Overview

• About Yahoo! and its business
• The Evolution of “Social Media”
• The Evolution of the Publishing Model
• Understanding the new Phenomena of the Internet and Social Media
• Yahoo! Research
• Overview of Some Research Challenges
• Concluding Thoughts
Globally, Internet Users Will Number Over 1 Billion by 2007

Yahoo! is the #1 Destination on the Web

73% of the U.S. Internet population uses Yahoo! – Over 500 million users per month globally!

- Global network of content, commerce, media, search and access products
- 100+ properties including mail, TV, news, shopping, finance, autos, travel, games, movies, health, etc.
- **25 terabytes of data collected each day... and growing**
  - Representing thousands of cataloged consumer behaviors

More people visited Yahoo! in the past month than:
- Use coupons
- Vote
- Recycle
- Exercise regularly
- Have children living at home
- Wear sunscreen regularly

Data is used to develop content, consumer, category and campaign insights for our key content partners and large advertisers.

Sources: Mediamark Research, Spring 2004 and comScore Media Metrix, February 2005.
Yahoo! Data – A league of its own...

GRAND CHALLENGE PROBLEMS OF DATA PROCESSING

TRAVEL, CREDIT CARD PROCESSING, STOCK EXCHANGE, RETAIL, INTERNET

Y! Data Challenge Exceeds others by 2 orders of magnitude
Advertising: Brand and DR

Knowledge of users & their behavior throughout the purchase funnel can grow brand & direct response revenue

> $200B Brand Advertising Market

Most time & activity is in consideration & engagement, but there are limited metrics & reach strategies

> $200B Direct Marketing Market
A question for the Audience:

Why is search-related advertising so powerful?
Moving Customers up the Funnel

Impulse Banners

- Target users based on their activity – both search and property -- within the NEXT HOUR
  
  - Behavioral Categories – Apparel, Computers, Home Appliances – all the same categories that you can use for regular behavioral targeting!
Impulse Banner Example

1. User searches on the word “Credit Card”

2. Sees that “Credit Card” falls under the category: “Finance/Credit and Credit Services”

3. Yahoo! serves “Finance/Credit and Credit Services” banners to User anywhere on the Yahoo! network within 1 HOUR

25% - 261% higher CTR than RON
Way Impulse Works

- Searches are not at all associated or tracked through personally identifiable information.
- No long-term memory of search terms, all stored on client cookie.
- We generalize the category is targeting is at generic category: e.g. Financial Services, not “credit card”.
- All targeting done in anonymous mode.
Behavioral Targeting: Shoppers

1,900,000 people looking for mortgage loans.

Includes users anywhere on the Yahoo! Network who actively manifest Interest.

Users searched keywords such as:
- Mortgages
- Home Loans
- Refinancing
- Ditech

Users visited pages such as:
- Financing section in Real Estate
- Mortgage Loans area in Finance
- Real Estate section in Yellow Pages

Source: Campaign Click thru Rate lift is determined by Yahoo! Internal research. Conversion is the number of qualified leads from clicks over number of impressions served. Audience size represents the audience within this behavioral interest category that has the highest propensity to engage with a brand or product and to click on an offer.

Results from a Jan’2007 campaign on Yahoo! Network

Y! Finance Audience  Mortgage Loans Target  Mortgage Loans Target

+121.9% CTR Lift

+626.0% Conv Lift
Moving Down the Funnel

- New generation marketing solutions to take brand advertisers down the marketing funnel
Types of Data Captured Across the Yahoo Network

- Demographics (Registration)
- Attitudinal (Survey)
- Behavior (Clickstream)
- Interests (Declared)
- Interests (Inferred)
- Shopping (Research/Transactions)
- Search Interests (Key Words)
- Campaign Response (View/Click)
- Attitudinal (Survey)
Identifying Car Shoppers

1. Identify relevant actions that indicate buying intent and aggregate them on an user basis
2. Compute a “purchase intent” score for each user
3. Segment results by score to identify top prospects

- Browse specs  - Loan Calculator
- Compare vehicles  - Configure and price

- Car manufacturers  - Car dealers
- Car buying guides

- Local dealer lookups

Yahoo! search
Yahoo! Local Yellow Pages
Strategic Data Solutions
FIND. REACH. KNOW.
What Can We Do With This Data?

• Using rich click stream data on Y!, we can identify consumers shopping for a car...
  – Capability unique to online medium; hard to identify “in the market” consumers off-line

• ...with a reasonable degree of accuracy
  – 70% identified “in the market” users looking to buy within 3 months
  – 24% users said they actually made a purchase within a month (results from a self-reported survey)
How Big is the Opportunity?

• Can identify ~250,000 “leads” a month on Yahoo (at 90% confidence level)
  – About 30% of total new cars sold in the U.S. every month to individuals

• More opportunities
  – Car financing, Car insurance, Used car listings
  – Other categories: travel intenders, high net worth individuals, small businesses, etc...
An Example

- A test ad-campaign with a major Euro automobile manufacturer
  - Designed a test that served the same ad creative to test and control groups on Yahoo
  - Success metric: performing specific actions on Jaguar website

- Test results: 900% conversion lift vs. control group
  - Purchase Intenders were 9 times more likely to configure a vehicle, request a price quote or locate a dealer than consumers in the control group
  - ~3x higher click through rates vs. control group
Brand Ads and Search Ads Interact!

- Is ad search strategy enough for a direct marketer?
- Do brand ads play a role in search advertising?
- Harris Direct Case Study
Case Study: Harris Direct

Viewing These Ads:

On: {Yahoo!, Finance, Mail, My Yahoo!, HARRISdirect}

Had This Effect On:

• Aided Brand Awareness  
  - Up 7%

• Brand Favorability  
  - Up 32%

• Purchase Intent  
  - Up 15%
Case Study: Harris Direct

People who saw display ads were **61% more likely to search** on related topics…

...and drove **139% more clicks** on algorithmic and sponsored links…

...specifically driving **249% more sponsored search clicks**…

...and driving **91% more activity** on the HarrisDirect.com website.
Social Media and Yahoo! Research

Example of challenges of inventing the new sciences of the Internet
Evolution of Social Media

• Although the “traditional notion” of portal and web content is still attracting growing audiences

• The original notion of “publishing content” to attract audiences is changing fast
  – As people discover the fact that the Internet is an Interactive Medium
  – The uses of the Internet enter areas we could not imagine a short time ago

• A new notion of “publishing” is fast emerging
  – The opportunity of user-generated content
Examples of Social Media

- Blogs
  - The individual as publisher
  - Comments and tags part of the process
- Sharing Photos: e.g. Flickr
- Social Search
  - My Web 2.0
  - Yahoo! Answers
  - Del.icio.us
- Web communities:
  - Yahoo! Groups
  - Individual web presence: Facebook, MySpace, Yahoo! 360, Friendster, ...
- Video sharing: You Tube, Yahoo! Video, etc...
Something Special is Happening on the Internet...

Web 2.0

User Generated Content

Culture of Participation

Wisdom of Crowds
Moving beyond “users”…
Web 2.0 Community Dynamics

100% creators
100% synthesizers
100% consumers
Anyone with a ________ is now a ________

keyboard camera iPod browser

author photographer deejay publisher
Photos from your contacts

Or, only show photos from your family and friends

From cbug
From thinvox
From rmaier
From jhaddickerson
From shaneahern
From flicknere

From jeannieh
From Marc Davis
From heather
From Kenneth Norton
From Brett003
From Bahr

From Ross Mayfield
From lantzilla
From Trexgirl
From simonpk

Research

What makes Flickr special?

1. User Generated Content

Content not licensed from providers such as Corbis or Getty, but rather contributed by users.
2. User Organized Content

Content is tagged, described, organized, discovered, etc. not by “editors” but by the users themselves.
Number Six says:
Wonderful composition - so much to hold one's interest.
Posted 8 months ago. (permalink)

 glaciergirl says:
Beautiful in so many ways.
Posted 8 months ago. (permalink)

 ken mccown says:
Wow! gorgeous on so many levels.
Posted 8 months ago. (permalink)

David Nicolas [deleted] says:
Stunning :)
Posted 8 months ago. (permalink)

Tilak Abeyasinghe says:
Fantastic picture. Congratulations
Posted 8 months ago. (permalink)

 Magic™ says:
Amazing .. breathtaking photo..
Posted 8 months ago. (permalink)

Scatti di vita says:
Molto bella!!
Posted 8 months ago. (permalink)
3. User Distributed Content

Flickr achieved distribution across the internet, not through “business deals” per se, but rather through the Flickr community which distributed Flickr content on 3rd-party blogs.
4. User Developed Functionality

Flickr exposed APIs (PHP, Perl, etc.) that allowed the community of developers to build against the Flickr platform.
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Flickr exposed APIs (PHP, Perl, etc.) that allowed the community of developers to build against the Flickr platform.

Entire ecosystem created by less than ten employees… aided by millions in the Flickr community.
Yahoo! Research
Inventing the new sciences of the Internet
New Science?

- The Internet touches all of our lives: personal, commercial, corporate, educational, government, etc...

- Yet many of the basic notions we talk about:
  - Search, Community, Personalization, Engagement, Interactive Content, Information Navigation, Computational Advertising
  - Are not at all understood, or well-defined
  - These are not disciplines that academia or any industry research labs focus on...
Areas of Research

• **Community:**
  - How do you know what to believe on the Internet?
  - Trust models on-line and trust propagation
  - What makes communities thrive? Whither?
  - Social media, tagging, image and video sharing

• **Microeconomics:** a new generation of economics driven by massive interactions
  - Auction marketplaces
  - The web as a new LEI of activities and economies

• **Information Navigation and Search**
  - We are in the early days of search and retrieval

• **Computational Advertising**
Mission & Vision

Vision: Where the Internet’s future is invented – with innovative economic models for advertisers, publishers and consumers.

Mission: NEXT -- Invent the Next generation Internet by defining the future media to Engage consumers and eXtend the economics for advertisers and publishers through new sciences that establish the Technical leadership of Yahoo!
How we get there

- Scientific excellence
  - World-recognized leadership through Business impact
  - Build the Largest, Deepest and Smartest Research Organization focused on a few chosen areas
  - Explore areas that nobody else is exploring
  - Open model with strong emphasis on publication, peer review, and real problems
A sampling of the Top Researchers now at Yahoo! (Search)

- Prabhakar Raghavan: CTO Verity, Web Research architect at IBM, Head of Y!R
- Andrei Broder: inventor of key search, web spam, technologies
- Andrew Tomkins: chief Scientist of WebFountain, inventor of key algorithms, structure of Web graph
- Ricardo Baeza-Yates: renowned expert in text and query mining, authored seminal texts in IR
A sampling of the Top Researchers now at Yahoo! (Community, Social Media, and User Experience)

- **Raghu Ramakrishnan**: world authority on data mining, database systems, and community/social search

- **Duncan Watts**: world expert in social networking, lead Yahoo!’s research in human social dynamics. Columbia University, director of the Collective Dynamics Group. Author of *Six Degrees: The Science of a Connected Age*.

- **Malcom Slaney**: multimedia analysis and user models, organized the Stanford CCRMA Hearing Seminar, IBM's Almaden Research Center, Interval Research, Apple's Advanced Technology Group, Schlumberger's Palo Alto Research Laboratory, and Bell Labs. Coauthor of *Principles of Computerized Tomographic Imaging,* and *Computational Models of Auditory Function.*
A sampling of the Top Researchers now at Yahoo! (Microeconomics)

- **Preston McAfee**: VP and Research Fellow at Yahoo! Research in Burbank, CA, leads Microeconomics research. Prof at Caltech. Author *Introduction to Economic Analysis*, and *Incentives in Government Procurement*. Author of *Competitive Solutions: The Strategist's Toolkit*. One of 4 editors of the *American Economic Review*, the most prominent economics journal.

- **Michael Schwarz**: renowned economist, auctions, web, Faculty at Harvard and U.C. Berkeley, was a National Fellow at the Hoover institution at Stanford, a Robert Wood Johnson Foundation Scholar at UC Berkeley.

- **David Pennock**: world expert on expertise is the design and analysis of prediction markets. Very well known experiments with on-line marketplaces.
Yahoo! Case Study: Blogs

Ravi Kumar, Jasmine Novak, Prabhakar Raghavan Andrew Tomkins, et. Al.

WWW May 2003; CACM Dec 2004; PNAS Aug 2005; KDD Aug 2005; WIP
Friendship graph

- Directed
- 80% mutual
- Average degree ~ 14
- Power law degrees
- Clustering coeff. ~ 0.2
- Most friendships explained by age, location, interest

Venn diagram showing:
- Age 1%
- Location 20%
- Interest 16%
- Overlap:
  - 5% common
  - 22% common
What’s surprising about Milgram?

- Surprising fact number one (observed by Milgram): network contains short paths
- Surprising fact number two (observed much later by Kleinberg): a purely local algorithm allows discovery of these short paths
Population density

- Dot for every inhabited location
- Each circle represents 50,000 bloggers
- Centered on Ithaca, NY
Modeling distance

- Why use distance to determine friendship probabilities?
  - Two people who live a mile apart in Beijing will never meet
  - Two people who live a mile apart in Iowa will be close acquaintances

- What's the difference?
  - Within Manhattan, there are thousands of people living within a mile
  - Within Iowa, there are very few

- Probability of friendship should depend on the size of the candidate population

\[ \text{Pr[friendship]} \sim \frac{1}{\text{(\# of closer people)}} \]
Properties of Rank-based friendship

- Population density determines relationship between distance and friendship

- For uniform density, rank-based friendship is equivalent to Kleinberg – same theorems hold

- For non-uniform density, a similar theorem can be shown...
Theorem

- For any $n$-person population network, for arbitrary source $s$, and uniformly-chosen target $t$, the expected length of a geographic greedy routing path from $s$ to the location of $t$ is $O(\log^3 n)$

- Compared to Kleinberg:
  - Lose: expectation rather than with high probability
  - Lose: another log factor
  - Gain: arbitrary population distributions
“Social” Search

Is the Turing test always the right question?
A Digression:
Computer Vision is hard
The ESP Game

As seen on CNN and newspapers around the world!

Welcome, BRADLEY23
(Not BRADLEY23? [link to sign in])

HOW TO PLAY

PLAY NOW

your profile

top scores

Did you know?
The ESP Game is helping to label all images on the Web.

[link to learn more]

Play our new game

NEW Peekaboom

Terms of Service | FAQ | ESP Image Search | Contact Us | Credits

Funded in part by the National Science Foundation (NSF).

© 2005 Carnegie Mellon University, all rights reserved. Patent Pending.
Score: 140
Time Bonus: 0
Total for this Game: 140
Percentile: 22
Cumulative Score: 33285
Rank: Gifted
Points needed for next rank: 166715

© 2005 Carnegie Mellon University, all rights reserved. Patent Pending.
The ESP Game

Welcome, BRADLEY23
(Not BRADLEY23? click here)

How to Play

) Play NOW ( your profile top scores

Terms of Service | FAQ | ESP Image Search | Contact Us | Credits

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© 2005 Carnegie Mellon University, all rights reserved. Patent Pending.

46 Players logged in

Did you know?
The ESP Game is helping to label all images on the Web! learn more...

Play our new game Peekaboom

TODAY'S BEST PLAYERS

GABE-THE-CAT 109565
SLINKYWYCKOFF  57255
DIEGOOLIVER  54525
EGGZ  43035
CKBLACK  41325
MISSPRINT  31435

Most points in the last 24 hours (Updated every hour; click reload)
What makes Flickr special?

2. User Organized Content

Content is tagged, described, organized, discovered, etc. not by “editors” but by the users themselves.
Research

We found 18,148 photos about golden and retriever.

View: Most relevant • Most recent • Most interesting

From norisons2005
From brian_zeqis
From brian_zeqis
From Laura Jones

From Jane_Gaad
From Kaben
From Tijos
From Tijos

Sponsored Results

Affordable Golden Retriever Puppies
WhiteLakeGoldens.com is your one-stop source for high-quality Golden Retriever...
www.whitelakegoldens.com

Golden Retriever Guide
Learn how to make your Golden Retriever happy, healthy and obedient. eBook $10.95 with...
www.all-about-puppies.com

Golden And Retriever at Amazon.com
Shop at Amazon.com for low prices on Golden And Retriever. Free Super Saver Shipping...
www.amazon.com

Information on Golden
We found 16,149 photos about golden and retriever.

Pablo
Uploaded on 16 August 2006
By norisons2005
See more photos, or visit his profile.
dog, golden, retrievers, pablo

Rachel and Max
Uploaded on 16 August 2006
We found 16,148 photos about golden and retriever.
The Sweet-Natured Golden Retriever...

...caught in mid-play with his brother Sammy. Rest assured - though they look vicious, they are indeed playing. They'll get rough for a few moments, make a few growling noises, then
weaving major says:
wow, look at those fangs! great capture!
Posted 2 weeks ago. (permalink)

Jeanne8 says:
As long as they are playing it looked like a mean fight at first.
Blessings!
Posted 2 weeks ago. (permalink)

Amanda Clouse Photography pro says:
cute! Dale and Toby like to do this!
Posted 2 weeks ago. (permalink)

djjoyboy says:
Amazing Catch Andrew, I wish you would make an EXPOSURE show in
Pittsburgh sometime soon!
Posted 2 weeks ago. (permalink)

Photo Patty pro says:
Great action shot. I'm sure they were having a ball.
Posted 2 weeks ago. (permalink)

Boston Fan in Michigan pro says:
You tagged that "gentle"?? Egads. Those teeth look awfully wolfish... :P
Posted 2 weeks ago. (permalink)

Duogirl says:
HAHA!!
Posted 2 weeks ago. (permalink)

saldous says:
Tags / jaguar / clusters

- car, cars, auto, type, automobile, classic, vintage, autoshow, red, show
  - See more in this cluster...

- zoo, animal, cat, animals, bigcat, seattle, woodlandparkzoo, sleep, edinburgh, caged
  - See more in this cluster...

- guitar, fender
  - See more in this cluster...

- aircraft, raf
  - See more in this cluster...

- mac, apple
  - See more in this cluster...
Challenges in social media

- How do we use these tags for better search?
- What’s the ratings and reputation system?
- How do you cope with spam?
- The bigger challenge: where else can you exploit the power of the people?
- What are the incentive mechanisms?
Case Study: Yahoo! Answers & Y!R
Illustrating New Research Challenges
1995: The Yahoo! Directory

- Apply human expertise and editorial to organize web sites

- What worked
  - Practical, Navigable
  - Trustworthy, Authoritative

- What didn’t
  - Scalability
  - Granularity
  - Etc.
1995: Altavista (Inktomi, Lycos, etc.)

- Automate the process of acquiring pages; use “information retrieval” techniques to return pages that contain a particular term

- What worked
  - Scalable (query for “IBM” returns 40M pages)
  - Simple
  - Granular

- What didn’t
  - Scalability a double-edged sword
  - Ranking and relevance poor
  - Not authoritative (spam, irrelevance, etc.)
c. 1999-2006: PageRank (Google, Yahoo)

- Use topology (link structure) of the web to confer authority

- What works
  - Relevance is greatly improved
  - Navigational query is born (query for “IBM” gets me to ibm.com)

- What doesn’t
  - Homogeneity of results (no personalization) means no “subjective” queries – webmasters vote by proxy for everyone – and their answer is the only answer
  - System easily “gamed” by spammers – leads to arms race
Query composition

~25% Informational

Select Category: Web | Images | Video | Audio | Directory | Local | News | Shopping

Search the Web: blood sugar levels
Yahoo! Answers: Ask a question | Answer questions

~40% Navigational

Select Category: Web | Images | Video | Audio | Directory | Local | News | Shopping

Search the Web: ebay
Yahoo! Answers: Ask a question | Answer questions

~35% Transactional

Select Category: Web | Images | Video | Audio | Directory | Local | News | Shopping

Search the Web: atlanta plumber
Yahoo! Answers: Ask a question | Answer questions
Subjective Queries

The kinds of queries that rely on domain expertise...

- “Do you know a reputable plumber in Atlanta?”
- “Where is the cool nightlife in Soho?”
- “What political blogs do you think I’d enjoy reading?”
- “Where can I buy a cool pair of boots?”

These kinds of queries are ill-served by today’s search engines, but are ironically the most valuable (i.e. transactional queries.)
“Better Search Through People”
Case Study: Yahoo! Answers
Making Connections

Today’s state-of-the-art web search (at best) connects a person with a query to a web page that contains those characters.

Even as we nobly try to index every page, (every book, every video, every podcast, etc.) it is worth noting that these are artifacts of human knowledge.

Yahoo! Answers addresses this problem. It connects a person with a question to a community of people best suited to answer the question.
Yahoo! Answers - Home - Mozilla Firefox

Research

Yahoo! Answers DETA

ask.
Ask a question on any topic and get answers from real people.

(you have 110 characters to work with)
Post Question

answer.
Share what you know and you might make someone’s day.

Featured Question
Was HAL 9000 (2001: A Space Odyssey) the first villain to be a machine?

discover.
Learn something new today by browsing resolved questions.

Featured Topic
See what people are asking about:
Cameras

Make vacation plans with help from Yahoo! Answers!

Search for questions & answers
Search

Advanced Search

Save to My Web
Track new questions on Answers

NY Yahoo! RSS

Share what you know. Answer open questions.

why does my computer run different after installing hunting game from value soft?
Asked by Inkernell - Video Games - 12 seconds ago

What’s the first line from a song lyric that comes on your mind?
Asked by Marima - Music - 21 seconds ago

Why is england using a different flag in all sports, games & even in
Search Results

1. Where is the best place to go in Atlanta?
   Asked by sanpetre - 3 weeks ago - in Atlanta - 2 Answers - Resolved

2. Does anyone know a place in Atlanta that has good sushi?
   Asked by mbrain26 - 2 months ago - in Ethnic Cuisine - 4 Answers - Resolved

3. is atlanta ga a good town to relax and have a nice short vacation? where is the best place to stay?
   Asked by dougie906 - 1 month ago - in Atlanta - 4 Answers - Resolved

4. What schools can I go to for fashion design?
   Asked by hayleyoravetz - 2 months ago - in Teen & Preteen - 2 Answers - Resolved
Research

Does anyone know a place in Atlanta that has good sushi?

I am looking for a place on the west side of Atlanta that has good sushi, any ideas?

Best Answer - Chosen by Asker
The question was specific to Atlanta as I recall! There is a Beni Hana in Atlanta and that is good all around. All the nice places like that are in a section of Atlanta called Buckhead so I suggest checking that out.

Asker's Rating: ★★★★★
Is there a low-fat, low-cal recipe for potato salad?

No definitive answer

Unverifiable answer

Community consensus
Incentives

Legitimate?
Where is the Science?

- Which questions are legitimate?
- What is the incentive system?
- How do we validate answers?
- What is the role of the community?
- What is the reputation system?
What are the challenges?

• Community of users
  – Social system

• Incentives and reputations
  – Economic system

• Poorly phrased, grammatically limited queries
  – Language analysis

• Improving user experience from past data
  – Data mining
What is a Library?
What is a book?
What is a reference?
Research
idlis sambar and masala dosa
belongs to the "food bigger than your head" category - look at the half pint glass for scale. I have no idea how one is meant to eat this.

Mumbai, Maharashtra, churchgate, India...

Uploaded on June 1, 2006
by digitalia

Add to favorites  View photo page
fried flowers
You can get deep-fried day lilies at 六十有山. Covered with pepper, they're pretty good. They sort of taste like tempura.

Uploaded on September 4, 2006 by alidarbac
The Kilimanjaro rain forest
The Kilimanjaro rain forest. It was a great climb!

africa, tanzania, kilimanjaro

Upbaded on May 3, 2006
by Steve Bate
From a bridge in Paris
Walking up towards Les Invalides you can catch this view of the Eiffel Tower.

Eiffel, Paris, France, Architecture...

Uploaded on January 12, 2006 by Matito
Night shot during dinner near the Eiffel...
Taken from the restaurant "Le ciel de Paris" on the top of the Montparnasse Tower.

Uploaded on May 29, 2006 by Fly For Fun

All geotagged photos matching "eiffel".
ZoneTag – implicit context

Take a picture — Instant upload to Flickr with location tags
Concluding Thoughts

- The notion of “corpus” and publishing is changing fundamentally
- We still do not have the basic sciences to understand what is happening
- How do you scale
  - Review and filtering of “content”?  
  - Reputation and Trust?
- How do you maintain a live, fast-changing “reference”?
  - The mass audiences still prefer “programming” (as in TV, movies, magazines and newspapers)
- Knowledge management has gained a whole new “dynamic” and fast-changing dimension
- What is the role of the IT Research Community in such a world?
No time to cover today

- Micro-Economics of the Web
  - Auction marketplaces
  - Marketplace and Exchange Design
  - The economics of Engineering IT Decisions

- Computational Advertising
  - Targeting and matching sciences
  - Inferring user intent
  - Pricing models (CPM, CPC, CPA, CPL, etc...)
  - Large-scale optimization and yield management
Thank You! & Questions?
Usama_fayyad@yahoo.com
What is this science?

• What media experiences grow/thrive?
  – Data-driven stickiness
  – EBay reputations, Amazon recommendations

• Which ones die out?

• More global/youthful demographic

• An intrinsically *data-driven* science