Predictive Analytics: Delivering on the Promise of Big Data

CASACT Ratemaking & Product Management Seminar
March 2014

Eric Siegel, Ph.D.
Founder, Predictive Analytics World
Author, Predictive Analytics
Welcome to the Predictive Analytics Times

We’re proud to present the most interesting and insightful data science, analytics, and business intelligence news, views and information. We’ll continue to bring you the latest news and updates from the world of analytics, highlighting the recent developments and trends that matter most to you.

It is a Mistake to… Focus on Training Results

By Dr. John Elder, CEO and Founder, Elder Research, Inc.

(From Chapter 3 of the Top 10 Data Mining Mistakes, drawn largely from Chapter 25 of the Handbook of Statistical Analysis and Data Mining)

www.predictiveanalyticstimes.com
PREDICTIVE ANALYTICS

THE POWER TO PREDICT WHO WILL CLICK, BUY, LIE, OR DIE

ERIC SIEGEL

www.ThePredictionBook.com
Marketing (along with credit risk) is the foundational business application of predictive analytics.
Agenda

1) Risk
2) Intro to PA – *The Prediction Effect*
3) How it works – *The Data Effect*
4) How it bolsters insurance
5) Insurance case studies
Product Failure
The concept of risk applies in:
- insurance
- financial credit
- health
- and even marketing
I am an individual patient, and an individual insurance policyholder. Risk effects all parties involved.
Insured “office workers”
"Discussion with State Farm's Eric Webster: Insurance and Data Mining,"
Gregory Piatetsky, Ph.D., KDNuggets.
Risk an individual may:
- Become a loss
- Become ill
- Not respond
- Commit fraud
No certified, regulated profession like the actuarial practice exists outside of what is strictly considered insurance.

Douglas Hubbard
The Failure of Risk Management

What is predictive analytics?
How does it address micro-risk?
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For the story on exactly how Obama’s campaign used predictive analytics in 2012:


http://www.predictiveanalyticsworld.com/patimes/obama/
Predictive Analytics:

(data)

Technology that learns from experience to predict the outcome/behavior of individuals ... in order to drive better decisions.
Predictive modeling learns from data in order to generate a predictive model. For details on how this work see Chapter 4 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (http://www.thepredictionbook.com).
A predictive model generates a predictive score for an individual. For details on how this work see Chapters 1 and 4 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (http://www.thepredictionbook.com).
Marketing targets an individual predicted as likely to buy. For details on how this work see the Introduction and Chapter 1 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (http://www.thepredictionbook.com).
Is prediction an audacious goal? Isn't prediction impossible? For details on how why predictive analytics predicts well enough, see the Introduction and Chapter 1 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (http://www.thepredictionbook.com).
A crummy predictive model delivers big value. It’s like a skunk with bling.

Simple arithmetic shows the bottom line profit of direct mail, both in general and then improved by predictively targeting (and only contacting 25% of the list). The less simple part is how the predictive scores are generated for each individual in order to determine exactly who belongs in that 25%. For details on how this work see Chapter 1 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (http://www.thepredictionbook.com).
Put another way, predicting better than guessing is often sufficient to generate great value by rendering operations more efficient and effective. For details on how this works, see the Introduction and Chapter 1 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (http://www.thepredictionbook.com).
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Yesterday is history, tomorrow is a mystery, but today is a gift. That is why it is called the “present.”
Each row of training data corresponds to one individual – first the individual’s facts and figures are listed (predictor variables, aka independent variables), and then the target variable (aka dependent variable) – ie, the thing you’re trying to predict – is listed.

A table of such rows composes the training data, on which predictive modeling operates.
Urban myth to some, but based on reported results:
Online conversion to paying membership, by email domain. Customers who sign up with "Hotmail" and "Yahoo" email accounts are far less likely (20 - 25% as likely) to convert to a paid subscription than users with email addresses that may be more "permanent," such as ".net" or "EarthLink" email addresses. This insight speaks directly to business strategy, such as employing incentives for customers to provide permanent email addresses, or partnering with certain email service providers.
Credit card used at the dentist
→ Less likely to miss payments repeatedly

http://www.nytimes.com/2009/05/17/magazine/17credit-t.html
Dental patients miss fewer payments.
The Data Effect:

Data is always predictive.
Correlation does not entail causation. For more information, see Chapter 3 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (http://www.thepredictionbook.com).
Warm weather

More ice cream eaten by humans

More humans eaten by sharks
Mysterious chemical in your bloodstream → More prone to cigarette addiction

More prone to carpal tunnel → Less prone to carpal tunnel

Smoke → Take more breaks → Less carpal tunnel
...and many more, such as Cox Communications, FedEx, Sprint, etc. - see the book "Predictive Analytics" (www.thepredictionbook) for many case studies, including a central compendium of 147 mini-case studies, of which 37 are examples in marketing applications of predictive analytics.

PREMIER Bankcard also lowered delinquency to increase net by over $10 million

More information about First Tennessee Bank and other case studies are available at http://tinyurl.com/PAExamples

Millions of decisions a day determine whom to call, mail, approve, test, diagnose, warn, investigate, incarcerate, set up on a date, and medicate.
- like, love, procreate
- buy, cancel, click
- default on payment, crash your car
- quit job

vote, qualify for benefits, drop out
commit crime, fraud, murder
get sick, die
think, lie
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Insurance has always been about predictive analytics. What are actuarial tables, loss history analysis, and pricing/risk algorithms if not “predictive”?

Seth Earley
Earley & Associates

http://uk.smartgridupdate.com/fc_fcbi1lz/lz.aspx?p1=056892S4006&CC=&p=1&cID=0&cValue=1
As Janet Jackson asked, "What have you done for me lately?"
Advantages of Predictive Analytics

1. Data elements

2. Mathematical models
Customer Attrition: Mortgages

Is the interest rate < 7.94%?

YES
Risk of defection: 3.8%

NO
Risk of defection: 19.2%
IF:
    the mortgage is greater than or equal to $67,751 and less than $182,926
    AND:
    the interest rate is greater than or equal to 8.69 percent
    AND:
    the loan-to-value ratio is less than 87.4 percent
THEN:
    the probability of prepayment is 25.6 percent.

Much higher than the overall average of 9.4% prepayment rate.
RENEW YOUR CELL PHONE CONTRACT...

AND GET A FREE PHONE!
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Leading international commercial lines insurance provider: This was from a case study at a conference presentation; however, the insurance company later rescinded authorization to be named in connection with this example. Here is a reference on the general principle that predictive modeling improves upon standard actuarial methods: Guillaume Briere-Giroux, FSA, MAAA, CFA, "Predictive Modeling Applied to Variable Annuity Lapse Rates," Predictive Modeling for Variable Annuities. www.claudepenland.com/2011/02/12/predictivemodeling-applied-to-variable-annuity-lapse-rates/.

Allstate: With a predictive modeling competition in 2012, tripled the accuracy of predicting bodily injury liability based solely on the characteristics of the insured vehicle. This could be worth an estimated $40 million annually to the company -- Kaggle, Allstate, "Predicting Liability for Injury from Car Accidents," Competition, April 13, 2012. www.kaggle.com/host/casestudies/allstate. Here is how the $40 million estimate is derived. Allstate's 2010 annual report puts bodily injury claims at roughly $1.6 billion. Industry insiders suggest 20 percent of bodily injury claims actuarially relate to vehicle. If we assume that a 1 percent improvement in error rate impacts claims costs by 0.25 percent, even just doubling the accuracy comes to a $40 million savings. See also www.iihs.org/research/hldi/fact_sheets/BodilyInjury_0911.pdf.

Accident Fund Insurance: Ascertains secondary medical conditions (such as obesity and diabetes) from written workers' compensation claim notes. These conditions are predictive of which injuries will be high-cost so that, for example, insured workers may be targeted for preventive measures to reduce their influence.
Fraud Detection

Transactions include:
- Invoices
- Credit card purchases
- Online activities
- Tax returns
- Telecom (calls)
- Checks
- Clicks (paid ads)
- Insurance claims

Citizens Bank:
Loss prevention up 20%
- or -
Prevention staff down 30%

A major automobile insurance carrier:
Predictive analytics delivers 6.5 times the fraud detection capacity of that attained with no means to rank or score insurance claims.

See also: http://www.abbottanalytics.com/data-mining-case-study-1.php
Fraud Detection

The National Insurance Crime Bureau says that **insurance criminals steal over $30 billion annually**, making such fraud the second most costly white-collar crime in the United States - behind tax evasion - resulting in $200 to $300 of additional insurance premiums per U.S. household.


More on mortality prediction:

Solo rockers die younger than those in bands. Although all rock stars face higher risk, solo rock stars suffer twice the risk of early death as rock band members. This may be due to the fact that band members benefit from peer support and solo artists exhibit even riskier behavior (factoid courtesy of public health offices in the UK).

Men on the Titanic faced much greater risk than women. A woman on the Titanic was almost four times as likely to survive as a man. Most men died and most women lived. This may be due to the fact that priority for access to life boats was given to women.
For more details, see the article, "Deathwatch: Five Reasons Organizations Predict When You Will Die":
http://www.predictiveanalyticsworld.com/patimes/deathwatch-five-reasons-organizations-predict-when-you-will-die/

Safety institutes: e.g., aviation accident mortality.

According to an industry poll, a growing number of life insurance companies go beyond conventional actuarial tables and employ predictive technology to establish mortality risk. They calculate when you are going to die.

This Atlantic article about gun violence prediction proposes a database that would lead the way to predicting offenses, including random killing sprees related to mental illness:

... and is there prediction after death? It turns out that death is not the final event to be predicted for a life. The Chicago Police Department predicts whether a murder can be solved. The department found that characteristics of a homicide and its victim help predict whether the crime will be solvable.
Beyond life insurance, one top-five health insurance company predicts the likelihood that elderly insurance policy holders will pass away within 18 months, based on clinical markers in the insured's recent medical claims.

For more details, see the article, "Deathwatch: Five Reasons Organizations Predict When You Will Die":
http://www.predictiveanalyticsworld.com/patimes/deathwatch-five-reasons-organizations-predict-when-you-will-die/

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TAKE-AWAYS:
Predictive Analytics for Insurance

- Applies across a range of functions
- Complements standard actuarial methods
  - Leverage big data
  - More types of models
- The Data Effect
- The Prediction Effect
Predictive Analytics World Conference

San Francisco - Boston
Chicago - Toronto
London - Berlin
Washington DC (Government)

Bigger wins!
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www.pawcon.com

“Predictive Analytics World was probably the best analytics conference I have attended... turned into my new must-go-to conference.”
Dennis Mortensen
Director of Data Insights
Yahoo!

PAW March 2012 drew 500 attendees.
PAW has included case studies from: AT&T, Aflac, Amazon.com, Amway, Anheiser-Busch, BBC, Barclays, Blue Cross, BoA, Citibank, Fidelity, GE Capital, Google, HP, HSBC, Infinity, Intuit, LinkedIn, Macy’s, Match.com, MetLife, Microsoft, NRA, Netflix, Orbitz, Overstock.com, PayPal, Reed Elsevier, Target, The Economist, US Bank, US Bank, Wells Fargo, YMCA, Yahoo! and many more.
INSURANCE INDUSTRY SESSIONS AT PREDICTIVE ANALYTICS WORLD 2014

See the following few slides
Case Study: Workman’s Safety Insurance Board

Discrete Time Logistic Hazards Models for Workplace Safety Insurance On-Benefit Duration Models

The safe and timely return to work for an injured worker is a key priority for Workers’ Compensation. Using predictive models, we understand the key risk factors affecting the time on-benefits and determine the probabilities being on benefits at different time points. Although most injured workers experience a single off benefit event, some may experience a recurrence for the same injury after returning to work. We use discrete time logistic hazards regression to model on-benefit and off-benefit durations. The probability of being on-benefit at a point in time is then calculated using the Markov transition probabilities from the above models.

Dragos Daniel Capan, Statistician, Corporate Statistics Division, Workplace Safety Insurance Board

http://www.predictiveanalyticsworld.com/toronto/2014/agenda.php#day1-1125a

More information about Predictive Analytics World: www.pawcon.com
**PAW Toronto (May 2014)**

**Expert Panel:**

**The Future of Predictive Analytics in Insurance**

The insurance industry has always embraced analytics. Through the actuarial discipline, techniques have been employed that allow companies to charge policy premiums which are more accurately reflect risk. But advancements in predictive analytics methods and technologies are rapidly raising the stakes. Here, our panelists discuss how they're using predictive analytics in their pricing strategies. Data challenges and how organizations have overcome them to more fully leverage predictive analytics will be discussed. Attend as our experts examine what lies ahead for organizations that truly embrace predictive analytics as part of their corporate DNA.

**Panelists:**
- Barb Addie, President, Baron Insurance Services
- Jamie McDougal, Vice President, Personal Insurance Solutions, Gore Mutual

http://www.predictiveanalyticsworld.com/toronto/2014/agenda.php#day2-215

More information about Predictive Analytics World: www.pawcon.com
Case Study: AIG

Predictive Analytics in Insurance

This case discusses the use of predictive analytics to evaluate professional service firms, make the right in-source/outsource decision, and develop strategies to improve the delivery of professional services. Attend and learn how savings were realized by the better matching professional service needs with professional service providers, and how the decision to in-source resulted in a measurable financial impact.

Domenick DiCicco, SVP, Head of Global Claims Litigation, AIG

http://www.predictiveanalyticsworld.com/chicago/2014/agenda.php#day1-445a

More information about Predictive Analytics World: www.pawcon.com
Case Study: *TD Insurance*

*Improve Customer Satisfaction with a Predictive Model*

*Session description forthcoming*

**Dominic Fortin**, Senior Manager, Forecasting & Analytics, TD Insurance

http://www.predictiveanalyticsworld.com/chicago/2014/agenda.php#day1-510a

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ALREADY PASSED:
PAW San Francisco (March 2014)

Case Study: A Top 3 P&C Provider in Japan

Digital Lead Optimization in Insurance

In this session, we present the development and implementation of a real-time digital lead aggregator optimization engine for a major global P&C carrier. We cover the technical difficulties and constraints the team faced and the solutions we developed. Moreover, we discuss how we achieved alignment across the supply and demand side of the aggregator/lead ecosystem. Result: The insurance carrier was able to reduce cost by 40% while maintaining 90% of conversion by eliminating, in real time, unproductive leads. The online lead suppliers were able to expand the available universe for selection, which lead to greater overall spending.

Anamitra Chaudhuri, Senior Director, Insurance Analytics, Merkle
Yanni Kotziagklaouridis, Vice President, Analytics Strategy Practice Lead
Insurance and Wealth Management Analytics, Merkle

http://www.predictiveanalyticsworld.com/sanfrancisco/2014/agenda.php#day2-415b

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“Thank you for the perfect introduction to predictive analytics. It’s just the right blend of a business and technical angle I was looking for.”

—Emiliano Pasqualetti,
CEO, DomainsBot Inc.

businessprediction.com
To Learn More:
The Predictive Analytics Guide

www.pawcon.com/guide