Analytics and Decision Making with Big Data: Big Opportunities and Big Pitfalls

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What is in Big Data?

- **Define Practical Big Data with 4V's:**
  - Volume (Data Quantity)
  - Velocity (Data Rate)
  - Variety (Data Types)
  - Veracity (Messiness)

Why Do We Have Big Data Now?
Why Did Not This Exist Before?

- **The Key Enablers of Big Data**
  - Increase in (affordable) storage capacities
  - Increase in processing speed and (affordable) computation
  - Increase in the availability of data
    - Massive deployment of sensors, data acquisition (e.g., smart phone)

- As a result, we generate 2.5 quintilion bytes of data every day.
  (2.5 x 10^{18}, or roughly 2.5 million terabytes)

- It is estimated that 90% of all our data was generated in the last two years.

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How Much Data Do We Generate Really?

- **Every minute, we generate:**
  - More than 204 million email messages
  - Over 2 million Google search queries
  - 48 hours of new YouTube videos
  - 684,000 bits of content shared on Facebook
  - More than 100,000 tweets
  - $272,000 spent on e-commerce

Big Data: What is Good, What is Bad?

- **The Good:**
  - Big
  - Timely
  - Predictive (sometimes)
  - Cheap (usually)
- **The Bad:**
  - Unknown population representation
  - Issues of data quality
  - Privacy and confidentiality issues
  - Difficult to assess accuracy and uncertainty

Where are Some of the Classical Applications?

- Smarter health care:
  - 80% of data is unstructured and clinically relevant.
  - Data in multiple places: lab and imaging reports, physician notes, medical correspondence, claims.

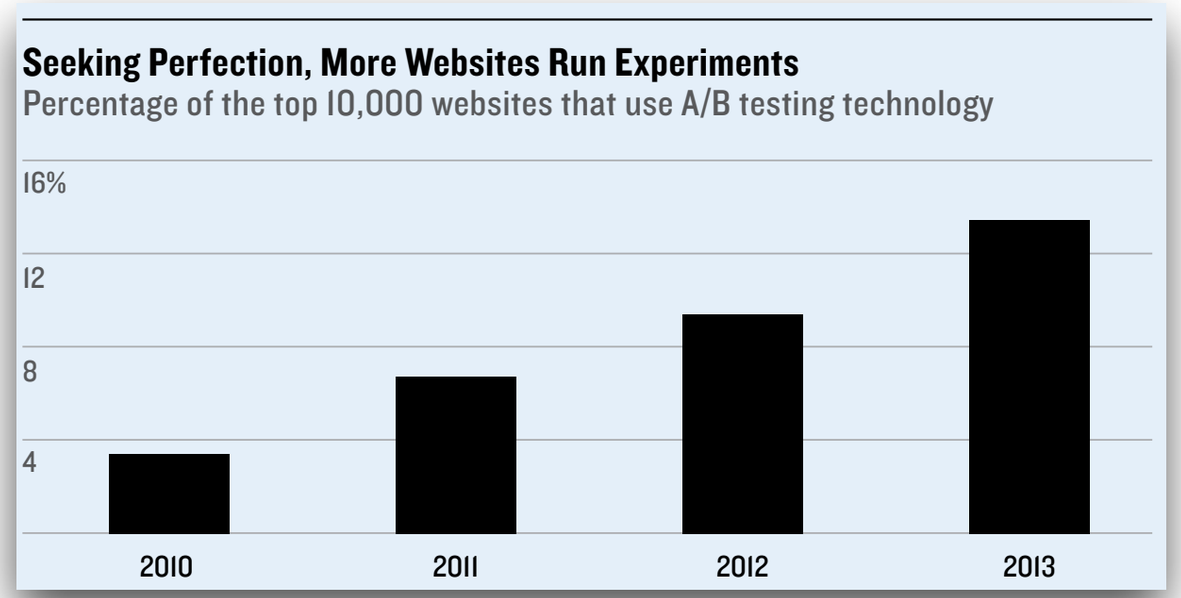
How Can We Utilize Big Data Now?
Experimentation for Better User Experience

- Optimizely runs “experiments” to decide how your website looks, how it is organized, and what goes on your website.
    - Slightly different versions of the website are provided the different users, and users’ interaction with the website is measured. — The data decides the winner.

Optimizely

- Google experimented with 41 different shades of blue to decide the current.

- Optimizely made many of the devisions for Obama’s online campaign.



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Scientific Method for Business Development

- Scientific method is based on **controlled experiments** that offer evidence for how nature really works.
- Big tech companies like, Facebook, Google, Microsoft, Amazon utilize experiments reap benefits/profits utilizing big data.

- However, there are number of pitfalls:

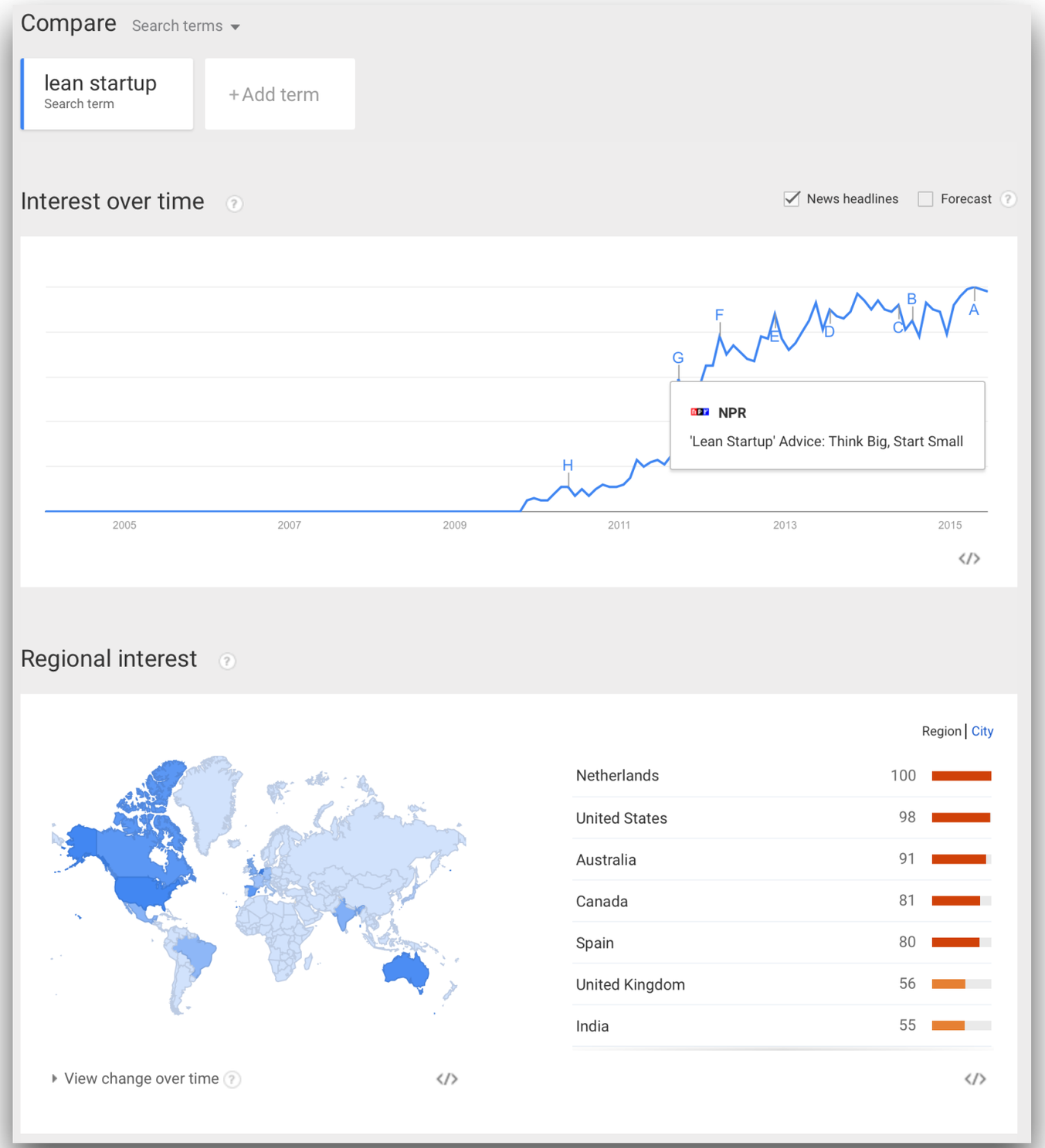
The New York Times

Facebook Tinkers With Users' Emotions in News Feed Experiment, Stirring Outcry

JUNE 29, 2014

Facebook revealed that it had altered the news feeds of over half a million users in its study.

Quickly Rule Out Bad Ideas



- Do you have an interesting idea?
- Quickly experiment with a few customers and observe the results, before you invest.

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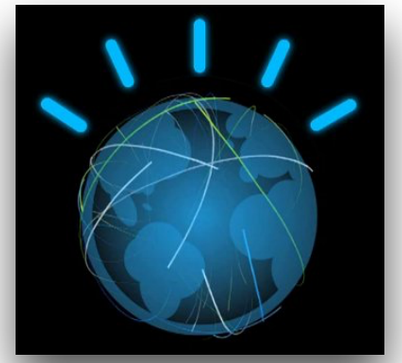
Other Potential Pitfalls

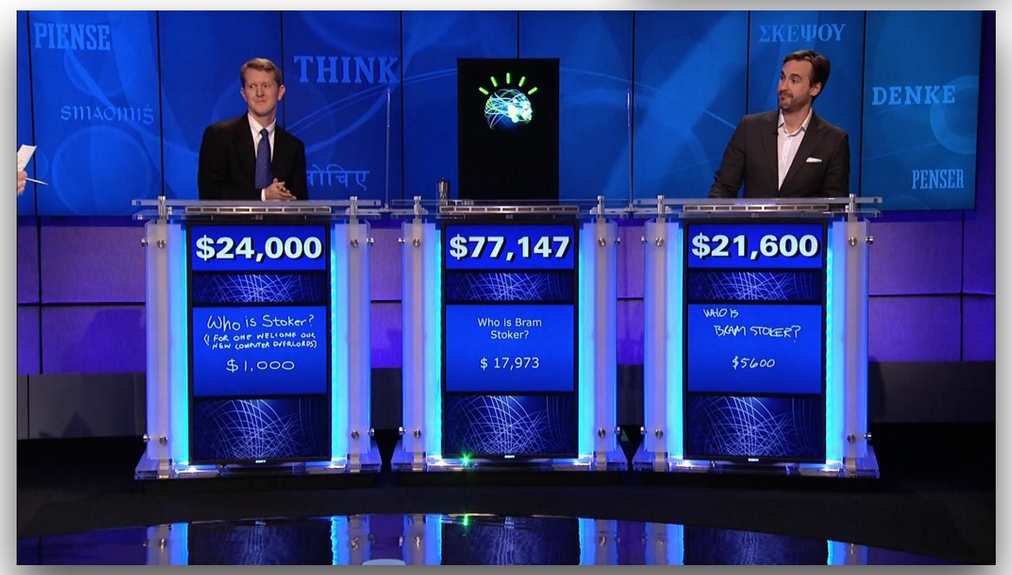
- **Over-reliance on data:**
  - Could not see the 2007-2009 financial crises, mainly due to confidence for positive data.

- Complex human phycology, human interactions create data:
  - Why “Charlie Bit Me” and “Gangnam Style” have been the most-viewed videos on YouTube?

Where is Watson Headed?



- Watson become famous by winning *Jeopardy!*



- IBM created the Watson Group, working solely on Watson, as a result of merging with ‘cognitive computing’ groups at IBM.
  - The Watson Group has its own operational officers (e.g., its own CTO), and it directly reports to IBM’s CEO.
  - Roughly 2,000 people work for the Watson Group
  - IBM hopes to generate $10 billion in revenues.
  - Currently, the group generates roughly $100 million in revenues.

- “You have to put this stuff into action and refine it. You need examples to work on”
  - Rob High, *Watson Group CTO.*

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What Can Watson Do Today?

- Focuses on the analysis of unstructured data:
  - Analysis of text, images, audio, and video.
- Applications of audio and video are also vast:
  - Audio data in call centers, meetings.
  - Video data in cameras and movies (e.g., consider a movie recommendation tool that actually watches the movies!)

- “It will be a Watson system that can hear, see, and talk.” - Rob High

- The Watson Group currently targets:
  - biomedical industry (e.g., cancer diagnosis)

What May Be Even More Powerful?
On Human-Computer Decision Making

- IBM's computer Deep Blue defeated Gary Kasparov in 1997. It was big!
- Even bigger in the chess world:
  - In 1995, two U.S. amateurs armed with three PC's defeated the best players/computers!!
  - It changed the field, many grandmasters started training with computers.

What May Be Even More Powerful?
On Human-Computer Decision Making

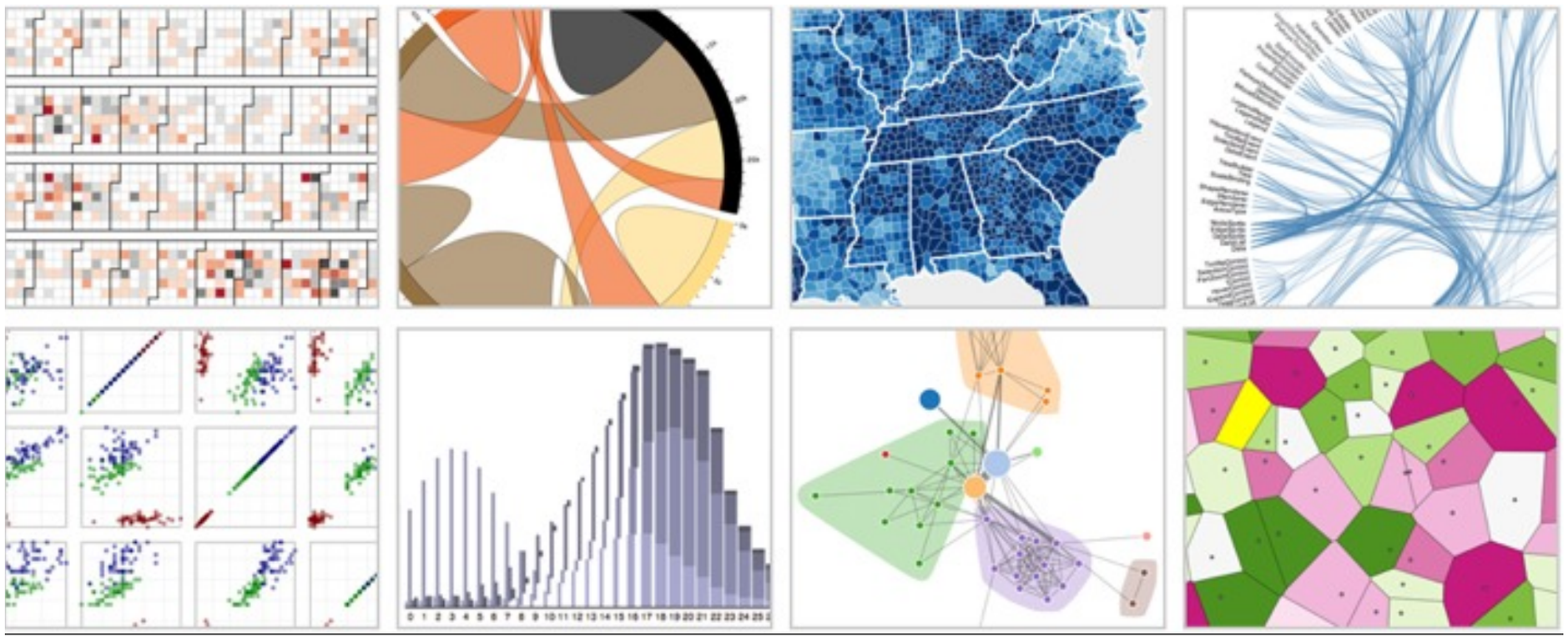
- Palantir is founded by ex-PayPal-engineers, who designed an automated system to catch fraud using big data.
- Their software caught 80% of the cases. The remaining 20% chased by people.
- At Palantir, they provide tools that fosters, what they call “human-computer symbiosis”.
- Palantir was valued at $15 billion in January of 2015.

Data Visualization

- Good “human-computer symbiosis” requires tools that go beyond optimization, statistics, and machine learning.

- Excellent **data visualization** and **interfaces** may be key tools for the next-generation managers, engineers, business professionals, …

- *We will look into rapid data visualization and rapid interfacing next!*



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