



Annual Workplace Safety and Health Conference

Predicting Injuries:

How to Be the Google of Safety -
Using Your Safety Data to Predict and
Prevent Workplace Injuries

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Agenda

- Definitions
- Current state
- Google
- Other companies usage
- How does it work
- What and how can you do this with safety



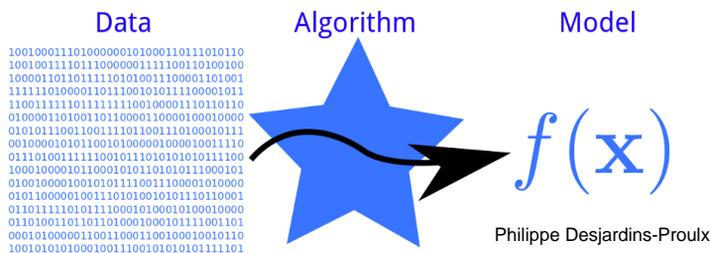


Field of study that gives *computers* the ability to *learn* without being explicitly programmed.

- *Arthur Samuel (1959)*



Machine Learning / Predictive Analytics



- Machine Learning synonyms:
 - Artificial Intelligence, Predictive Analytics, Deep Learning, Neural Networks, Big Data Analytics, etc.
- It is *not* statistical analysis that you learned in school.



“Machine learning...is the next transformation...[it] will be the basis and fundamentals of every successful huge IPO win in 5 years.”

– Eric Schmidt, Google Executive Chairman



“Clearly, a data analytics evolution is well underway...”

-Deloitte Survey





Era of Big Data

- 2.5 quintillion bytes of data created daily
- 90% of data in the world was created in the last two years

Source: IBM 7



Safety Big Data Set

- 260 million observations
- 5.5 million inspections
- 18,000 worksites
- 70,000 unique inspectors
- 60,000 incidents

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Age of the Data Scientists Age of Machine Learning Software





“Early adopters of *Big Data Analytics* have gained a *significant lead* over the rest of the corporate world.

Examining over 400 large companies globally, we found that those with the most advanced analytics capabilities are *outperforming competitors* by wide margins.

The leaders are

- twice as likely to be in the *top quartile of financial performance* within their industries;
- five times as likely to *make decisions faster* than market peers;
 - three times as likely to *execute decisions as intended* and
- twice as likely to *use data very frequently when making decisions.*”

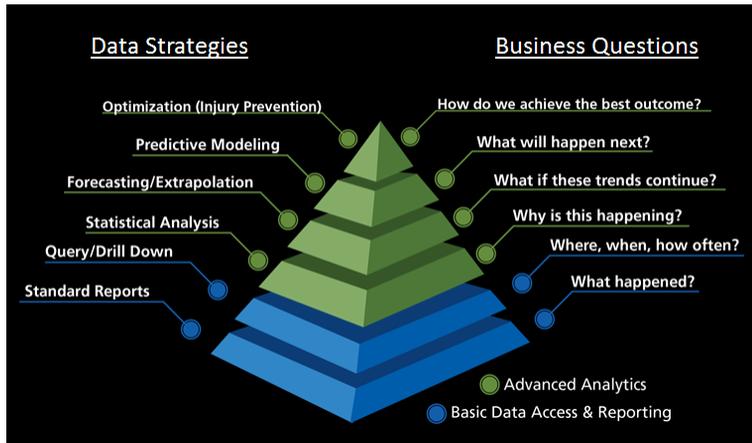


What Is Google Doing?

- TensorFlow
- Cars
- Data center power consumption
- Search engine
- Everything they do leverages machine learning



What Can Be Done with Data?



Adapted from *Competing on Analytics* by Thomas Davenport and Jeanne Harris



Current Uses

- Behavior recognition from text
 - Purchasing patterns
 - Social interactions
 - Game theory
- Fraud, spam, and network intrusion detection
- Pricing
- Video and image analysis
 - Identify objects and world around
 - Determine human reactions
- Medical
- Predictive maintenance
- Predictive modeling



What Are Others Doing?

- Netflix
- IBM
- Amazon
- Facebook
- GE
- Law enforcement
- Sports
- Movie making companies
- Construction
- Manufacturing
- Retail





Carnegie Mellon University



Tremendous Results!



Top 5 public U.S. university saved over \$20 million in insurance fees across four years of construction projects



A Fortune 150 energy company reduced its injury rate by 67% within 18 months



A top 20 construction company achieved significant safety improvements including 90% of worksites experiencing no lost-time incidents



A Fortune 150 manufacturer reduced its lost work day rate by 97% within one year



Predictive Analytics is HERE and It Is Ubiquitous



Why Not Safety?

- Of course safety!
- Some companies, such as General Electric, are using their internal data scientists for safety.
- Others are using services.
- Remember
 - Statistical analysis is NOT machine learning.
 - Machine-learning algorithms know nothing about safety.



Input Variable

Safety Big Data Set

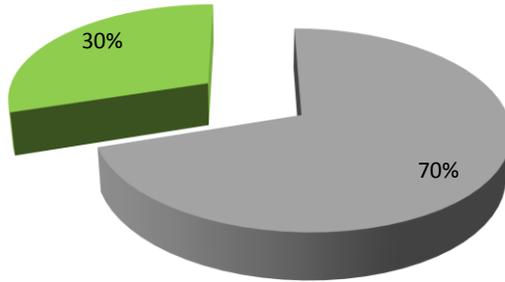
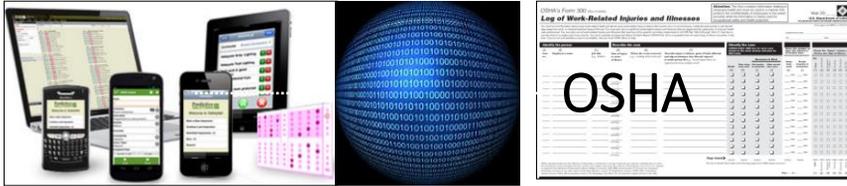
- 260 million observations
- 5.5 million inspections
- 18,000 worksites
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- 60,000 incidents**

OSHA

Target Variable

OSHA's Form 300 - Log of Work-Related Injuries and Illnesses

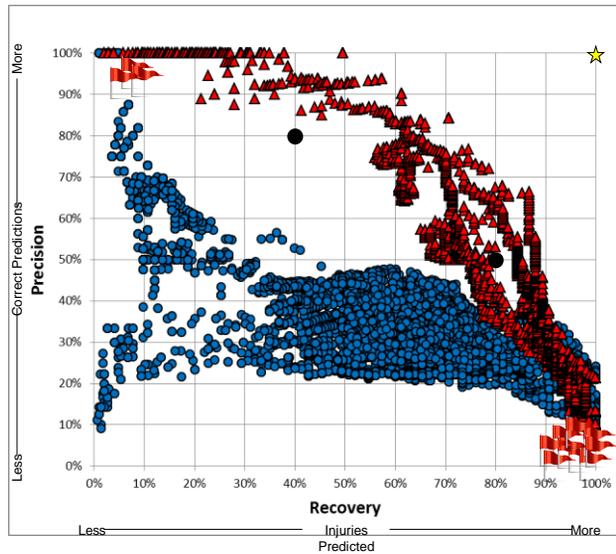
The complex block features a background of binary code (0s and 1s) in shades of blue. On the left, a semi-transparent grey box contains the text 'Safety Big Data Set' and a list of statistics, with '60,000 incidents' highlighted in red. On the right, there are three mobile devices (laptop, tablet, and smartphone) displaying data, and below them, a screenshot of an OSHA Form 300 'Log of Work-Related Injuries and Illnesses' with the word 'OSHA' overlaid in large black letters. The text 'Input Variable' is at the top right and 'Target Variable' is at the bottom right, both in white and red respectively.

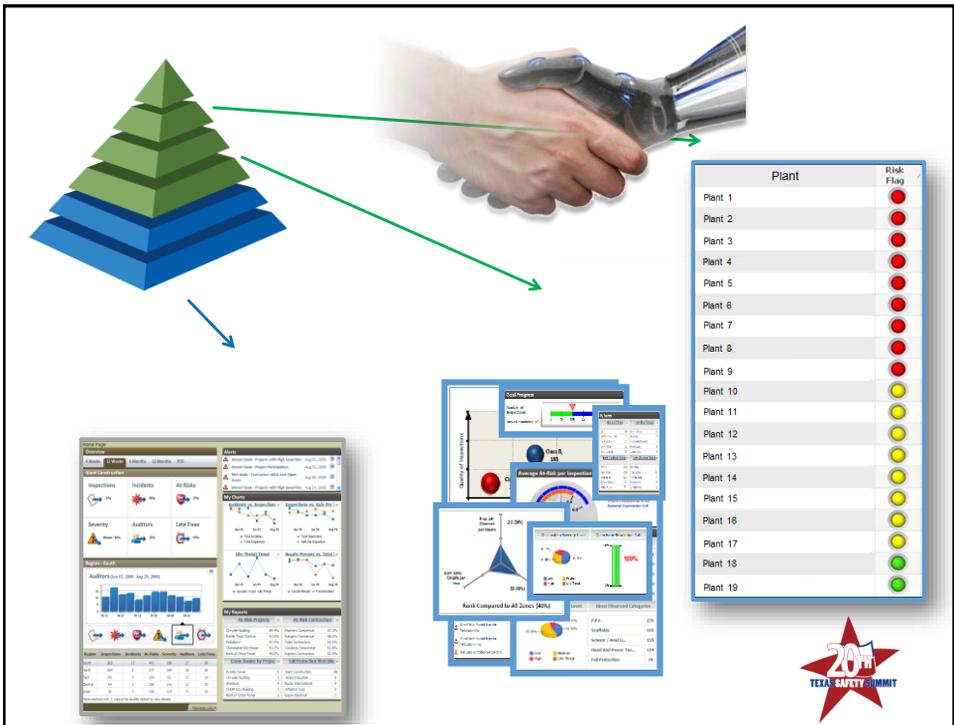
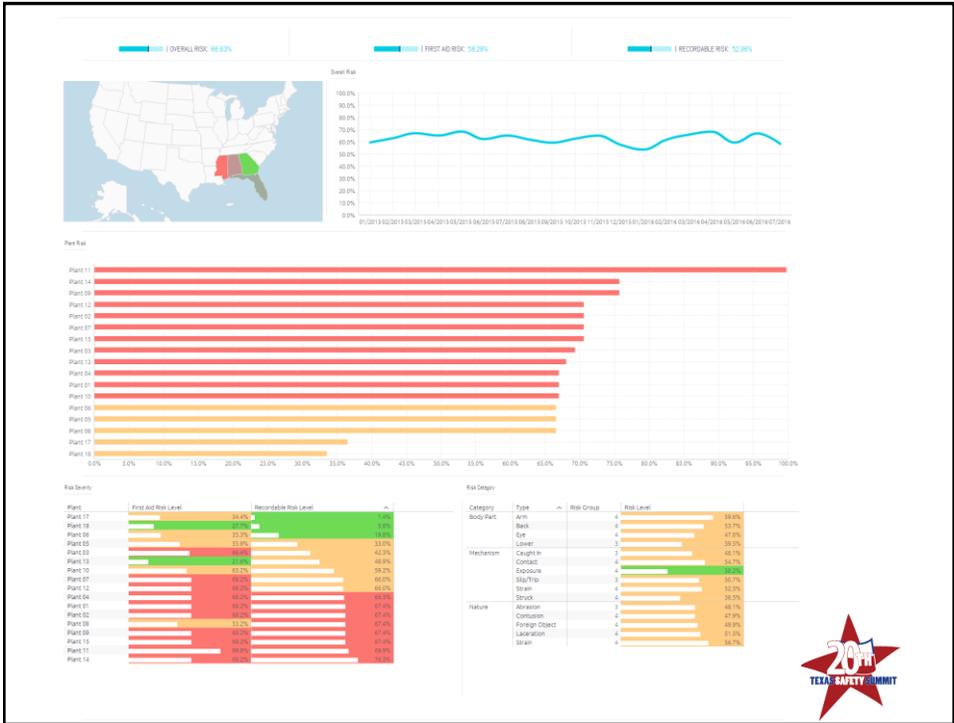


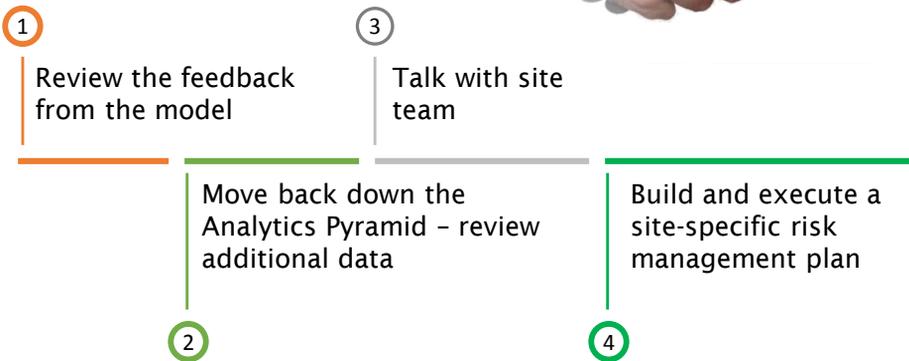
■ Training Data ■ Test Data



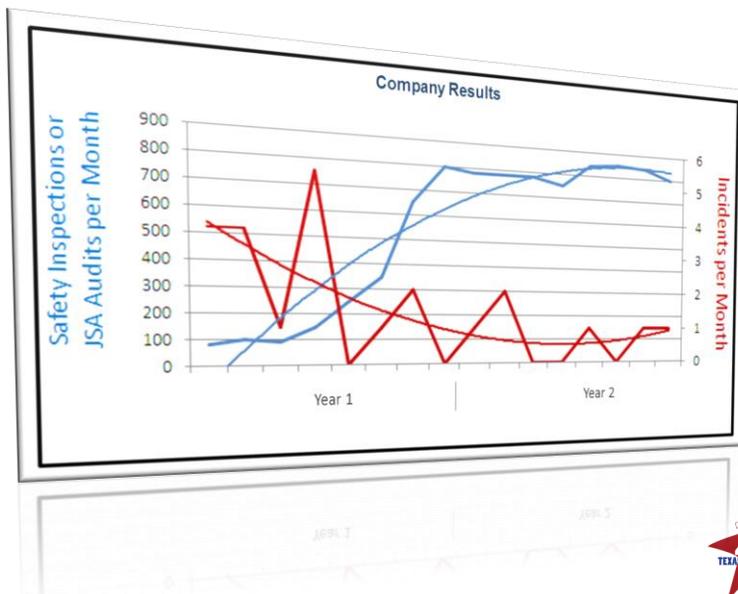
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Tremendous Results!





“A statistical **plateau** of worker fatalities is not an achievement, but evidence that this nation’s effort to protect workers is stalled. These statistics call for nothing less than a **new paradigm** in the way this nation protects workers.”

- Terrie Norris, President, ASSE



Safety program evolution

Chart Area
Traditional

MODERN

Incidents

Incident Investigation

Improved Safety Programs

Advanced & Predictive Analytics

What You Can Do?

- Get IT involved
- Prepare your data
- Find services (Google, Microsoft, IBM, many more)
- Hire data scientists (consultants or staff)
- Not enough data? Find cohorts



THANK YOU! QUESTIONS?

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