/05 - 09/05

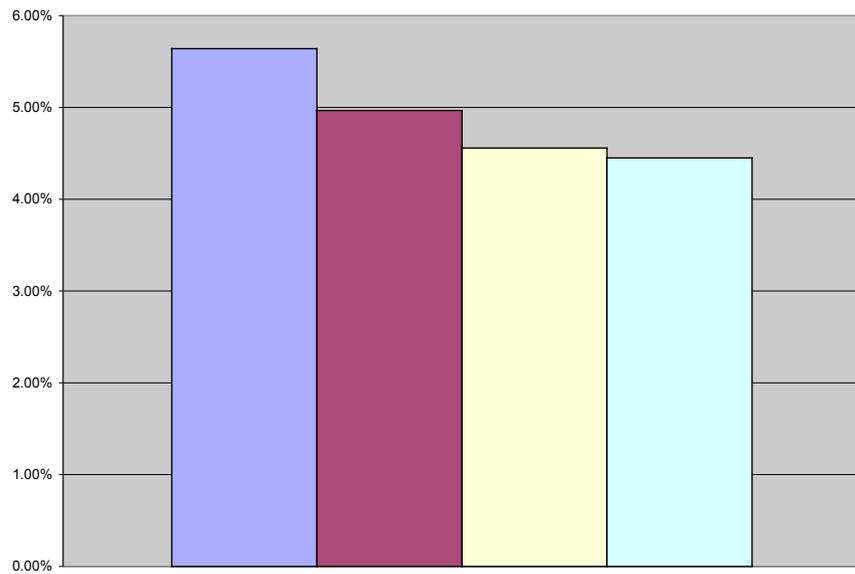
Already seen? N/Y



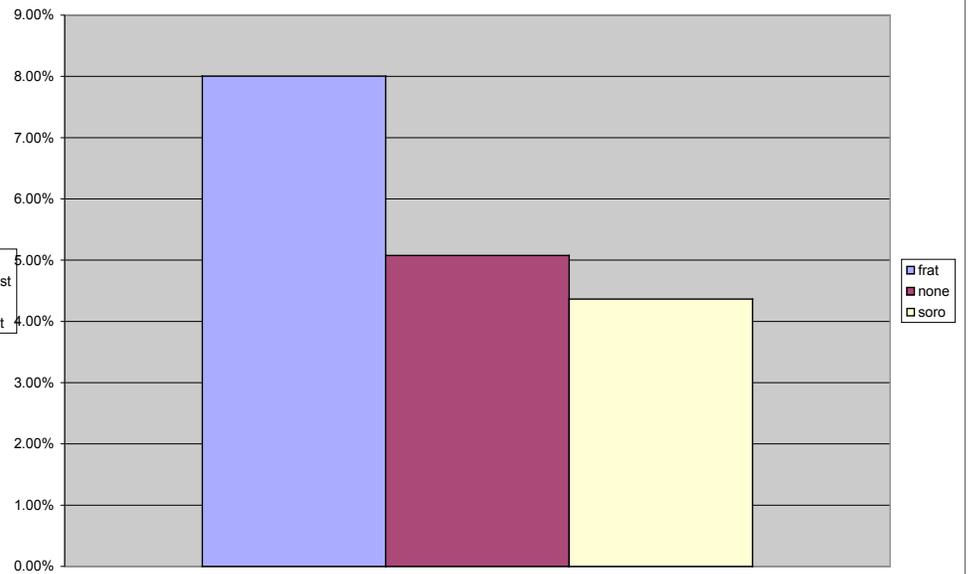
Email opt-in Y/N



Region: S, NE, W, M-W



Fraternity/None/Sorority



Highly Responsive Segment for "Art Institute" Ad

Segment definition included:

- Still in high school
- Expected college graduation date in 2008 or earlier
- Certain military interest
- Never saw this ad before

Segment probability of accepting ad: **13.5%**

Average overall probability of accepting ad: **2.7%**

Highly Responsive Segment for a "Navy" Ad

Segment definition included:

- Has opted in for emails
- Has not seen this ad before
- Is in college
- SAT verb-to-math ratio is not too low, nor too high
- SAT written is over 480
- ACT score is over 15
- No high school name specified

Segment probability of accepting ad: **2.6%**

Average overall probability of accepting ad: **1.6%**

Money-Making Model: Improved Resulting Revenue

A-B test deployment to compare:

- A. Legacy system based on acceptance rates across users
- B. Model-based ad selection

Result:

25% increased acceptance rate

3.6% increased revenue observed; 5% later reported by the client

This comes to almost \$1 million per year in additional revenue, given the existing \$1.5 million monthly revenue.

Conclusions

Summary and take-aways

Eric Siegel, Ph.D.
Prediction Impact, Inc.
eric@predictionimpact.com
(415) 683 - 1146

Predictive Analytics for Business, Marketing and Web

Predictive Analytics Initiatives

- **Per-customer predictions:** Unlimited range of business objectives
- **Management:** An organizational process ensures predictions are actionable, driven by business needs; multiple roles and skills
- **Deployment:** Mitigate risk and track performance

Predictive Analytics Technology

- **Data preparation:** An intensive bottleneck, critical to success
- **Modeling methods and tools:** No one method that is always best; compare multiple methods

Predictive Analytics and Data Mining

Services:

- Defining analytical goals & sourcing data
- Developing predictive models
- Designing and architecting solutions for model deployment
- "Quick hit" proof-of-concept pilot projects

Training programs:

- **Public seminars:** Two days, in San Francisco, Washington DC, and other locations
- **On-site training options:** Flexible, specialized
- **Instructor:** Eric Siegel, Ph.D., President, 15 years of data mining, experienced consultant, award-winning Columbia professor
- **Prior attendees:** *Boeing, Corporate Express, Compass Bank, Hewlett-Packard, Liberty Mutual, Merck, MITRE, Monster.com, NASA, Qwest, SAS, U.S. Census Bureau, Yahoo!*

www.PredictionImpact.com

If you predict it, you own it.

Predictive Analytics and Data Mining

Applications:

- Response modeling for direct marketing
- Product recommendations
- Dynamic content, email and ad selection
- Customer retention
- Strategic segmentation
- Security
 - *Fraud discovery*
 - *Intrusion detection*
 - *Risk mitigation*
 - *Malicious user behavior identification*
- Cutting-edge research for groundbreaking data mining initiatives

Verticals:

- Online business: *Social networks, entertainment, retail, dating, job hunting*
- Telecommunications
- Financial organizations
- A fortune 100 technology company
- Non-profits
- High-tech startups
- Direct marketing, catalogue retail

www.PredictionImpact.com

If you predict it, you own it.

Predictive Analytics and Data Mining

Team of several senior consultants:

- Experts in predictive modeling for business and marketing
- Relevant graduate-level degrees
- Communication in business terms
- Complementary analytical specialties and client verticals
- Published in research journals and industrials

Extended network of many more:

- Closely collaborating partner firms
- East coast coverage

Eric Siegel, Ph.D., President

Prediction Impact, Inc.

San Francisco, California

eric@predictionimpact.com

(415) 683 - 1146

For our *bi-annual newsletter*, click “*subscribe*”:

www.PredictionImpact.com

To receive notifications of training seminars:

training@predictionimpact.com

If you predict it, you own it.