

New sciences for a new web



Prabhakar Raghavan

Yahoo! Research

Microeconomic

Social Sciences

Statistics

Computation



What companies like mine do



Audience arrives



Intent Marketplace

Re



Info/Service Marketplace

\$2



\$1



-\$5



Info and Service providers – advertisers, publishers, commerce



The promise

- Measurability – Auditable notion of audience engagement and fulfillment
- Targetability – matching good enough to let marketplace design dictate granularity
- Scale – leads to virtuous cycle in system learning, as well thicker markets for monetization



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Canon Latin America, Inc. 703 Waterford Way, Suite 400 Miami, FL 33126
Phone: 305-260-7400

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Advertisements
=Monetization

Algorithmic results
=Audience



Search: Content vs. Intent

- Premise:
 - People don't want to search
 - People want to get tasks done



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YAHOO! SEARCH papa johns Search

Answers

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1 - 10 of about 761,000 for papa johns - 0.09 sec. (About this page)

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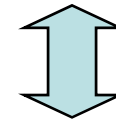


Web of objects

- Documents
 - Object extraction
 - Long tail normalization
- Queries
 - Intent extraction
 - (Matching) object assembly

hotel near leicester square

Go



1. The Savoy

Located on The Strand in the
of the West End theatre distri

Reviews

Deals

...

...



Grand challenges

- What's an intent?
- What's a web of objects?
 - Social annotations, geo ...
- How do you gauge intent satisfaction?
 - How do you build a framework for relevance?
- Uniformity of experience vs. Diversity of intent fulfillment



A post-HCI revolution

- Science of online audience engagement
 - Not just about people interacting with computers
 - But about people interacting with other people, information and services
 - An intrinsically *data-driven* science



Prototypical insights

- Why do people choose to lurk or participate?
- Why do people create new online personas?
- Why are YouTube, Facebook and Flickr successful? (and many others, not)
- What new genres are emerging - and what can we provoke?
 - For content creation
 - Enrichment
 - Participation




Audience engagement

- What does it mean to have an engaged audience?
 - Broadcast: hours watched/listened
 - Print: Circulation
- Today on the internet: page views, hours ...
- Who cares?
 - Advertisers, publishers



Proxies for engagement

Increasing engagement

A red arrow pointing downwards, indicating the direction of increasing engagement.

- Page views, repeat visits
- Time elapsed within page and between pages
- Clicks, click-throughs and click chains
- Content generation
- Content transport through networks
- Subscriptions
- Creation of user IDs
- Creation of user profiles
- Downloads, purchases



Audience metrics

- How about

$$\sum_{pageviews} repeat \times (time_spent)^\alpha \times \log(user_neighborhood)$$

- Where did this come from?
 - I made it up, not totally implausible
 - But utterly ungrounded in psychology

Granovetter, Schelling 1978; Kempe/Kleinberg/Tardos 2003;
Domingos/Richardson 2002



Grand challenges

- Devise and standardize defensible metrics of online engagement
- Use these to predictively design online experiences
 - Not a substitute for creativity
 - But a scientific basis



The Long Tail (The “power law distribution” ...)

How Endless Choice Is Creating Unlimited Demand

The Long Tail



Why the Future of Business
Is Selling Less of More

CHRIS ANDERSON

*“Anderson’s insights influence Google’s strategic thinking in a profound way.
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—ERIC SCHMIDT, CEO, GOOGLE

- The expected number of times a query is asked is a constant
 - But the mass in the tail is non-trivial.

Most of our industry encounters long-tailed distributions (power laws ...)

Most of our math builds on small-tailed distributions (binomials, Normal, Poisson ...)



Estimating user responses

- What is the likely response of a user to a page view?
 - (Response prediction)
- What if we've almost never seen such a user before
 - But can't afford to ignore him

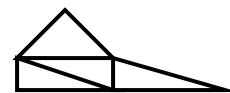
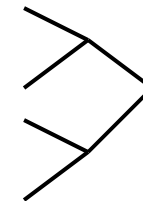
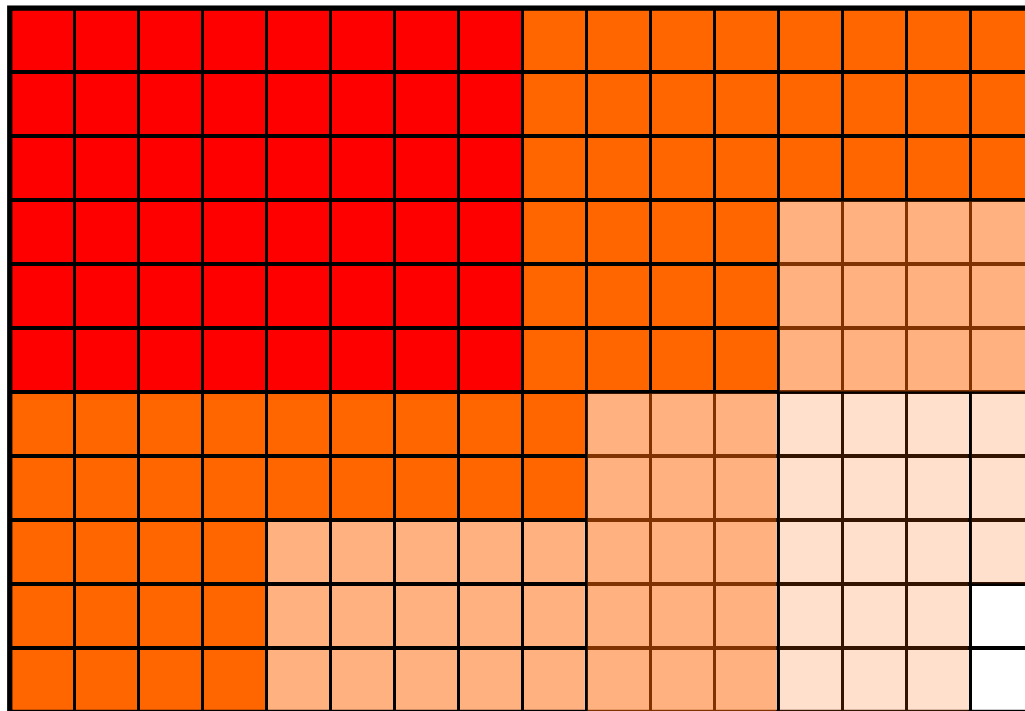
Fresh challenges in building and optimizing computing artifacts.



Learning in long-tailed spaces

Features →

Long-tailed sparsity



Domain info

Hierarchical bandits, Block estimation



Exchange and marketplace design

- Today providers vie for intents
 - *Males 25-30 in NYC during the super bowl*
 - *Women shopping for \$1000+ dishwashers*
- Risk management
 - Bid on either spot or future contracts
 - Charge for impressions, clicks or actions ... arbitrage



Design questions

- How do you express a bid?
- How do you price a bid?
 - Antecedent in airline yield management
 - But different here for several reasons
 - Both supply and demand are stochastic
 - Near (and not-so-near) substitutes
 - Uniformity/fairness desires
- How do you match a bid to audience?



A new convergence

- Monetization and user engagement an intrinsic part of system design
 - Not an afterthought
 - Mistakes are costly!
- Computing meets humanities like never before – sociology, economics, anthropology ...

Thank you.



Questions?

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