Life After Grad School

Using Your Physics Degree
at Internet & Tech Companies:
Data Science and Predictive Modeling

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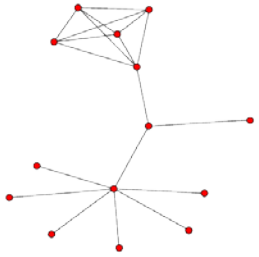
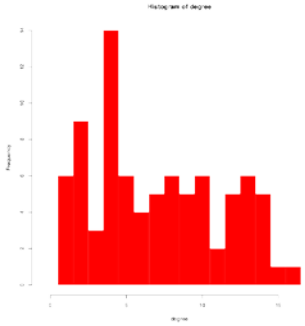
Outline

- Introduction
- Physics Grad School 2003-2010
- Transitioning to industry 2009-2010
- Studying and Interviewing
- Insurance R&D 2010-2012
- Decision Science 2012-present
- Conclusion

Physics at U of M

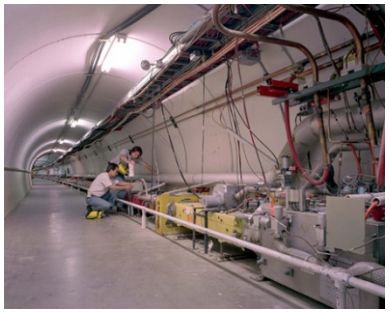
- 2003-2010
- Studied under 4 advisors (not necessarily recommended!)
  - Econophysics / Condensed Matter Theory
  - Condensed Matter Experiment
  - Back to condensed matter theory
  - Experimental High Energy Particle Physics at Fermilab
- Learned about social networks – turned out pretty useful
- Found interesting problems along the way
  - Optimal binning of data
  - Evaluating goodness-of-fit for models

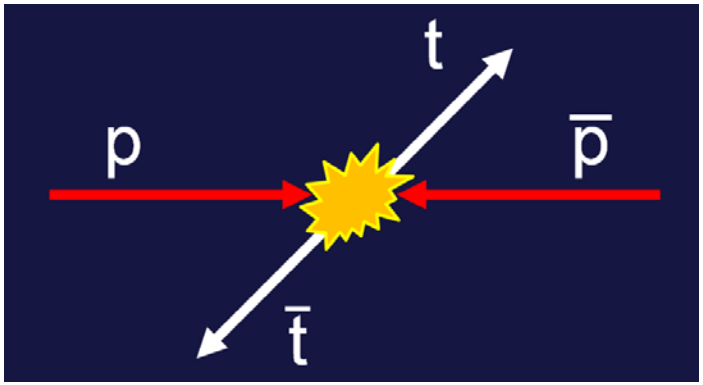


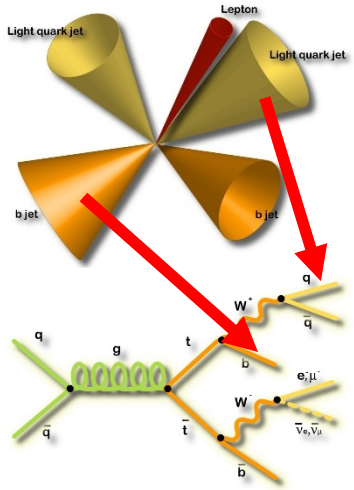


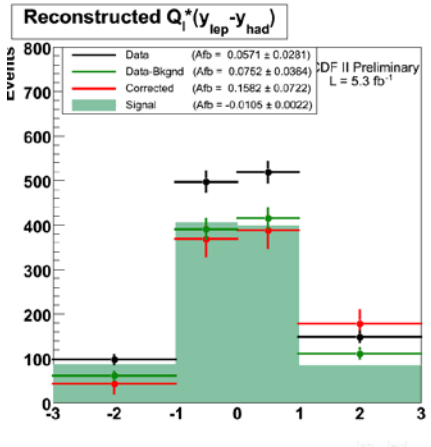
Physics at Fermilab

- 2006-2010
- Enjoyed working with people from different countries
- Learned several new computer languages and analysis techniques
- Loved Chicago!









5.3 fb^{-1} of data (p27)

Why did I leave academia?

- Fermilab was shutting down… I'd have to move to Europe to continue
- Highly competitive – only a handful of my cohort in HEP have academic positions
- Didn't want to apply for grants
- Wanted to study more human-based data – I didn't have intuition for top quarks like I might for car accidents or internet purchases
- My interests changed – computer science, predictive modeling, statistics
- Why leave physics altogether? HEP has no direct industries to my knowledge
- Shorter work hours (potentially)
- Higher pay

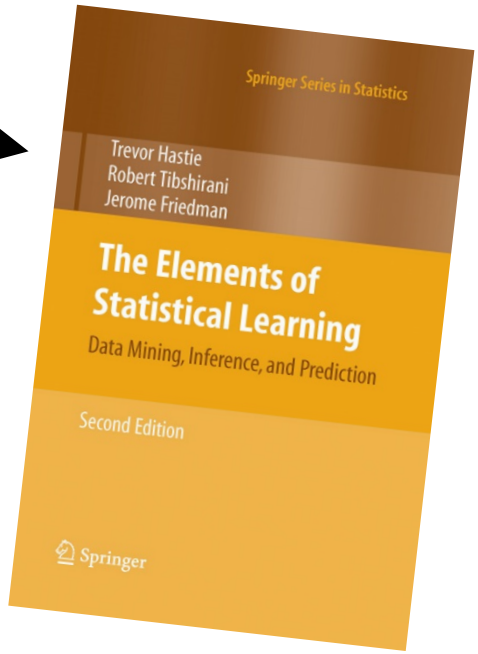
?

What did I fear?

- Would the problems be boring?
- Would my freedoms be restricted? (work hours, dress code, tools, etc.)
- Would I have access to good tools/computing resources?
- Would I get along with my managers and coworkers?
- Were there opportunities for advancement?
- Long hours?
- Too much or too little travel?
- Job stability?
- Would I succeed, or fail?
- Would I hate my job?

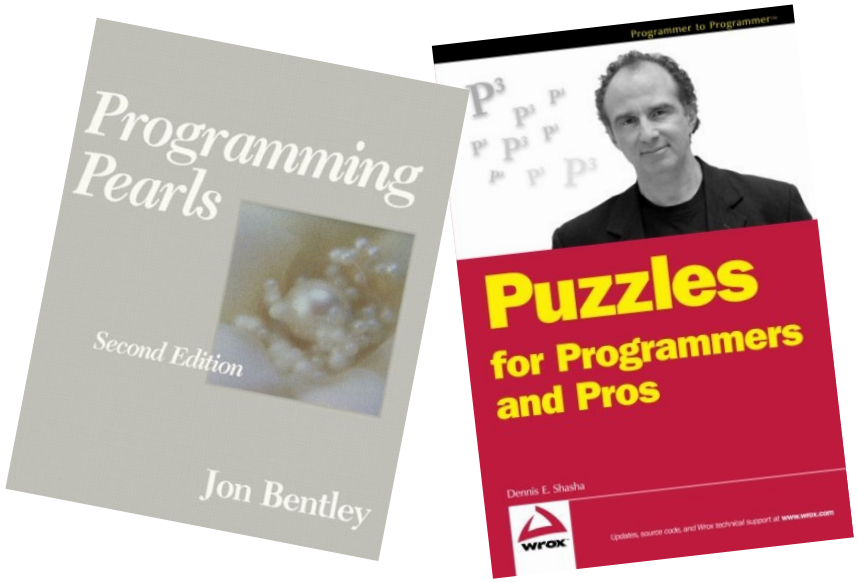
Netflix Prize and Statistical Learning

- 2009-2010 – decided that I wanted to investigate jobs
- Learned about the Netflix Prize
- Started hearing about the terms "predictive modeling" and "statistical learning" – read a lot of Wikipedia
- Did a LOT of Amazon surfing and found the best books in the field, read as much as I could
- Note: my friends who transitioned from physics to finance did similar self-study of finance books

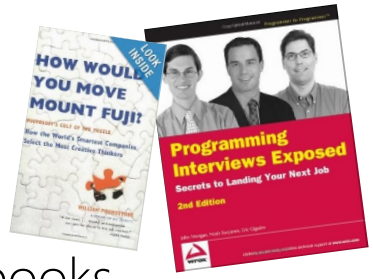


Interviewing with Google

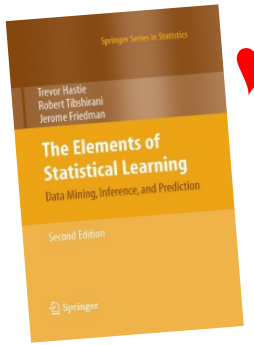
- 2010 interviewed with Google
- Use connections on LinkedIn to land interview
- Their team gave me a book list to study
- Be prepared to do live coding! (they used Google Docs to watch me code solutions to their interview questions)
- I passed a few initial rounds… but the interviews are very difficult, especially for object-oriented programming
- Google has the luxury of being very selective, so knowing physics isn't enough



Interviewing with Insurance Company



- 2010 interviewed with a national insurance company
- Again used connections on LinkedIn to land interview!
- Read some Microsoft interview questions and other puzzle books – really helped me feel confident and think like an interviewer



- Interviewers were impressed that I had been reading Elements of Statistical Learning – they had a reading group at the company for the same book!
- Most difficult interview questions were related to confounding variables and selection bias, but the interviewer didn't want to use those terms and lead me, so I had to finally figure out what he was really asking.
- Be prepared for 6+ hours of interviews… this can be exhausting and stressful, which is part of the test

Insurance

- 2010-2012
- Decent first job out of grad school
  - 4x increase in pay!
  - Didn't need any experience other than my grad research
  - Learned SAS on the job
  - Learned a lot about corporate life, management styles
- Unfortunately…
  - Technology and analysis methodology were not up to FNAL/physics standards
  - I didn't care for SAS – an archaic, clumsy language
  - Was not allowed to use many open source solutions (however, I did learn R)
  - Had several issues with management – they did not value creativity and were threatened by PhDs

Insurance

- More good points:
  - Learned new ways to THINK, namely, organizing my time, energy, and goals to align with business needs
  - Started finding new intellectual problems
    - How does one bin data correctly/optimally?
    - How does one treat missing values?
    - How does a company implement a model effectively? Can some parameters of a model be static? Should they?
  - Found new tools, increased my skillset
    - SQL
    - R
    - SAS

Insurance

- More bad points:
  - Company was VERY hierarchical, managed in a top-down way – it was difficult to be noticed, heard, or to make a difference
  - Projects were highly managed, and implementation of an idea could take years
  - Our research division was poorly managed, and it became more-and-more obvious that things weren't healthy – after a year, I began actively looking for a position away from insurance
  - In the space of +/- 3 weeks of my notice to leave, 5 other people similarly left
  - Eventually the group was re-organized and people were laid off

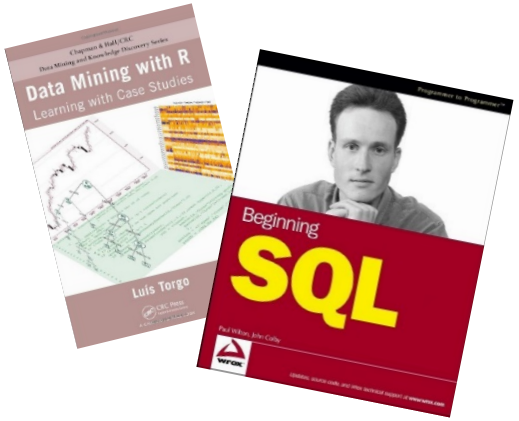
What did I fear?

- Would the problems be boring? YES
- Would my freedoms be restricted? (work hours, dress code, tools, etc.) restricted tools
- Would I have access to good tools/computing resources? no
- Would I get along with my managers and coworkers? some
- Were there opportunities for advancement? maybe
- Long hours? **no, but I hated being there**
- Too much or too little travel? **fine**
- Job stability? evidently not
- Would I succeed, or fail? **was on track to fail**
- Would I hate my job? YES

Time to leave!!

Interviewing… again…

- During my job search, I knew I wanted to leave insurance, but where should I go? Did a lot of self-searching.
- Did some personality tests / career tests
- Used LinkedIn, Dice, Monster, PhDJobs.com, etc.
- Reviewed my earlier books
- Began studying additional skills – SQL, R, finance
- Had phone interviews with a ton of companies – think of it like dating
- Interviewed with several companies
  - Sears
  - demographic data companies in Chicago
  - Amazon
  - Dotomi



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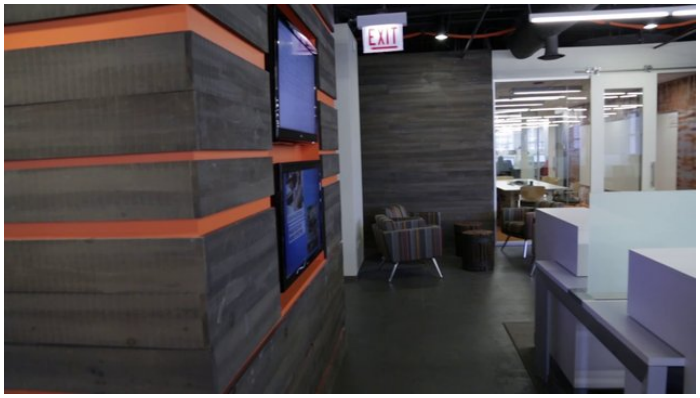
- Flat structure – little hierarchy, small team size
- Ideas implemented immediately – I can see the results of my work
- Freedom of schedule – little-to-no micromanaging
- Creativity valued!
- Not just large data, but truly BIG data!
- Excellent computing resources
- Young, talented co-workers, excitement, and a fun work environment
- Slight increase in pay – I didn't need to sacrifice anything to move to this better job



Introduction

http://chicagocreativespace.com/valueclick/

So what exactly does ValueClick do?

Internet ads, for products you use every day!

Ads with Style

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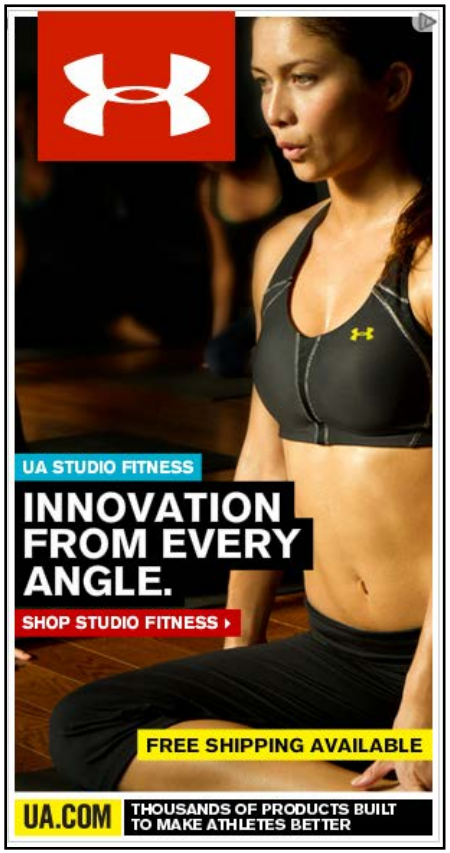
Personalized Treatment



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One Watch, Different People

MAN
SINGLE
35-45
NEW YORK CITY
OVER 150 K

★8 TRANSACTIONS
★$1350 SPENT IN THE LAST 6 MONTHS
★RISK-TAKER
★FLASHY STYLE
★THE FINER THINGS IN LIFE
★ALWAYS IN THE MARKET

WOMAN
MARRIED
35-45
CHICAGO SUBURBS
OVER 75 K
CHILDREN PRESENT AGE 6-10

★3 TRANSACTIONS
★$600 SPENT IN THE LAST 6 MONTHS
★CLASSIC COMFORT
★VALUE SHOPPER
★GIFT-GIVER
★RESEARCH ONLINE/BUY OFFLINE

MAN
EXECUTIVE
55-65
OVER 250 K
DIVORCED, NO CHILDREN
WATCHES ABANDONER

★QUALIFIED PROSPECT
★3 SITE VISITS IN LAST 45 DAYS
★RISK-AVERSE
★THE FINER THINGS IN LIFE
★LUXURY STYLE
★VALUE SHOPPER

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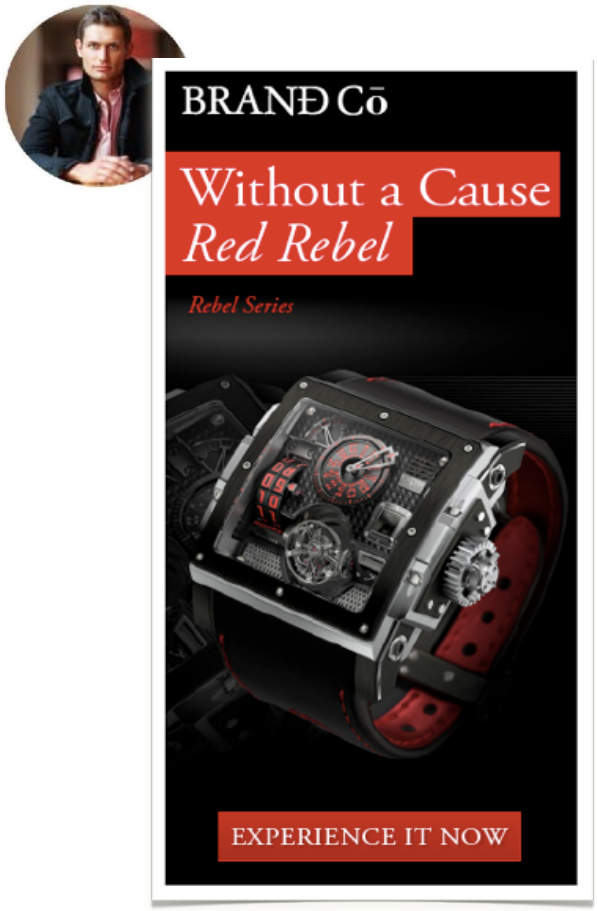
One Watch, Different People



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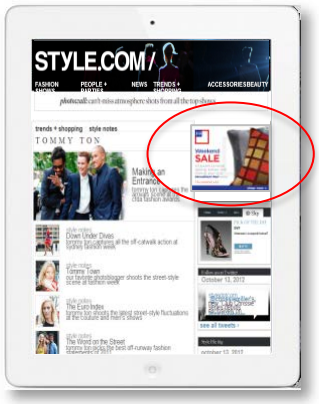
CONSUMER JOURNEY ACROSS DEVICES

ID 9A73NQ1

Breakfast Browsing



Lunch Time

Commute Home

Evening on the Sofa

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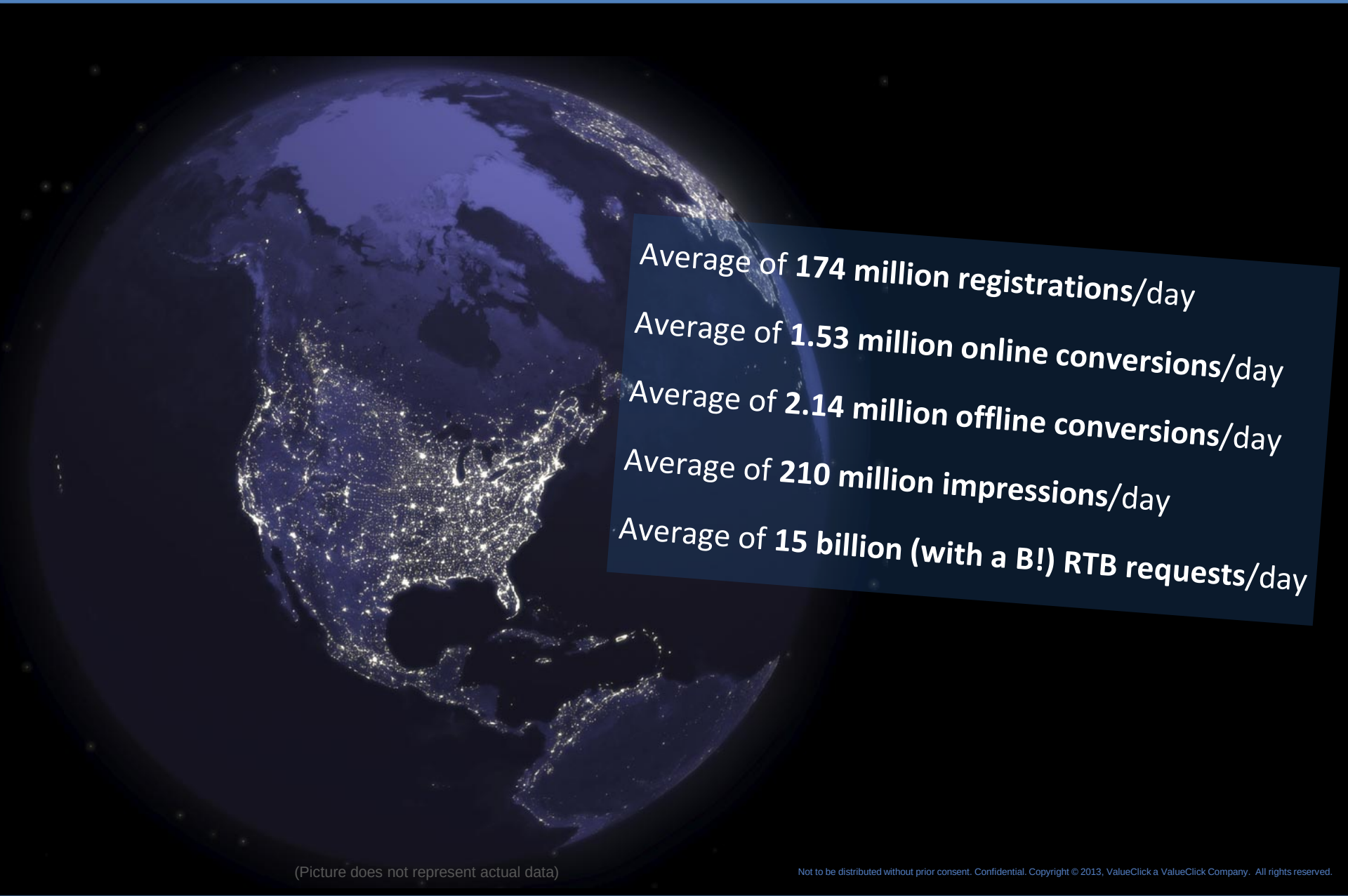
DOTOMI VOLUMES – FROM Q4 2012



Average of **174 million registrations**/day

Average of **1.53 million online conversions**/day

Average of **2.14 million offline conversions**/day

Average of **210 million impressions**/day

Average of **15 billion (with a B!) RTB requests**/day

(Picture does not represent actual data)

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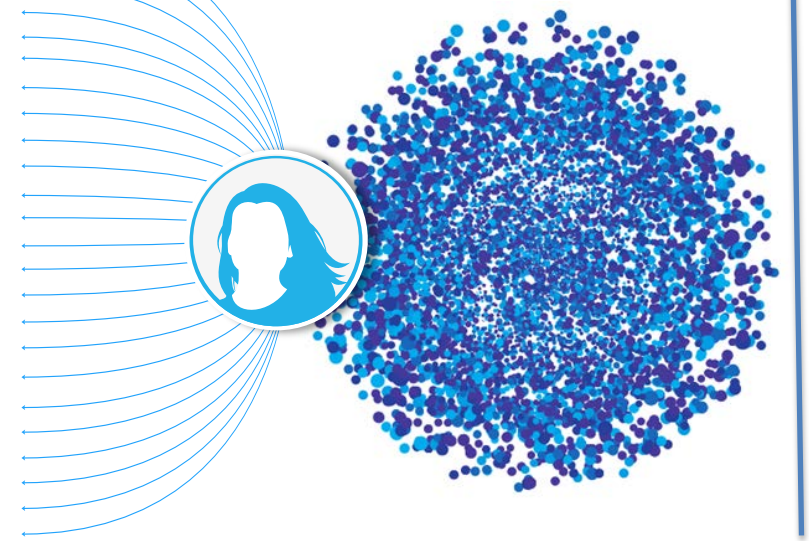
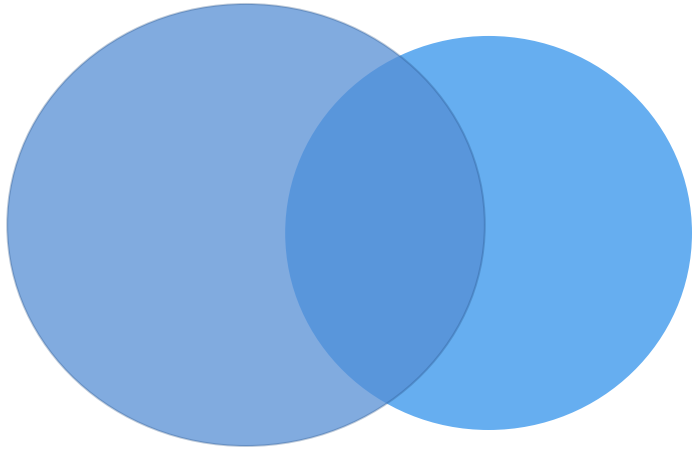
BUILDING AN ADDRESSABLE AUDIENCE

Multidimensional profiles are the foundation for data-driven communication.

CATALOG
ACQUISITION
SITE VISITATION
CATEGORIES VISITED
LAST VISIT DATE
CLIENT SCORING
CREDIT CARD
EMAIL
OFFLINE
ONLINE
GEO
AGE
GENDER
HOUSEHOLD INCOME
MOVER
OF VISITS
OF PURCHASES
UNITS PER TRANSACTION
CATEGORY
SUBCAT
PRODUCT VISITED
PREFERRED CAT/SUB
EMAIL SUBSCRIBER
PROMOTIONS



80MM+ MULTIDIMENSIONAL PROFILES



50MM+
Unique Site Visitors
(13 months)

30MM+ Offline
Buyer File

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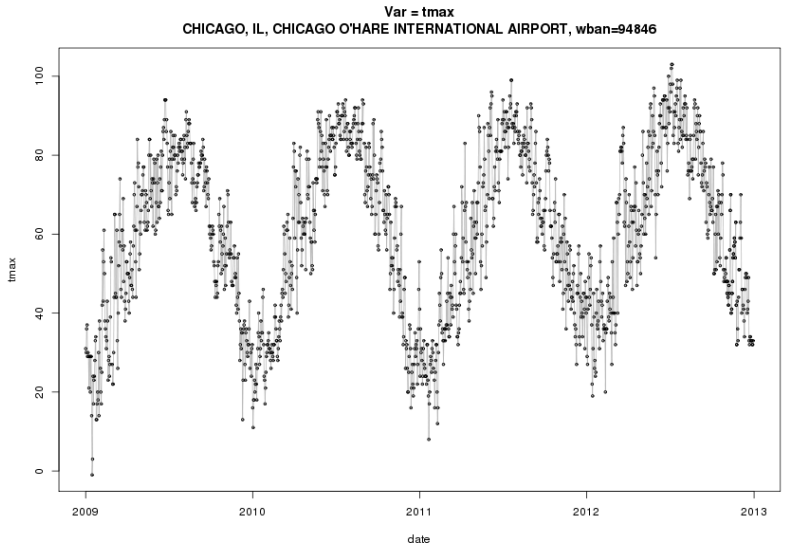
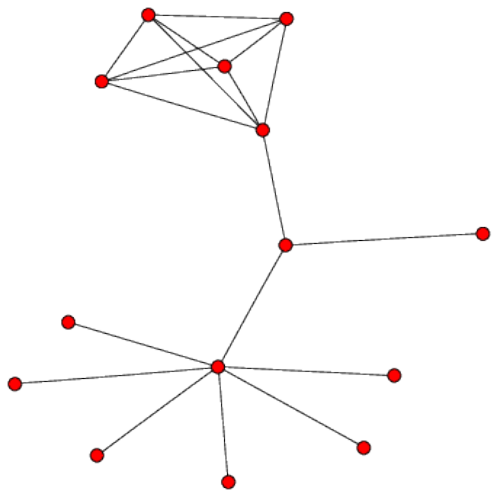
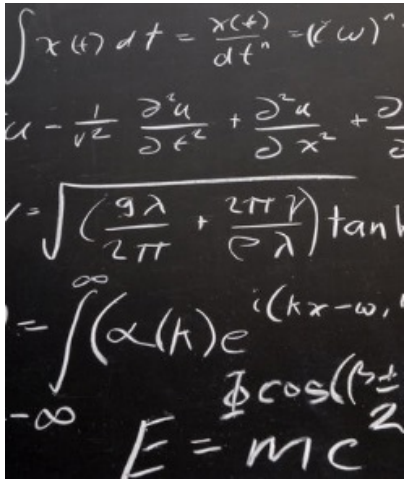
- Some projects I've worked on so far:
  - Found correlations between local weather and client sales
  - Evaluated predictive power of new 3rd party internet data sources
  - Network analysis (Brian Ball's summer project)
  - Matching, matching, matching!







What did I fear?

- Would the problems be boring? **no, interesting!**
- Would my freedoms be restricted? (work hours, dress code, tools, etc.) **casual, use SQL+R!**
- Would I have access to good tools/computing resources? **yes**
- Would I get along with my managers and coworkers? **yes**
- Were there opportunities for advancement? **maybe (flat organization)**
- Long hours? **yes, but I love being here**
- Too much or too little travel? **none**
- Job stability? **yes, but rapidly changing environment**
- Would I succeed, or fail? **succeeding**
- Would I hate my job?

No, I love it!

Good fit for me!

Advice

- Prepare!
  - You will be competing with talented people for every job
  - Read some books
  - Polish up your résumé
  - Practice interviewing – accept interviews even if you think you won't accept the job – it's good interview practice
- Be confident and take risks – why not apply to Google or Amazon?
- Be present online – social networks, job sites, etc.
- Network – most of my interviews came from knowing someone
- Be selective – I wish that I had interviewed longer before accepting my first job

Questions?

Any questions?

Thank you for your time today!