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//* open | on | secure

October 1, 2024

IBM TechXchange Virtual Event

IBM Z data, analytics and mastering the rare art of AI model deployment

Eric Siegel
Jonathan Sloan

To continue your learning beyond this keynote:

Machine Learning Leadership and Practice – End-to-End Mastery

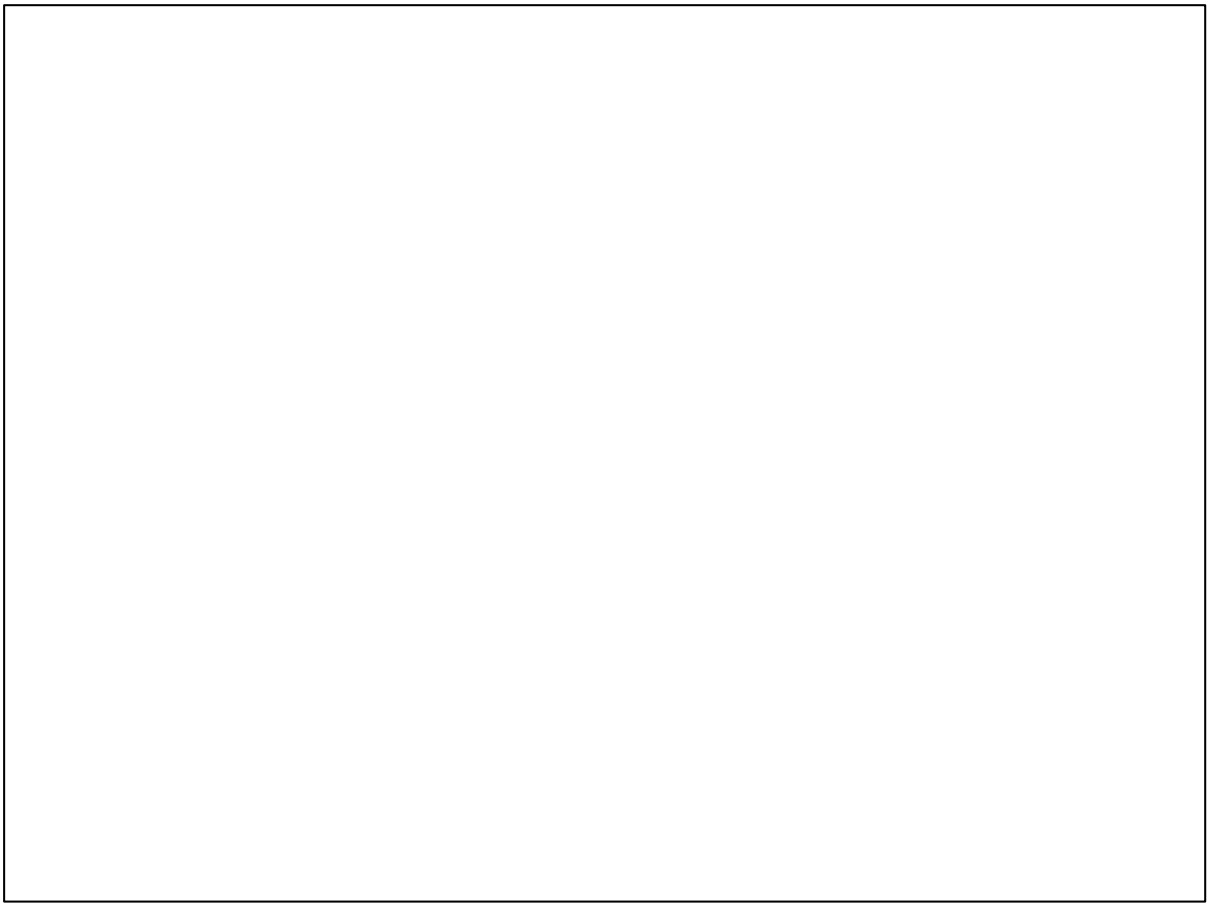
This end-to-end, three-course series will empower you to launch machine learning. Accessible to business-level learners and yet vital to techies as well, it covers both the state-of-the-art techniques and the business-side best practices.

http://www.MachineLearning.courses

Also, for more information/citations regarding the examples in this presentation, see the Notes, freely-accessible online, for the book "Predictive Analytics" by Eric Siegel (http://www.thepredictionbook.com). Most of the various examples shown are covered in the book (some only briefly, within the book's Central Tables of 182 mini-case studies, so not necessarily with more detail there than in this presentation). So, for greater detail about each case study named, see its reference/citation - search by organization name within the book's Notes PDF, available online at http://www.PredictiveNotes.com.

Agenda

- Predictive AI's value
- Predictive AI's deployment challenge
- The **bizML** playbook
- Mainframe data



business

data

prediction

machine learning

predictive AI
predictive analytics

boost sales

cut costs

combat risk

prevent fraud

fortify healthcare

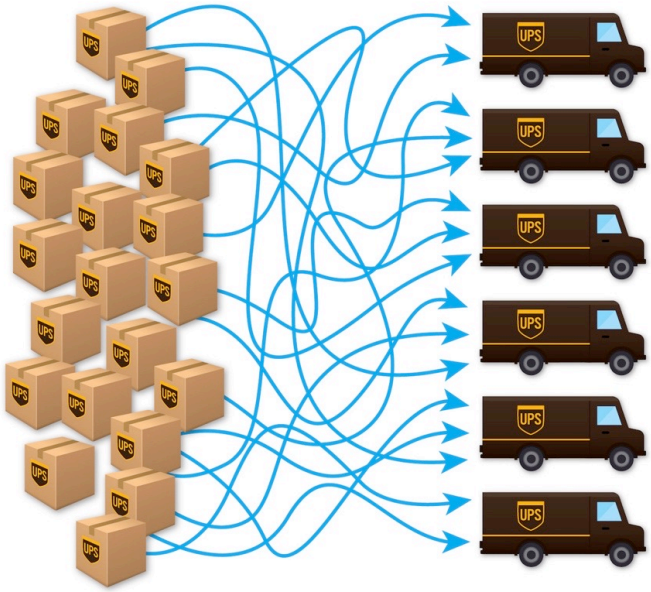
streamline logistics

conquer spam

win elections

Prediction as a capability -- calculating probabilities -- is the Holy Grail for improving large-scale operations.

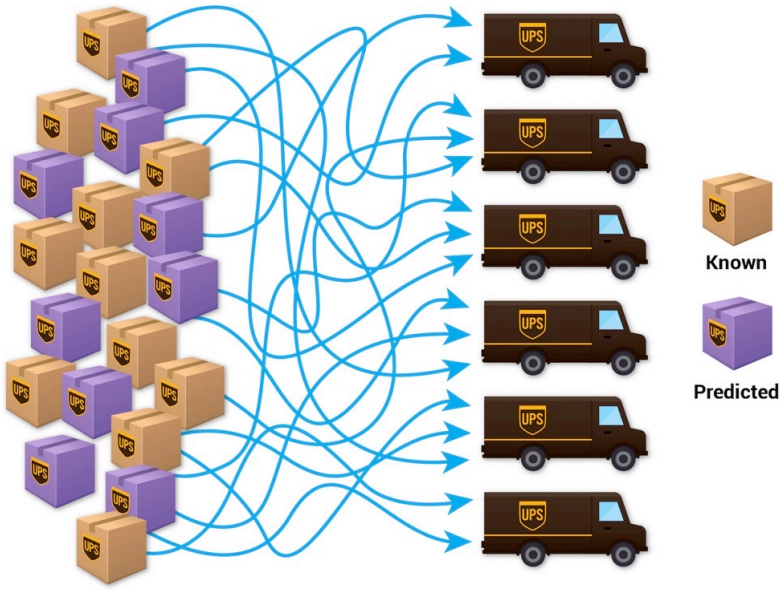
Quote from the foreword of *The AI Playbook*, by Eric Siegel (MIT Press, 2024).



Eric Siegel @predictanalytic

Machine Learning Week

16 million packages/day
1000 shipping centers
55 trucks
300 packages


Known
Predicted

Package Flow Technology and ORION

Overall annual savings:

185 million miles

$350+ million

185,000 metric tons of emissions

Annual savings due specifically to delivery-prediction (estimated):

18.5 million miles

$35+ million

Generative AI is easier to use.

Consultants using AI were significantly more productive (they completed 12.2% more tasks on average, and completed tasks 25.1% more quickly), and produced significantly higher quality results (more than 40% higher quality compared to a control group). https://www.hbs.edu/ris/Publication%20Files/24-013_d9b45b68-9e74-42d6-a1c6-c72fb70c7282.pdf

> *By using Generative AI, marketers were able to reduce the time needed to produce creative campaigns and content by up to 2-3 weeks, resulting in an average time savings of 34%.*

... which could equate to an annual savings of almost 3,000 hours across the participant team.

Ally Financial: a top 25 U.S. financial holding company managing $196B in assets and serving over 11 million customers.

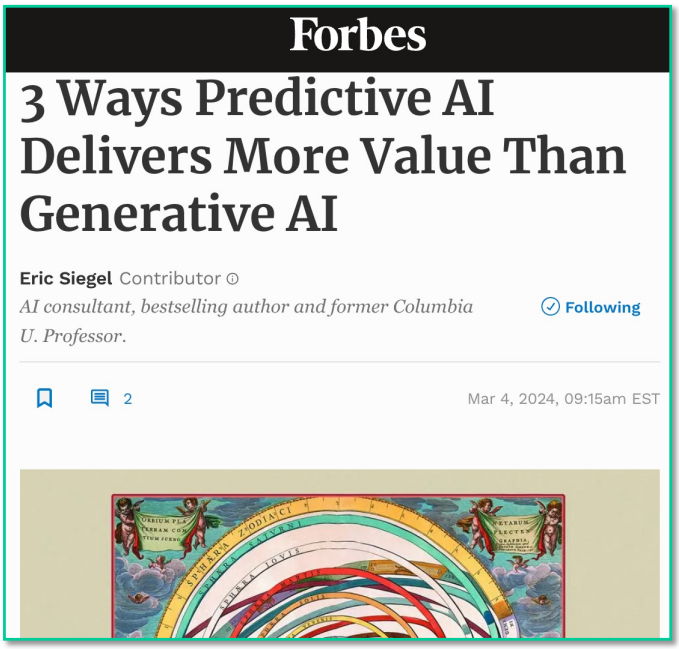
One of the nation's leading automotive lenders, as well as providing deposit, lending, mortgage, and credit card services as the nation's largest all-digital bank.

https://www.forbes.com/sites/randybean/2023/11/27/how-ally-financial-is-delivering-business-value-from-generative-ai/?sh=166e03999a86

Generative AI is easier to use…

…but much harder to use **well**…

3 Ways Predictive AI Delivers More Value Than Generative AI
By Eric Siegel, Forbes
https://www.forbes.com/sites/ericsiegel/2024/03/04/3-ways-predictive-ai-delivers-more-value-than-generative-ai/



Forbes

3 Ways Predictive AI Delivers More Value Than Generative AI

Eric Siegel Contributor

AI consultant, bestselling author and former Columbia U. Professor.

Following

2

Mar 4, 2024, 09:15am EST

Eric Siegel @predictanalytic

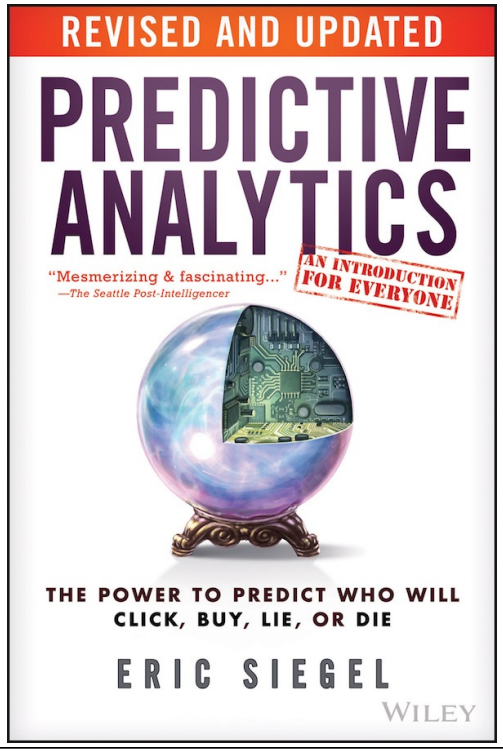
Machine Learning Week

https://www.forbes.com/sites/ericsiegel/2024/03/04/3-ways-predictive-ai-delivers-more-value-than-generative-ai/?sh=7c028f584e84

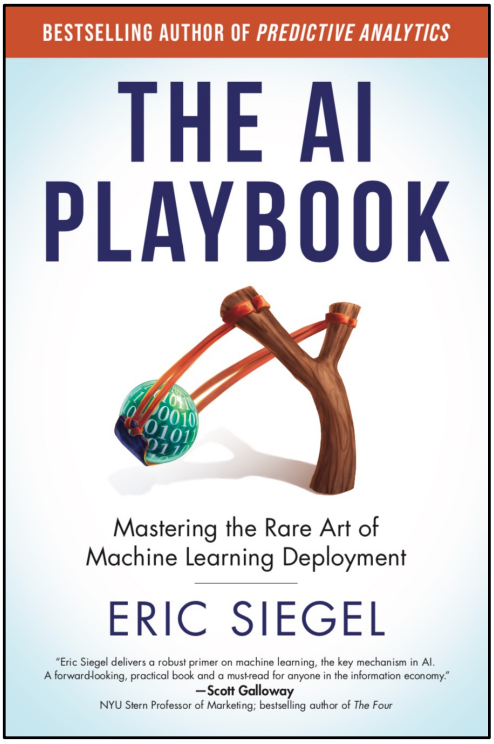
1) Predictive AI often delivers **higher returns** than generative

2) Predictive AI can operate **autonomously**, whereas generative AI usually cannot

3) Predictive AI is much **cheaper** and imposes a much smaller footprint than generative



http://www.ThePredictionBook.com



http://www.bizML.com

https://machinelearningweek.eu

https://machinelearningweek.com/

https://www.gooder.ai/

Today's model development is missing the ability to test and visualize the business performance – so it doesn't maximize for business objectives.

Gooder AI addresses a fundamental flaw with the typical model development process: It evaluates models in terms of business metrics like profit/ROI/savings, rather than only technical metrics like AUC/precision/recall.

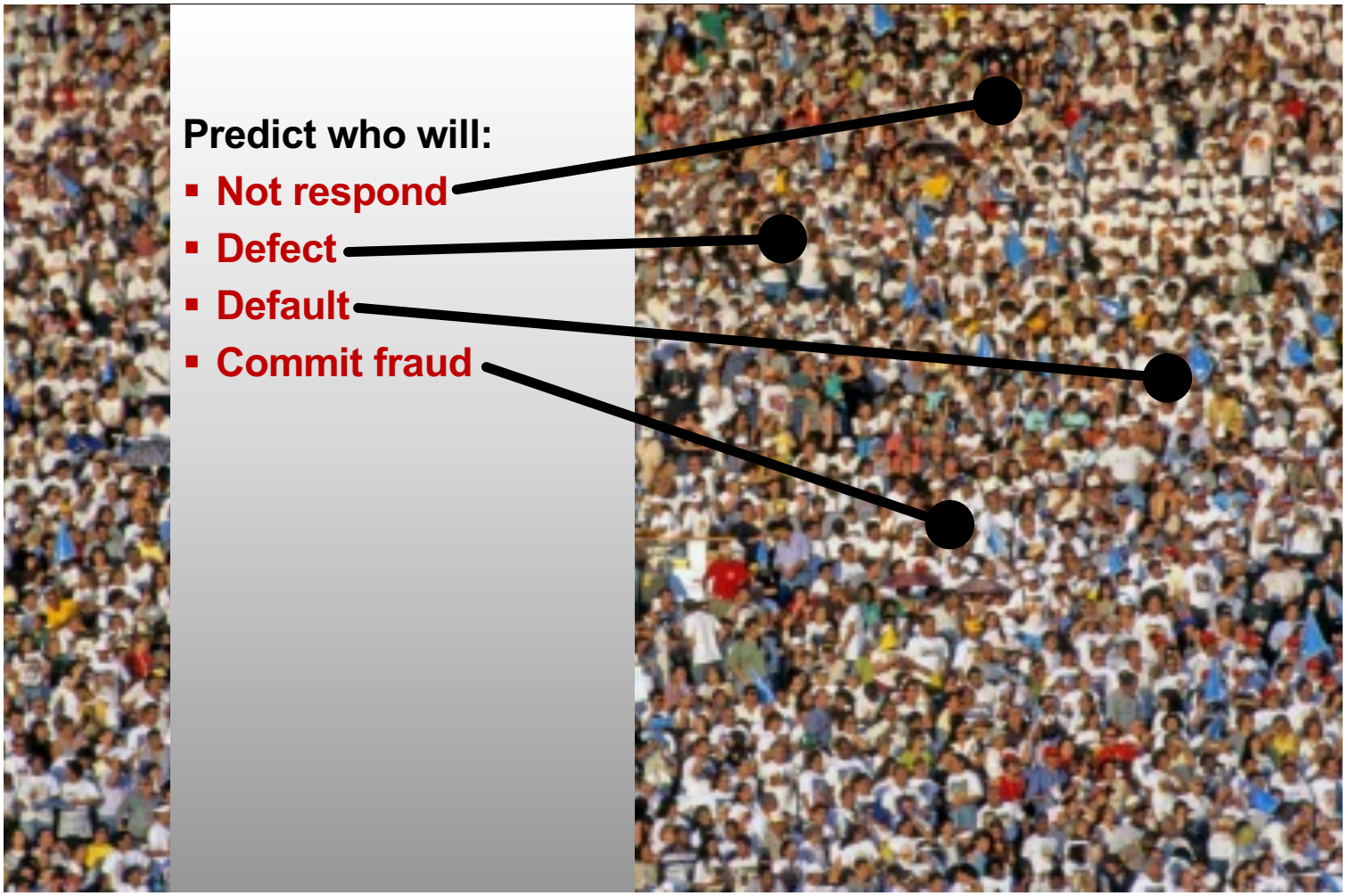
Product overview document:
https://docs.google.com/document/d/1AVzEH9vo1pMExZ7V1Uwyf-pnnvX6kga9vEzhuwCQzkg/edit?usp=sharing

Gooder AI maximizes the value of machine learning by testing and visualizing its business performance.

Validate any ML model for max value.

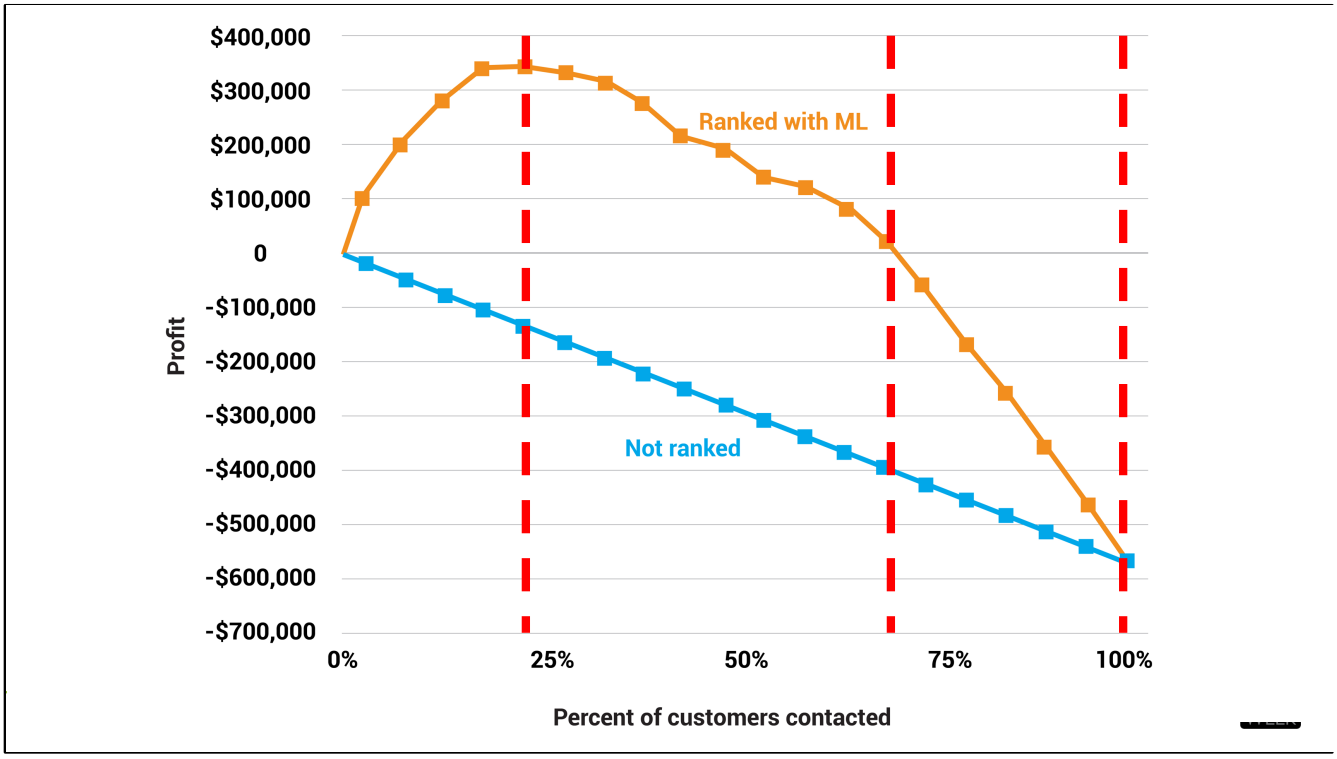
Universal ML validation to maximize value capture.

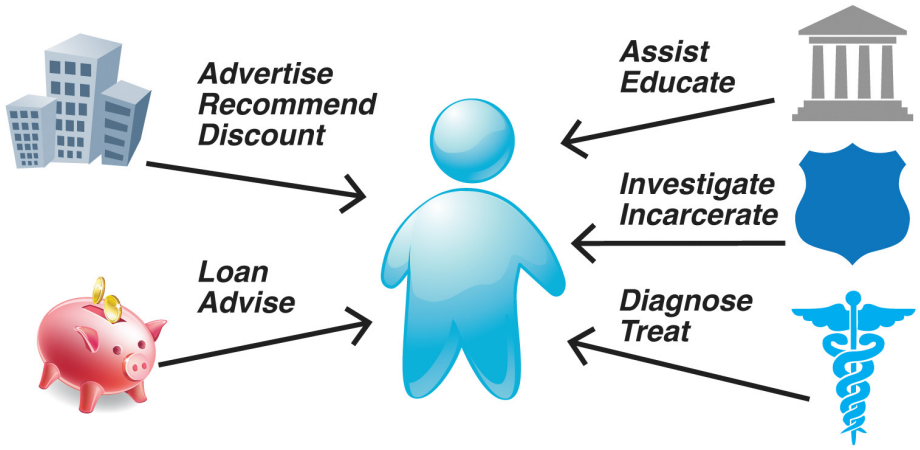
Empowers data scientists and orgs to optimize for the business objective.


Predict who will:
Not respond
Defect
Default
Commit fraud


85 85 84 84 84 75 70 70 70 65 65 65 65 65 64 60 60 60 60
55 50 50 50 50 43 32 29 29 29 24 22 19 19 0 0 0 0 0


85 85 84 84 84 75 70 70 70 65 65 65 65 65 64 60 60 60 60
55 50 50 50 50 43 32 29 29 29 24 22 19 19 0 0 0 0 0


$400,000
$300,000
$200,000
$100,000
0
-$100,000
-$200,000
-$300,000
-$400,000
-$500,000
-$600,000
-$700,000
Profit
Ranked with ML
Not ranked
0%
25%
50%
75%
100%
Percent of customers contacted



Millions of decisions a day determine whom to ***call, mail, approve, test, diagnose, warn, investigate, incarcerate, set up on a date, and medicate.***

Machine learning:

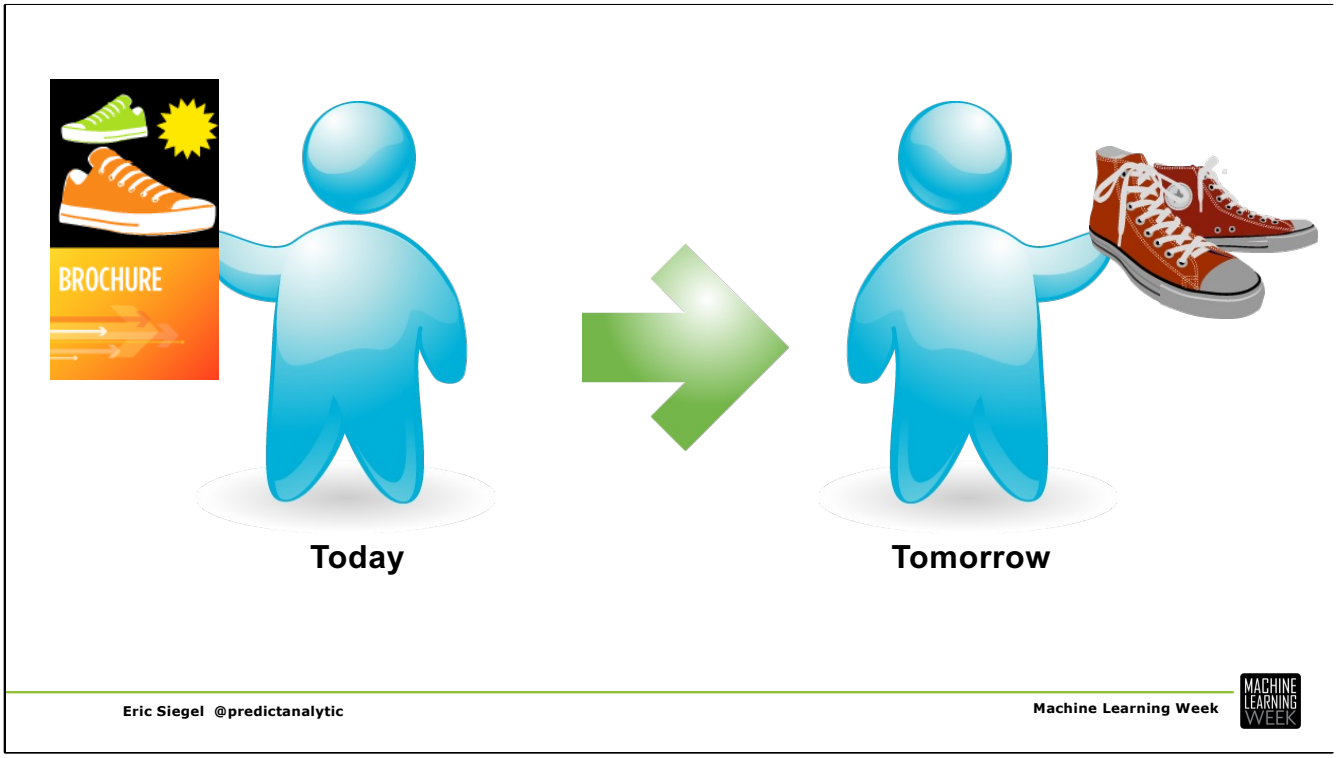
(data)

Technology that learns from experience to predict the outcome or behavior of each customer, patient, business, vehicle, image, piece of equipment, or other individual unit

… in order to drive better decisions.

This talk is about machine learning in the above practical, applied sense.

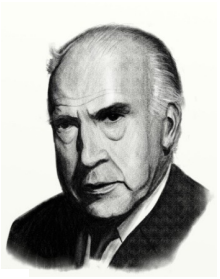
A.k.a. *predictive analytics, predictive AI*



Marketing targets an individual predicted as likely to buy. 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).

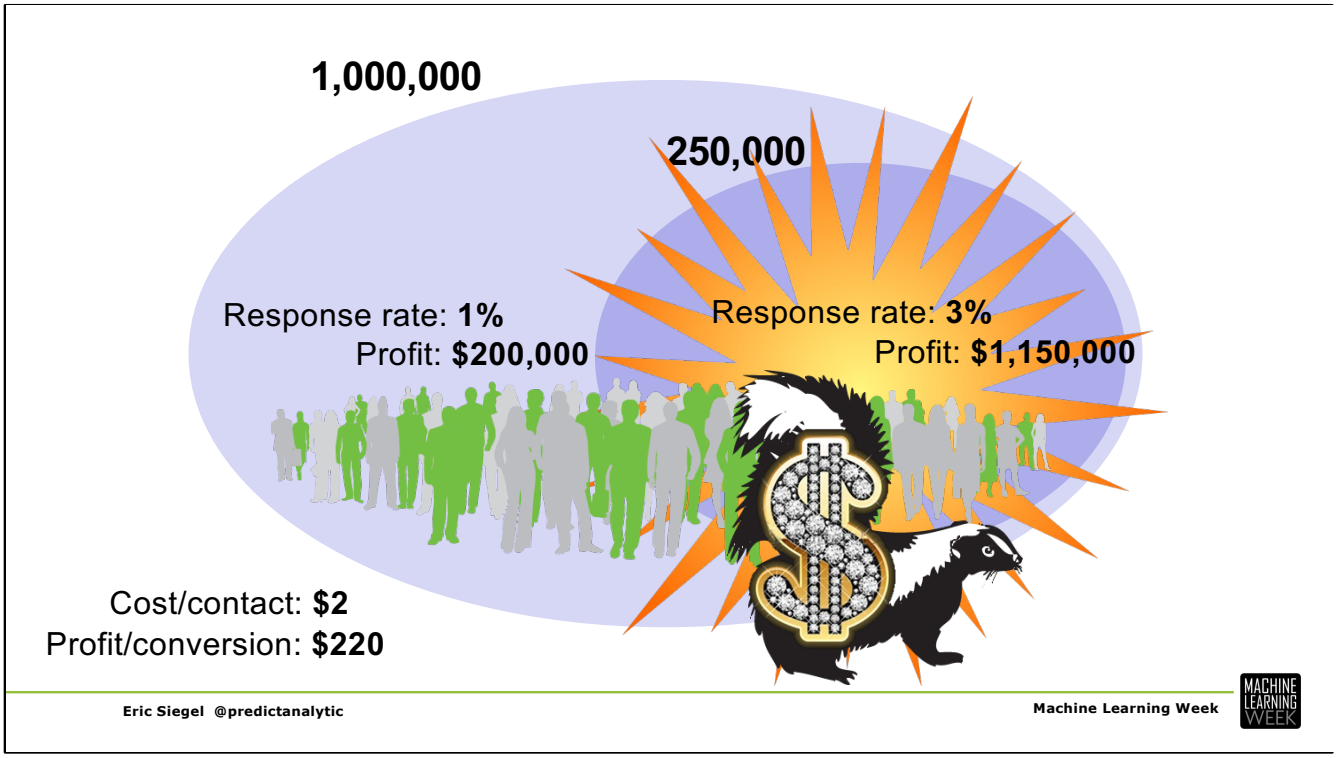
The Challenge of Prediction

Prediction is very difficult, especially if it's about the future.
- Niels Bohr



How come you never see a headline like "Psychic Wins Lottery"?
- Jay Leno

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" (free to access as a PDF on the "Excerpts" page of http://www.thepredictionbook.com).



A crummy predictive model delivers big value. It's like a skunk with bling.

here is a spreadsheet detailing the calculations, which you may copy and toy with at will.
https://docs.google.com/spreadsheets/d/1sLp2sGxTZKH0FW4x-ViukfZ-RsCYDrD9B-ReuMZus8M/edit?usp=sharing

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 works, see Chapter 1 of the book "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die" (http://www.thepredictionbook.com).

The Prediction Effect:

A little prediction goes a long way.

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" (available for free on the Excerpts page of http://www.thepredictionbook.com).

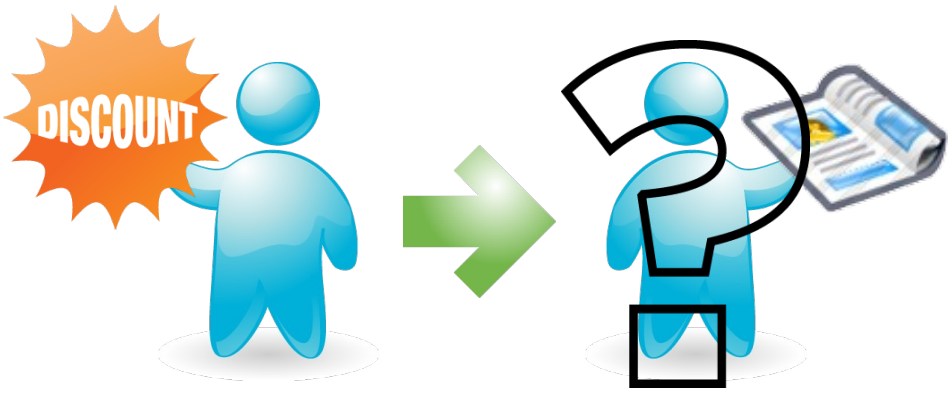
...and many more, such as Cox Communications, FedEx, Sprint, etc. - see the book "Predictive Analytics" (www.thepredictionbook) for many case studies, including a central compendium of 147 mini-case studies, of which 37 are examples in marketing applications of predictive analytics.

Reference for most examples/case studies in this presentation are in the Notes PDF for Eric Siegel's book, "Predictive Analytics." For each example's reference/citation, search by organization name within the book's Notes PDF, available at www.PredictiveNotes.com

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

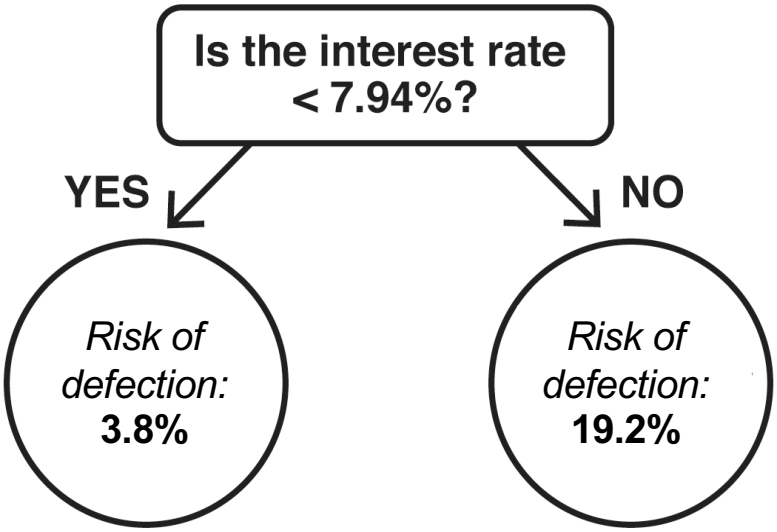
Dan Marks, First Tennessee Bank, "First Tennessee Bank: Analytics Drives Higher ROI from Marketing Programs," IBM.com, March 9, 2011. www.ibm.com/smarterplanet/us/en/leadership/firsttenbank/assets/pdf/IBM-firstTennBank.pdf



Today

Tomorrow

Customer Attrition: Mortgages



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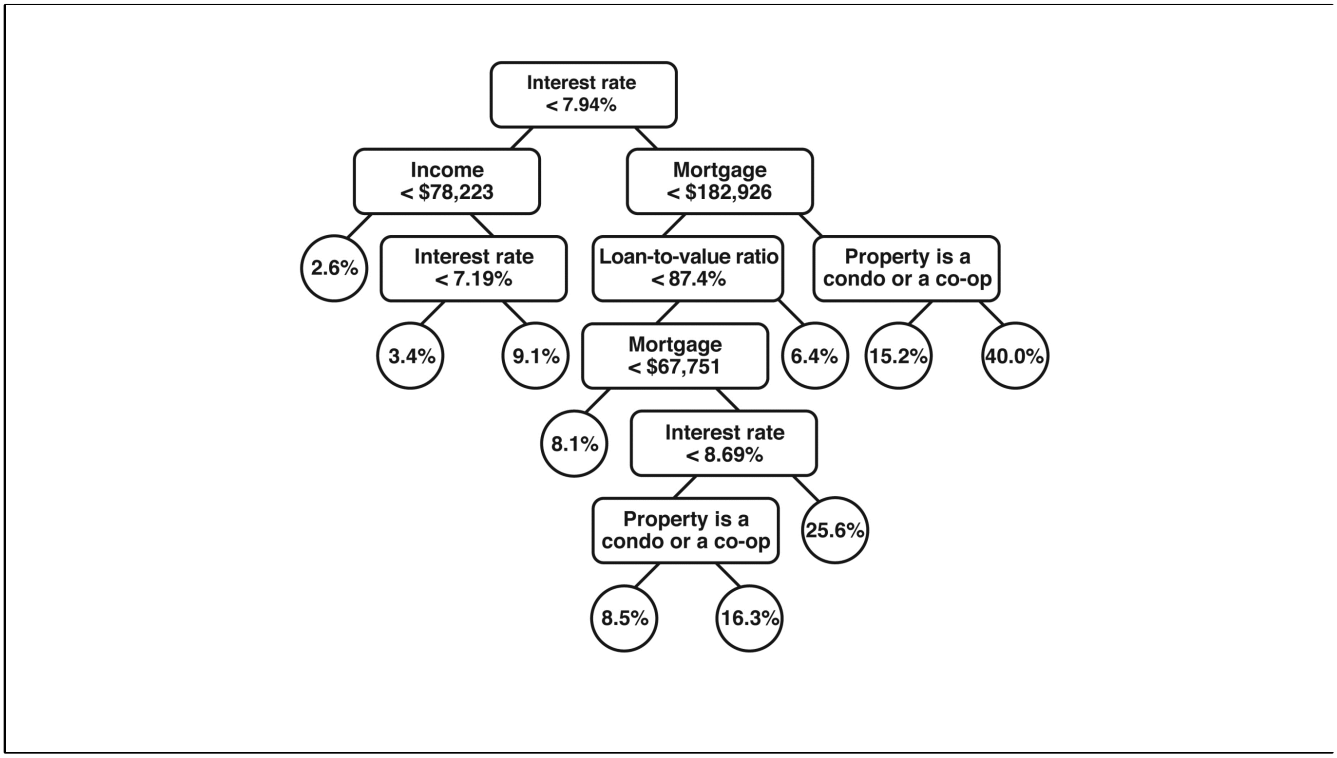
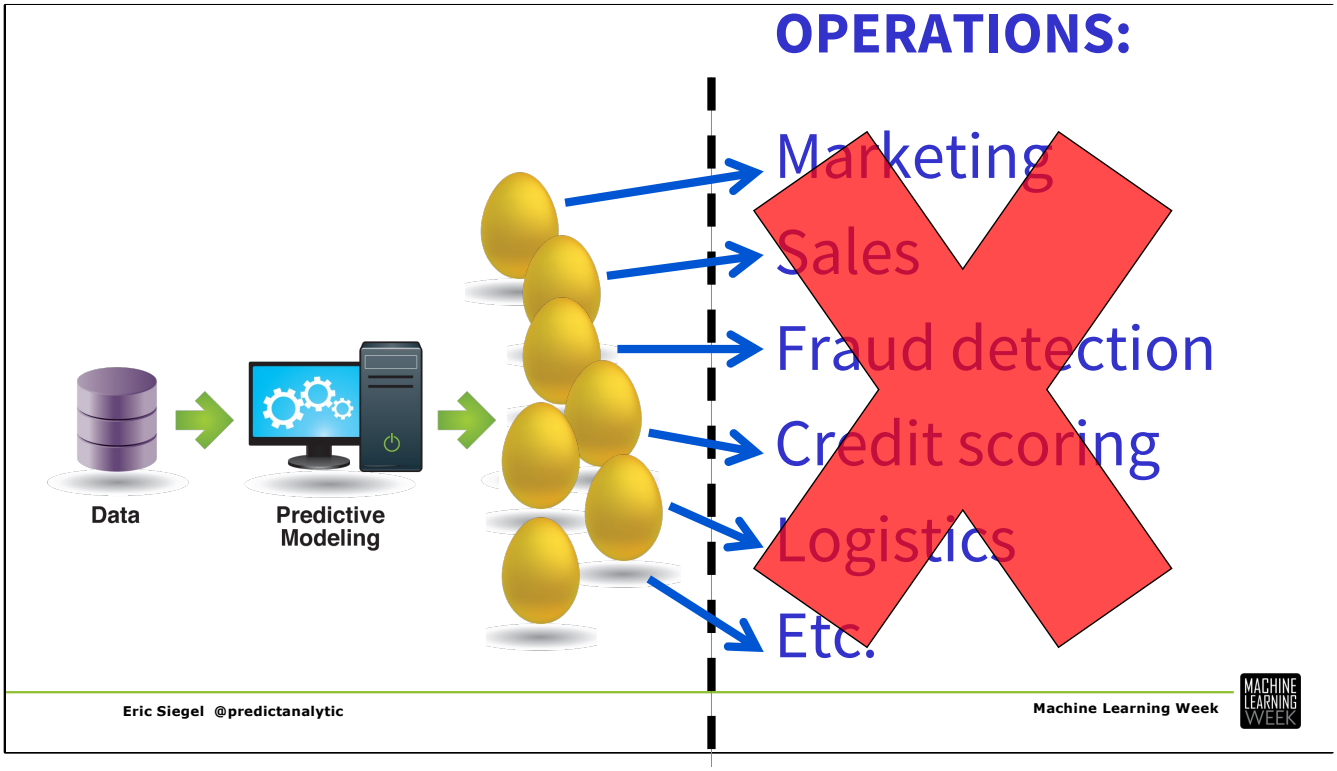

Interest rate
< 7.94%
Income
< $78,223
Mortgage
< $182,926
2.6%
Interest rate
< 7.19%
Loan-to-value ratio
< 87.4%
Property is a
condo or a co-op
3.4%
9.1%
Mortgage
< $67,751
6.4%
15.2%
40.0%
8.1%
Interest rate
< 8.69%
Property is a
condo or a co-op
25.6%
8.5%
16.3%


OPERATIONS:
Marketing
Sales
Fraud detection
Credit scoring
Logistics
Etc.
Data
Predictive Modeling
Eric Siegel @predictanalytic
Machine Learning Week
MACHINE LEARNING WEEK

New AI Projects Often Struggle to Deliver Returns

AI's average returns are lower than the cost of capital.
—IBM

Only 10% of companies obtain significant financial benefits from AI.
—MIT Sloan & BCG

Only 22% of data scientists say new their initiatives usually deploy.
—Eric's industry research (with Rexer Analytics)

"average ROI on enterprise-wide initiatives is just 5.9%,—well below the typical 10% cost of capital."
ibm.com/thought-leadership/institute-business-value/en-us/report/ai-capabilities

"Only 10% of companies obtain significant financial benefits from AI technologies."
MIT Sloan & BCG
https://sloanreview.mit.edu/projects/expanding-ais-impact-with-organizational-learning/

Only 22% of data scientists say "new capability" initiatives usually deploy
ie most fail
OLD: only 11 percent of data scientists say their models always deploy
https://www.rexeranalytics.com/data-science-survey

Only 11% of data scientists say their models always deploy.
—Rexer Analytics

"I predict we will see the third AI Winter within the next five years."
- Usama Fayyad, the world's fist CDO, June 2022

The greatest tool is the hardest to use. Machine learning is the world's most important general-purpose technology – but it's notoriously difficult to launch. Outside Big Tech

and a handful of other leading companies, machine learning initiatives routinely fail to deploy, never realizing value.

McKinsey's AI Index reveals that the "divide between AI lead- ers and the majority of companies still struggling to capitalize on the technology" is only widening.

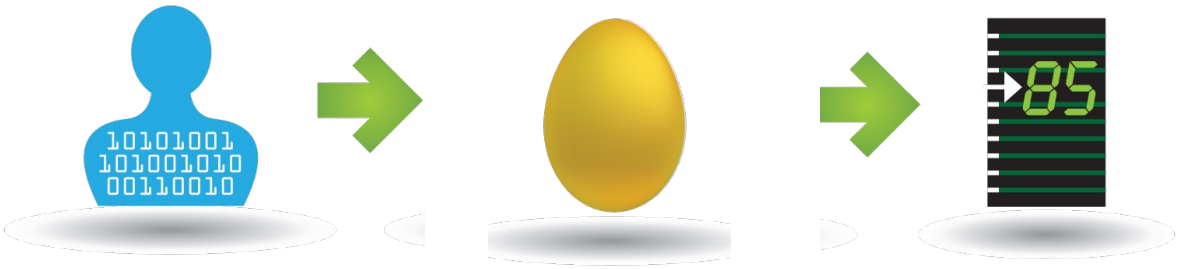
A report prepared by the AI Journal based on surveys by Sapio Research showed that the top pain point for data teams is "Delivering business impact now through AI." Ninety-six percent of those surveyed checked that box. That challenge beat out a long list of broader data issues outside the scope of AI per se, including data security, regulatory compliance, and various technical and infrastructure challenges.

According to a survey of senior executives by ESI ThoughtLab, "the average return on all AI investments by company is only 1.3%" and "only 20% of AI projects are in widespread deployment."
From: Survey of senior executives by ESI ThoughtLab
https://resources.appen.com/wp-content/uploads/2020/09/ESITL_Driving-ROI-through-AI_FINAL_September-2020.pdf

"Many AI initiatives fail. Seven out of 10 companies surveyed report minimal or no impact from AI so far."
https://sloanreview.mit.edu/projects/winning-with-ai/

McKinsey: "out of the 3,073 respondents, only 20 percent said they had adopted one or more AI-related technology at scale or in a core part of their business."
https://www.mckinsey.com/~/media/mckinsey/industries/advanced%20electronics/our%20insights/how%20artificial%20intelligence%20can%20deliver%20real%20value%20to%20companies/mgi-artificial-intelligence-discussion-paper.ashx

For many more such factoids and sources, see "The AI Playbook"'s chapter 0 (zero) book notes:
https://www.machinelearningkeynote.com/the-ai-playbook-book-notes

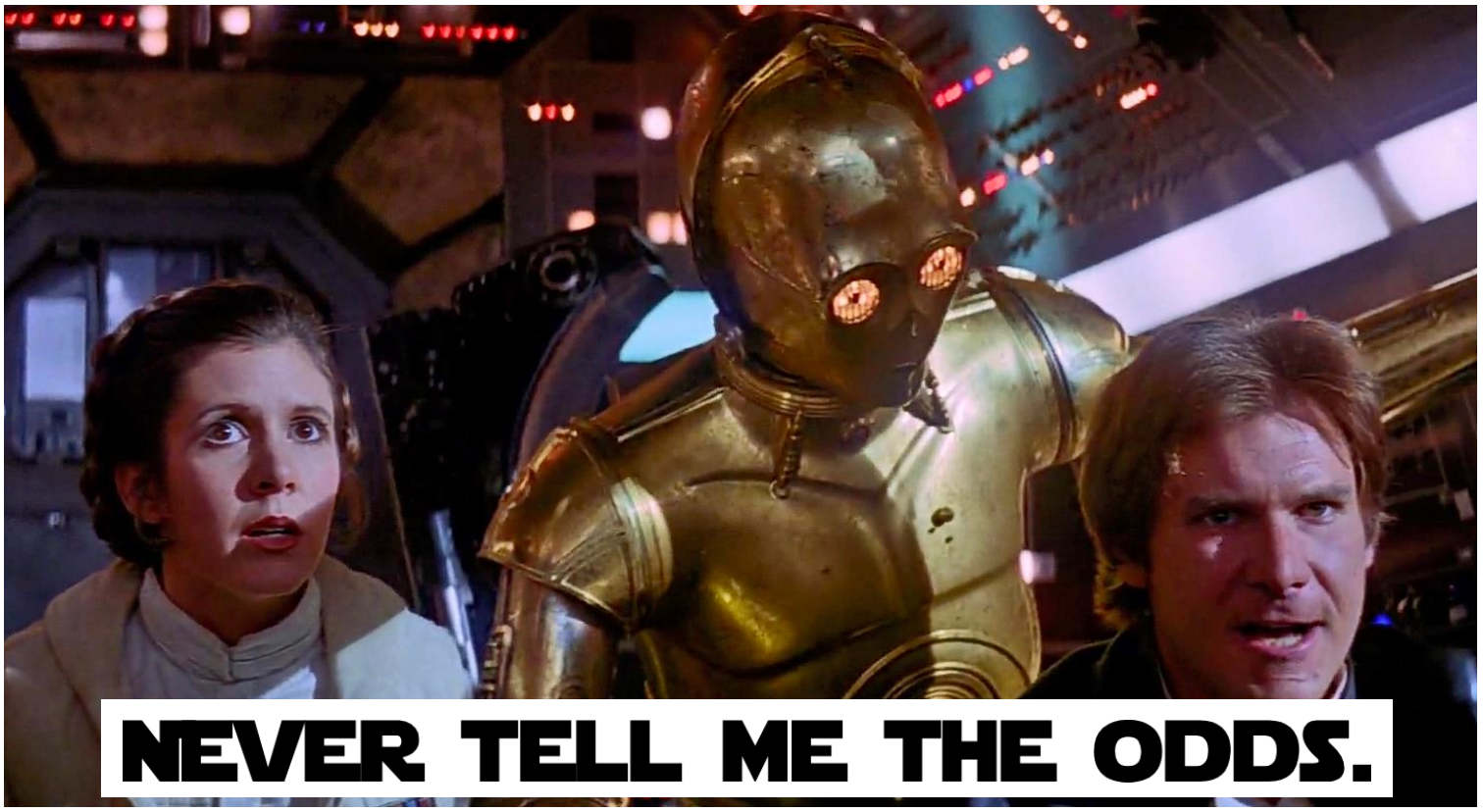


Characteristics of an Individual

Predictive Model

Probability

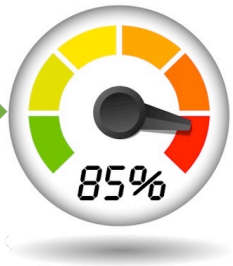
A probability calculator



C3P0: The possibility of successfully navigating... 3,720 to 1.

Han Solo: Never tell me the odds.

"Moneyball" celebrates math and yet epitomizes the glossing over of math.



1) What's predicted

2) How well

3) What's done about it

Eric Siegel @predictanalytic

Machine Learning Week

To transfer business expertise into to technical requirements is to get business professionals ramped up on:

- What's predicted, How well, What do about it

- What the model does, with what success, how use it

- Dependent variable, metrics, deployment: how predictive probabilities actively change business operations in order to improve them. Stakeholders must understand change in order to manage it.

Application	What's predicted	What's done about it
Response modeling *to increase the marketing response rate*	*Will the customer buy if contacted?*	Mail a brochure to those likely to buy.

Application	What's predicted	What's done about it
Response modeling *to increase the marketing response rate*	***Will the customer buy if contacted?***	Mail a brochure to those likely to buy.

Application	What's predicted	What's done about it
Response modeling *to increase the marketing response rate*	*If sent a brochure, will the customer buy within 13 business days with a purchase value of at least $125 after shipping and not return the product for a refund within 45 days?*	Mail a brochure to those likely to buy.

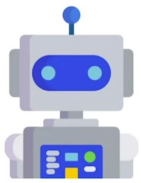
Dependent variable: **1) What's predicted**

Metrics: **2) How well**

Deployment: **3) What's done about it**

Benchmarks for training and deployment

Technical performance and business performance



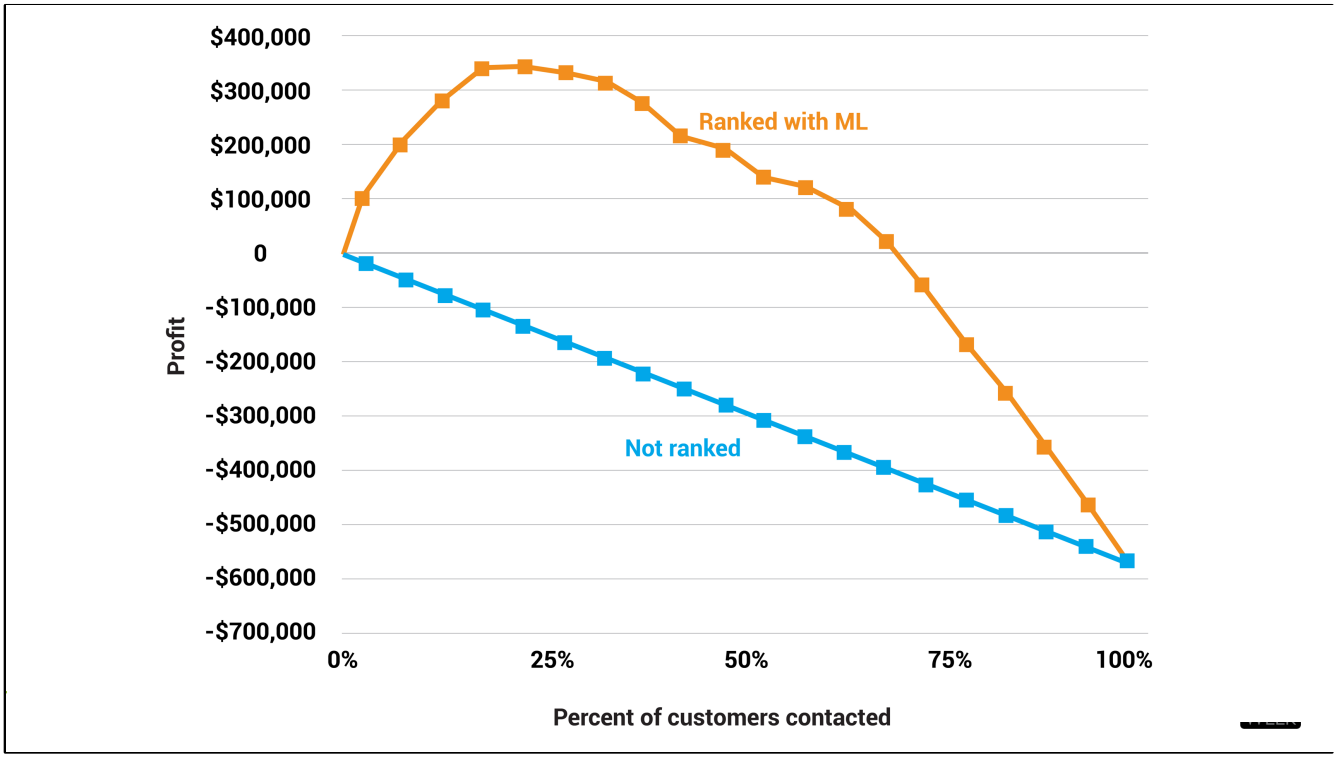
Technical metrics:

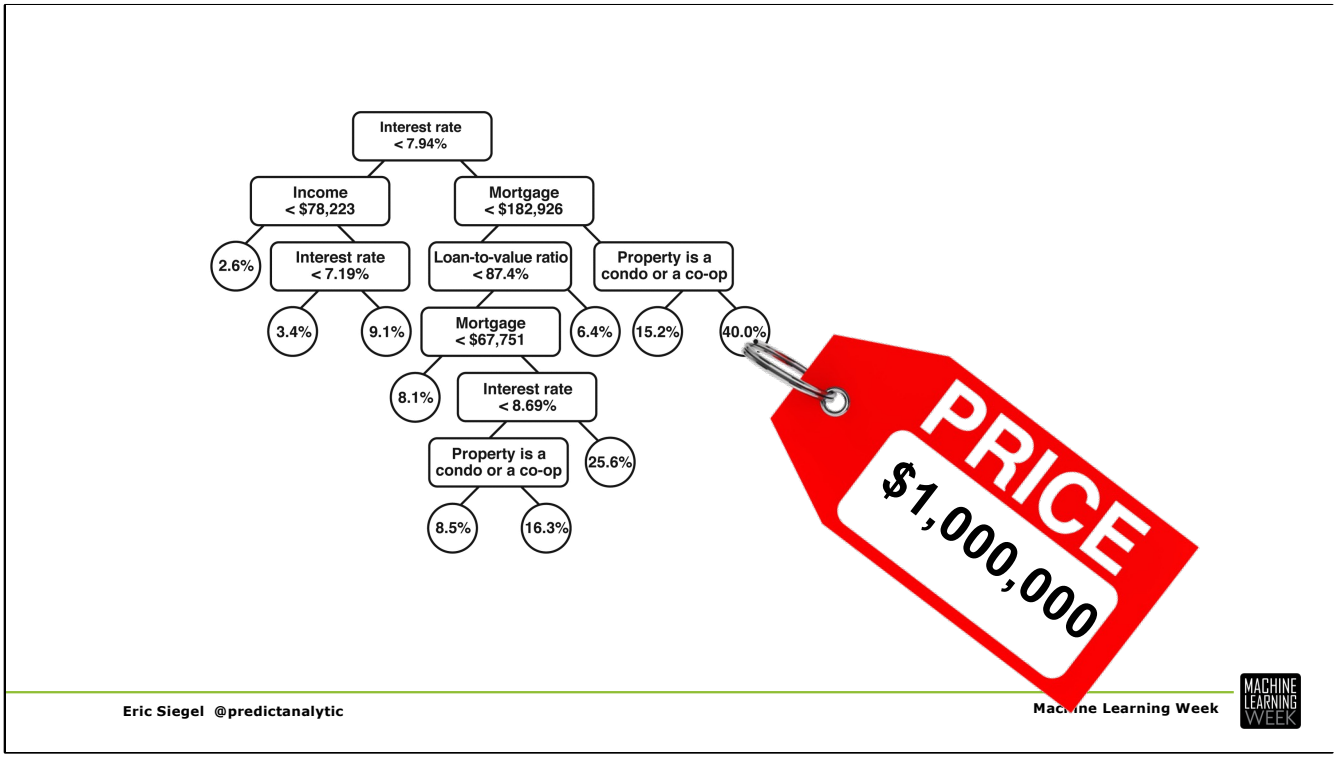
- Precision
- Recall
- AUC

Business metrics:

- Profit
- Savings
- ROI

Eric Siegel has co-founded a startup to move from technical ML metrics to business metrics: https://www.Gooder.ai


$400,000
$300,000
$200,000
$100,000
0
-$100,000
-$200,000
-$300,000
-$400,000
-$500,000
-$600,000
-$700,000
Profit
Ranked with ML
Not ranked
0%
25%
50%
75%
100%
Percent of customers contacted



You can't just say, "This model is worth a million bucks" -- its value depends on how you use.

Move the decision threshold:
View the available tradeoffs between competing metrics

Adjust the parameters:
Visualize the effects of changing parameters

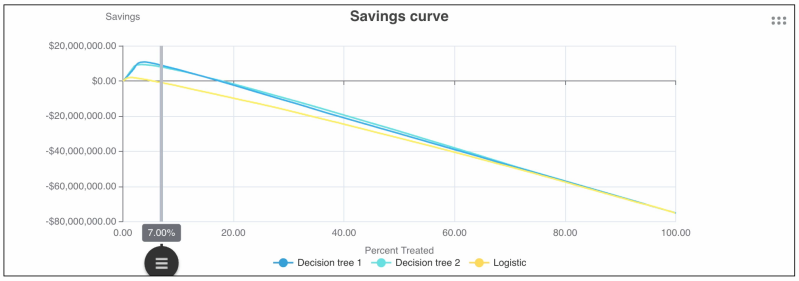
A key capability offered by Gooder AI is to contextualize – and visualize the effect of – setting the confidence threshold (aka decision threshold). Doing so isn't the "rocket science" part of an ML project – it's the part that aims the rocket. In making this choice, every predictive AI project must wrestle with striking practical tradeoffs between competing objectives.

GOODER AI

Payment Card Fraud Detection

Metrics at 7.00% (Population: 10,000,000):

	Decision tree 1	Decision tree 2	Logistic
Gains	66.33%	61.28%	24.53%
Loss	$10,908,998.54	$12,153,622.11	$20,714,600.20
Savings	$8,880,346.80	$7,906,661.70	-$977,749.18
False positives	469,367	483,320	610,187
Blocked fraud	224,845	209,300	82,501



FP-cost: 10

FN-cost: 60

bizML

1) Establish the **deployment goal**
2) Establish the **prediction goal**
3) Establish the **metrics**
4) Prepare the data
5) Train the model
6) Deploy the model

BizML: The strategic playbook for machine learning deployment

1) Establish the deployment goal (value)

Define the business value proposition: how ML will affect operations in order to improve them.

2) Establish the prediction goal (target)

Define what the ML model will predict for each individual case.

3) Establish the evaluation metrics (performance)

Determine the salient benchmarks to track during both model training and model deployment and determine what performance level must be achieved for the project to be considered a success.

4) Prepare the data (fuel)

Define what the training data must look like and get it into that form.

5) Train the model (algorithm)

Generate a predictive model from the data.

6) Deploy the model (launch)

Use the model to render predictive scores and then use those scores to improve business operations.

After step 6: Maintain the model (upkeep)

Monitor and periodically refresh the model as an ongoing process.

Key execution strategy:

All steps require deep collaboration with business stakeholders.
Business stakeholders must hold a semi-technical understanding of ML.
The steps are not executed linearly – backtracking prevails.

From *The AI Playbook* by Eric Siegel

bizML

1) Establish the **deployment goal**
2) Establish the **prediction goal**
3) Establish the **metrics**
4) Prepare the data
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Eric Siegel @predictanalytic

Machine Learning Week

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From *The AI Playbook* by Eric Siegel


freepik
PRNDS

Conclusions

- Predictive AI is a consulting gig
- Focus on concrete value
- Upskill on semi-technical
- A specialized playbook: **bizML**

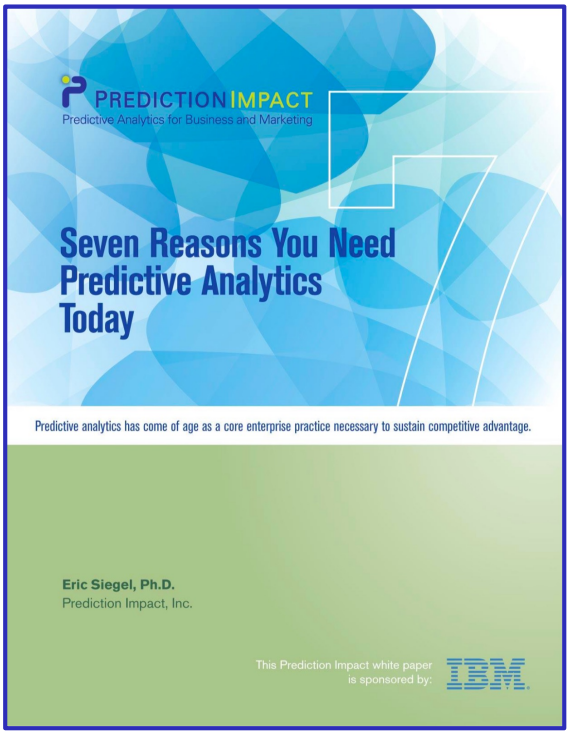
The highest-frequency ops are the largest ops.

So real-time deployment offers the greatest opportunity

How do you manage risk and greenlight change?

Organizations often miss the greatest opportunities that machine learning has to offer because tapping them **requires real-time predictive scoring**. In order to optimize the very largest-scale processes – which is a vital endeavor for your business – predictive scoring must take place right at the moment of each and every interaction. The good news is that you probably already have the hardware to handle this endeavor: the same system currently running your high-volume transactions – oftentimes a mainframe. But getting this done requires a specialized leadership practice and strong-willed change management.

https://www.predictiveanalyticsworld.com/machinelearningtimes/real-time-machine-learning-why-its-vital-and-how-to-do-it/12166/



Download the white paper, "Seven Reasons You Need Predictive Analytics Today" by Eric Siegel

http://www.predictiveanalyticsworld.com/signup-whitepaper.php

This white paper reveals **seven strategic objectives** that can be attained to their full potential only by employing predictive analytics, namely **Compete, Grow, Enforce, Improve, Satisfy, Learn, and Act.** Its contents complement those of Eric Siegel's book, *Predictive Analytics.*

More content from Eric Siegel

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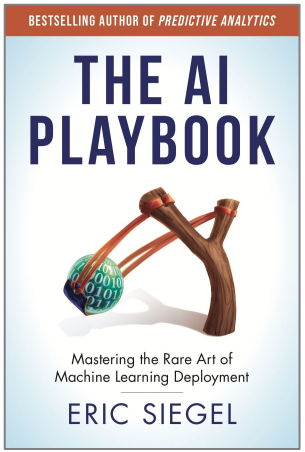

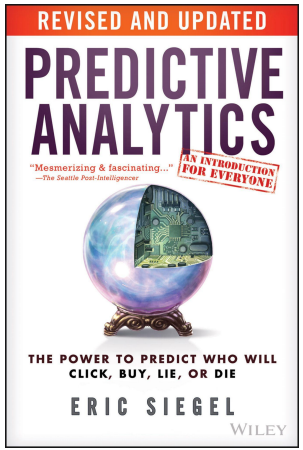

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