Introduction to Computational Advertising

MS&E 239
Stanford University
Autumn 2011
Instructors: Dr. Andrei Broder and Dr. Vanja Josifovski
Yahoo! Research
General course info

- Course Website: [http://www.stanford.edu/class/msande239/](http://www.stanford.edu/class/msande239/)
- Instructors
  - Dr. Andrei Broder, Yahoo! Research, [broder@yahoo-inc.com](mailto:broder@yahoo-inc.com)
  - Dr. Vanja Josifovski, Yahoo! Research, [vanjaj@yahoo-inc.com](mailto:vanjaj@yahoo-inc.com)
- TA: Krishnamurthy Iyer
  - Office hours: Tuesdays 6:00pm-7:30pm, Huang
- Course email lists
  - Staff: [msande239-aut1112-staff](mailto:msande239-aut1112-staff)
  - All: [msande239-aut1112-students](mailto:msande239-aut1112-students)
  - Please use the staff list to communicate with the staff
- Lectures: 10am ~ 12:30pm Fridays in HP
- Office Hours:
  - After class and by appointment
  - Andrei and Vanja will be on campus for 2 times each to meet and discuss with students. Feel free to come and chat about even issues that go beyond the class.
Course Overview

1. 09/30 Overview and Introduction
2. 10/07 Marketplace and Economics
3. 10/14 Textual Advertising 1: Sponsored Search
4. 10/21 Textual Advertising 2: Contextual Advertising
5. 10/28 Display Advertising 1
6. 11/04 Display Advertising 2
7. 11/11 Targeting
8. 11/18 Recommender Systems
9. 12/02 Mobile, Video, and other Emerging Formats
10. 12/09 Project Presentations
Lecture 9: Emerging advertising formats: mobile, social, coupons, games …

This lecture is mostly “observational”
Disclaimers

- This talk presents the opinions of the authors. It does not necessarily reflect the views of Yahoo! inc or any other entity.
- Algorithms, techniques, features, etc mentioned here might or might not be in use by Yahoo! or any other company.
- These lectures benefitted from the contributions of many colleagues and co-authors at Yahoo! and elsewhere. Their help is gratefully acknowledged.
Plan for today

1. Mobile advertising (60 min)
2. Student preso (15 min)
3. Break
4. Student preso (15 min)
5. Social advertising
Mobile Advertising
Example of mobile advertising
Why mobile advertising is important?

% of U.S. adults age 18 and older who own each device, by year ...

Source: Pew Research Center's Internet & American Life Project Tracking Surveys. Margin of error on all surveys of U.S. adult population is plus or minus 2 percentage points.
Smartphone penetration

US Smartphone Users and Penetration, 2010-2015
millions, % of mobile phone users and % of population

Source: eMarketer, Aug 2011

www.emarketer.com
Mobile advertising formats

1. **Messaging**
   - SMS (a.k.a. texting) = Short Message Service (potentially interactive)
   - MMS = Multimedia Message Service (potentially interactive e.g. Motorola at House of Blues)

2. **Display**
   - Idle screen
   - Embedded
     - In an application
     - In game

3. **Search driven**
   - Branded (Google, Yahoo!, etc)
   - White label ("Provided" by the telecom)

4. **Video**

5. **Gray areas**
   - Browse driven (drop-down menus)
   - Mobile coupons
   - Etc.
US mobile ad spending by format

### US Mobile Ad Spending, by Format, 2010-2015

**millions and CAGR**

<table>
<thead>
<tr>
<th>Format</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Messaging</td>
<td>$327.3</td>
<td>$442.6</td>
<td>$508.3</td>
<td>$560.2</td>
<td>$612.0</td>
<td>$633.0</td>
<td>14%</td>
</tr>
<tr>
<td>Banners and rich media</td>
<td>$202.5</td>
<td>$376.4</td>
<td>$594.8</td>
<td>$883.2</td>
<td>$1,207.1</td>
<td>$1,600.0</td>
<td>51%</td>
</tr>
<tr>
<td>Search</td>
<td>$185.0</td>
<td>$349.4</td>
<td>$594.8</td>
<td>$908.4</td>
<td>$1,291.6</td>
<td>$1,767.1</td>
<td>57%</td>
</tr>
<tr>
<td>Video</td>
<td>$28.3</td>
<td>$57.6</td>
<td>$104.5</td>
<td>$171.6</td>
<td>$270.5</td>
<td>$395.6</td>
<td>69%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$743.1</strong></td>
<td><strong>$1,226.1</strong></td>
<td><strong>$1,802.4</strong></td>
<td><strong>$2,523.3</strong></td>
<td><strong>$3,381.3</strong></td>
<td><strong>$4,395.7</strong></td>
<td><strong>43%</strong></td>
</tr>
</tbody>
</table>

*Note: numbers may not add up to total due to rounding*

*Source: eMarketer, Sep 2011*
Spending by format

US Mobile Ad Spending Share, by Format, 2010-2015

<table>
<thead>
<tr>
<th>Year</th>
<th>Messaging</th>
<th>Banners and rich media</th>
<th>Search</th>
<th>Video</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>44.0%</td>
<td>30.7%</td>
<td>28.2%</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>36.1%</td>
<td>33.0%</td>
<td>22.2%</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>28.2%</td>
<td>33.0%</td>
<td>18.1%</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>22.2%</td>
<td>35.0%</td>
<td>14.4%</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>18.1%</td>
<td>35.7%</td>
<td></td>
<td>14.4%</td>
</tr>
<tr>
<td>2015</td>
<td>14.4%</td>
<td>36.4%</td>
<td></td>
<td>14.4%</td>
</tr>
</tbody>
</table>

Note: numbers may not add up to 100% due to rounding
Source: eMarketer, Sep 2011
Messaging
Example of SMS ad

Payment types

- CPM type
  - Pay per impression (possible auction)
- CPC type
  - Pay per “reply” → Ad asks you to text something e.g. “More info” in reply to SMS
  - Pay per click → Ad contains some URL
  - Pay per call → ad contains some phone number that can be dialed
Example (from zeepmedia.com)

Insert an SMS ad
Reach an engaged, on-the-go mobile audience and only pay when someone responds to your ad.

First, write your ad
We'll place it at the bottom of SMS messages. Next, you'll choose how people can respond to your ad.

Sign up for MS&E 239!

Now, choose your ad type.
Example (cont)

Ad Text
5 to 30 characters – Currently 22

Sign up for MS&E 239!

When a recipient replies MORE, we’ll send them a new message with more information.

More Information
10 to 160 characters – Currently 93

Fantastic class! Don’t forget to vote for Andrei & Vanja as the best teachers in the world!
Conventional marketing using SMS

SEND & RECEIVE TEXTS AND EMAILS BY VOICE

TEXT “VLINGO” TO 66746
(but not while you’re driving!)

WWW.VLINGO.COM

Photograph © www.tatango.com SMS marketing blog

NB: This type of ads on billboards might be banned soon!
Display
Display ads – embedded/in app

Yahoo News

New York Times

India Microcredit Faces Collapse From Defaults

K. Shivamma, a 38-year-old farmer in the Indian
% of U.S. adult cell phone owners in each year who...

- Download apps to their phone: 22% (Sept 2009), 29% (May 2010), 38% (August 2011)
- Have preloaded apps on their phone: 38% (May 2010), 43% (August 2011)
- Total who have apps on phone: 43% (May 2010), 50% (August 2011)

Source: Pew Research Center's Internet & American Life Project, July 25-August 26, 2011 Tracking Survey. N=1,948 cell phone owners, margin of error is plus or minus 2.6 percentage points. Interviews conducted in English and in Spanish. May 2010 figures from April 29-May 30, 2010 Tracking Survey. N=1,917 cell phone owners, margin of error is plus or minus 2.7 percentage points. Interviews conducted in English only. September 2009 figures from August 18–September 14, 2009 Tracking Survey. N=1,868 cell phone owners, margin of error is plus or minus 2.7 percentage points. Interviews conducted in English only. An asterisk (*) indicates a significant difference across years at the 95% confidence level.
In app advertising: AroundMe
Gray area – paid participation in drop down menus

• Examples
  • What’s nearby?
    • Various categories of stores and services (Movies, ATMs, Taxi, etc)
    • Buzzwords:
      • LBS = Location Based Services
      • LBA = Location based advertising

• Taxonomy
  • Travel needs

• Storefinder
  • Nearest outlet by brand

• So far no/little personalization, will probably change
In app: Pandora

Robert Gambarini
The Two Lonely People
Easy To Love

From the App Store

Polomalooza
P&G Productions
Sports

47 Ratings ★★★★★

It's not a big deal to have a smart phone anymore, but it's a ridiculously big deal to have Polomalooza on your smart phone. Make your man-do fuller and thicker with funny little pictures, track progress for instant smack-talking... More▼
Polamalooza
Mostly targeted

Source: Millennial Media, July 2010, via MarketingCharts.com
The consumer point of view
Mobile ads are more effective than online ads

<table>
<thead>
<tr>
<th>Metric</th>
<th>Mobile Norms</th>
<th>Online Norms</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ad awareness</td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Message association</td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Purchase intent</td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Brand favorability</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Aided awareness</td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Unaided awareness</td>
<td></td>
<td></td>
<td>9</td>
</tr>
</tbody>
</table>

*delta defined as point difference in exposed vs. control groups
Ads are increasingly viewed as useful

<table>
<thead>
<tr>
<th>Types of Ads US Mobile Phone Owners Find Useful, 2009 &amp; 2010</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text or multimedia messages including coupons or special offers redeemable by showing the phone message at the business</td>
<td>36% (2009)</td>
</tr>
<tr>
<td>Text or multimedia messages sent to your phone from businesses that you have given permission to send</td>
<td>35% (2009)</td>
</tr>
<tr>
<td>Ads for businesses located nearby (based on your current location)</td>
<td>33% (2009)</td>
</tr>
<tr>
<td>Text or multimedia messages notifying you of current sales and promotions available to everyone</td>
<td>29% (2009)</td>
</tr>
<tr>
<td>Text or multimedia messages sent to your phone from businesses without first getting your permission</td>
<td>13% (2009)</td>
</tr>
<tr>
<td>Online banner or pop-up ads in the phone's web browser</td>
<td>12% (2009)</td>
</tr>
</tbody>
</table>

Note: ages 18+
### User activities

**Mobile Content Usage**
3 Month Avg. Ending May 2010 vs. 3 Month Avg. Ending Feb. 2010  
Total U.S. Age 13+  
Source: comScore MobiLens

<table>
<thead>
<tr>
<th>Activity</th>
<th>Feb-10</th>
<th>May-10</th>
<th>Point Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Mobile Subscribers</td>
<td>100.0%</td>
<td>100.0%</td>
<td>N/A</td>
</tr>
<tr>
<td>Sent text message to another phone</td>
<td>63.8%</td>
<td>65.2%</td>
<td>1.4</td>
</tr>
<tr>
<td>Used browser</td>
<td>29.6%</td>
<td>31.9%</td>
<td>2.3</td>
</tr>
<tr>
<td>Used downloaded apps</td>
<td>27.9%</td>
<td>30.0%</td>
<td>2.1</td>
</tr>
<tr>
<td>Played games</td>
<td>21.8%</td>
<td>22.5%</td>
<td>0.7</td>
</tr>
<tr>
<td>Accessed social networking site or blog</td>
<td>18.2%</td>
<td>20.8%</td>
<td>2.6</td>
</tr>
<tr>
<td>Listened to music on mobile phone</td>
<td>13.1%</td>
<td>14.3%</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Source: comScore's May 2010 U.S. Mobile Subscriber Market Share Report
Great user engagement with ads!

According to JWire, Q1 2010:

- Over 50% engaged with an ad seen inside an application within the last 30 days
- Over 18% made a purchase driven by an ad seen within the last 30 days

(Seem high!)
Coupons & codes
Mobile coupons
Is there a QR code in your future?

- QR Code = two-dimensional bar code created by Japanese corporation Denso-Wave in 1994
- Easy to read **with** and **from** smart mobile phones.
Yahoo! Academic Relations and the Stanford EE Computer Systems Colloquium Present:

Loopage

Douglas Crockford
JavaScript Architect
Yahoo! Inc.

Date: Wednesday, October 13th 2010
Time: 4:15pm
Location: NEC Auditorium, Gates Computer Science Building B03

Software development is hampered by a specific set of design mistakes that were made in the first programming languages and repeated in everything that has been done since. And, somewhat miraculously, JavaScript is going to make it right, radically transforming the way we write applications. Again. In the Loop of History, it has all happened before, but it has never happened like this.

For a sneak peak at the content of this talk (and five earlier talks), all on the future of JavaScript, see Doug Crockford’s blog: http://yuiblog.com/crockford/.

Douglas Crockford is a senior JavaScript Architect at Yahoo! He is well known for his work in introducing JavaScript Object Notation (JSON). He has also worked on the computerization of media at Atari, Lucasfilm, and Paramount. Crockford was the founder and CEO of Electric Communities from 1993 to 2001, and the founder and CTO of State Software (also known as Veil Networks) from 2001 to 2002. Crockford is the author of JavaScript: The Good Parts ISBN 978-03064517746.
QR Codes on TV
TV ad from BlueFly
BlueFly landing page

A little hook-up just for you!
Take $30 off any $150 order
Sign up now to receive promo code via email

EMAIL ME WITH THIS OFFER
Promo code will be received via email within 12-24 hours

Can't get enough Bluefly Closet Confessions?
Watch full video now
2D Code (PDF417?) used as coupon
## Mobile Marketing Tactics Used by US Marketers, May 2011

<table>
<thead>
<tr>
<th>Mobile Marketing Tactics</th>
<th>% of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text messaging (SMS)</td>
<td>59.3%</td>
</tr>
<tr>
<td>Scannable codes (QR or 2-D barcode)</td>
<td>53.3%</td>
</tr>
<tr>
<td>Branded smartphone apps</td>
<td>36.5%</td>
</tr>
<tr>
<td>Mobile display ads</td>
<td>33.8%</td>
</tr>
<tr>
<td>Mobile video</td>
<td>30.4%</td>
</tr>
<tr>
<td>Mobile coupons</td>
<td>29.4%</td>
</tr>
<tr>
<td>Mobile rich media ads</td>
<td>17.0%</td>
</tr>
<tr>
<td>Brand integration into mobile games</td>
<td>8.6%</td>
</tr>
</tbody>
</table>

*Source: Chief Marketer, "2011 Mobile Marketing Survey," June 13, 2011*
## Consumer usage of mobile coupons

### US Adult Mobile Coupon Users, 2010-2013

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult mobile coupon users (millions)</td>
<td>13.3</td>
<td>19.8</td>
<td>28.7</td>
<td>35.6</td>
</tr>
<tr>
<td>—% change</td>
<td>90.8%</td>
<td>49.0%</td>
<td>44.8%</td>
<td>24.0%</td>
</tr>
<tr>
<td>—% of adult mobile phone users</td>
<td>6.5%</td>
<td>9.5%</td>
<td>13.5%</td>
<td>16.5%</td>
</tr>
</tbody>
</table>

*Note: ages 18+; used mobile phone (includes smartphones) in the past year to redeem coupon/code obtained from SMS, application, mobile internet and/or QR code for online or offline shopping; includes group buying coupons purchased via mobile phone*

*Source: eMarketer, Aug 2011*
### Preferred Method of Receiving Mobile Coupons

**According to US Mobile Phone Owners, Feb 2011**

<table>
<thead>
<tr>
<th>Method</th>
<th>% of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have them sent to me via text message</td>
<td>25%</td>
</tr>
<tr>
<td>Get them via email on my phone</td>
<td>18%</td>
</tr>
<tr>
<td>Text in to receive them when I'm in a store</td>
<td>17%</td>
</tr>
<tr>
<td>Find them myself using an application</td>
<td>13%</td>
</tr>
<tr>
<td>Scan a QR code to receive them</td>
<td>10%</td>
</tr>
<tr>
<td>Get them in exchange for checking in</td>
<td>8%</td>
</tr>
</tbody>
</table>

*Source: InsightExpress, "Digital Consumer Portrait," March 1, 2011*
### Actions for Which US Smartphone Users Have Used QR Codes, Feb 2011

<table>
<thead>
<tr>
<th>Activity</th>
<th>% of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>To get a coupon, discount or deal</td>
<td>53%</td>
</tr>
<tr>
<td>Access additional information</td>
<td>52%</td>
</tr>
<tr>
<td>Enter a sweepstakes</td>
<td>33%</td>
</tr>
<tr>
<td>Sign up to receive more information</td>
<td>26%</td>
</tr>
<tr>
<td>Access video</td>
<td>24%</td>
</tr>
<tr>
<td>Make a purchase</td>
<td>23%</td>
</tr>
<tr>
<td>Interact with social media properties</td>
<td>23%</td>
</tr>
<tr>
<td>Other</td>
<td>23%</td>
</tr>
<tr>
<td>Don’t know</td>
<td>2%</td>
</tr>
</tbody>
</table>

Note: ages 18+; among respondents who have used a QR code. Source: MGH survey conducted by Vision Critical, March 22, 2011.
Back to computational advertising ...
Previous lectures: Finding the “best ad” as an IR problem

1. Analyze the “query” and extract query-features
   - Query = full context (content, user, environment, etc)

2. Analyze the documents (= ads) and extract doc-features

3. Devise a scoring function = predicates on q-features and d-features + weights

4. Build a search engine that produces quickly the ads that maximize the scoring function
Sample features & typical matching approaches

- Query over the ad space
  - Words, meaning, user demographics + interests, language, browser, bandwidth, etc. etc.
- Ad
  - Words, meaning, industry, advertiser, campaign, past performance, economics, etc. etc.
- Search over the ad space
  - Must support wide queries (hundreds of features)
  - Need high efficiency (branch & bound, early termination, etc)
- Ranking
  - Machine learning from very large & noisy logs
  - Explore/exploit
Specific features (and targeting dimensions) for mobile advertising

- **High precision demographics**
  - Billing address, subscription plan, monthly charges, credit history, SMS habits, etc.
- **Location**
  - Geo (GPS or tower triangulation)
  - Location functionality: Shopping mall, at home, airport, etc
  - Personal context: working, on vacation, etc
- **Social context**
  - Alone, with colleagues, with family, with friends, travelling, …
  - Who else in your plan,
- **Language**
- **Device model, capabilities, OS, installed apps (?)**,  
- **Bandwidth**
- **Operator**
- **Time of day**
- **Speed (walking vs. driving)**
- **Recent history**
- **Page orientation, number of scrolls, etc.**
- **Specific application data (e.g. music tastes)**
- **Etc**
On-deck vs. off-deck

- “On deck” advertising
  - The publisher is the wireless operator
    - Operator provided content and services
  - Full complement of targeting features
  - Has operator data
  - Might not have interest data

- “Off deck” advertising
  - Arbitrary mobile web pages
  - Fewer features
  - Might have personal interest data
Other consideration in the mobile environment
(See w3c initiative http://www.w3.org/Mobile/)

- Device limitations (display, colors, processing powers, etc)
- Keep it small
- Use network sparingly
- Help & guide user input (typing is a pain)
  - Predictive text completion
  - Voice input (Provided by all “majors” e.g.
    http://mobile.yahoo.com/search/iphone,
    http://www.google.com/mobile/google-mobile-app_exp/index.html and of course Siri
- Mobile is not miniature web!!
Web search vs. mobile search
Web User Needs – Types of Queries (Lecture 3)

- **Type of queries [Brod02, RL04]**
  - **Informational** – want to learn about something (~40% / 65%)
    - Swine Flu prevention
  - **Navigational** – want to go to that page (~25% / 15%)
    - Alitalia US
  - **Transactional** – want to do something (web-mediated) (~35% / 20%)
    - Access a service
    - Downloads
    - Shop
    - New York weather
    - Mars surface images
    - Canon GPS camera
  - **Gray areas**
    - Find a good hub
    - Exploratory search “see what’s there”
    - Rome hotels
Main historical trend in web search

Answer the user query via syntactic matching (matching words) in web pages

Answer the user need via (maybe trivial but effective) semantic match wrt multiple info sources
Yahoo! 2007: britney spears

1. Britney Spears - official site with chat, email, tour information, merchandise, and more. Category: Rock and Pop > Britney Spears
   www.britneyspears.com - 2k - Cached - More from this site - Save - Block

   www.britney.com - 10k - Cached - More from this site - Save - Block

3. World of Britney
Yahoo! 2009: britney spears
Google 2009: new york city

New York City in One Day
www.NYC-tour.com Check out the NY See It All Tour. Only OnBoard New York Tours.

New York, NY maps.google.com

New York City - Wikipedia, the free encyclopedia
A leading global city, New York exerts a powerful influence over worldwide commerce, finance, culture, fashion and entertainment. As host of the United...

Lower Manhattan in 1660 - Weather Averages - The Five Boroughs
en.wikipedia.org/wiki/New_York_City - Cached - Similar - Filter
hotels san francisco

1. Palace Hotel - Website - (415) 512-1111 - Directions
2. Sir Francis Drake Hotel - Website - (415) 392-7755 - Directions
3. Radisson - Website - (415) 392-6700 - Directions
4. Cathedral Hill Hotel - Website - (415) 776-8200 - Directions
5. Phoenix Hotel - Website - (415) 776-1380 - Directions
6. Hotel Rex - Website - (415) 433-4434 - Directions
7. Hotel Del Sol - Website - (415) 921-5520 - Directions
8. Hotel Nikko San Francisco - Website - (415) 394-1111 - Directions

San Francisco Hotels - The Best Cheap, Luxury & Boutique Hotels in SF
Find the best San Francisco Hotels at SanFrancisco.com and view pictures, reviews & virtual tours from the web's largest selection of cheap, luxury & boutique hotel rooms in San...
Mobile Search: Answer consumer’s immediate needs

PC Search ≠ Mobile Search
Finding the Right Ad for Sponsored Search – Web vs. Mobile

- Remember our example of advanced match:
  - Suppose your ad is:
    - “Good prices on Seattle hotels”
  - On the web:
    - Can bid on any query that contains the word Seattle
  - Mobile:
    - Can bid on any query made in Seattle by roamers (non-Seattle residents)
Finding the Right Ad – Web vs Mobile (cont)

• **Problems**
  • **Web**: What about query “Alaska cruises start point”?
  • **Web**: What about “Seattle’s Best Coffee Chicago”
  • **Mobile**: What about a query made from inside Seattle Sheraton hotel?

• **Some better targeting possibilities**
  • **Web**: Bid on any query related to Seattle as a travel destination (**hard!**)
  • **Mobile**: Bid on any query made by a roamer in the first two hours after arrival at Seattle airport (**easy! – with the right info**).
Disruptive technologies

(mentioned in Lecture 1)
What can change the game?

- Disintermediation of the “web search paradigm”
  - Use specific apps: e.g. Kayak rather
- Instant location aware “push” couponing
  - One time use coupons sent via SMS/MMS to handset
- Handset as contactless credit/cash card
  - Interaction with point-of-sale via optical readers (one way), bluetooth (two way), or wireless network
  - Direct purchase (tickets, take-out food, etc) -- see Starbucks
- Smartphone becoming standard phones
  - High precision GPS in all phones
- Ipads & equivalents becoming “standard”
- Lots of things we haven’t thought about …
Search vs specific app

Did you mean: SFO to LIS

San Francisco International (SFO) to Lyon Flights
3 flights from 3 advertisers. Deals are automatically sorted by most popular.
Change search. San Francisco (SFO), Lyon (LYS). Depart: ...
www.cheapflights.com/flights-to...

Flights from San Francisco to Lyon - SFO to LYS Flights | Expedia
Book your San Francisco to Lyon flights with Expedia and we guarantee you find the best price with no Expedia booking fees on ...
flights.expedia.com > Expedia.com

Google search  Expedia landing page  Kayak
Starbucks store card

http://www.starbucks.com/coffeehouse/mobile-apps/starbucks-card-mobile
What might die (as consumer appliances/features)

- Portable GPS navigators
- Low end cameras (still and TV)
- Random small devices
  - Compasses
  - Watches, Metronomes, Alarm clocks
  - Music tuners, Noise meters,
  - Remote controllers
  - Level bars (http://www.ihandysoft.com/level_free.html)
  - Many other, possibly with additional sensors (e.g. temp, weight) or accessories (e.g. health sensors, car connections)
- Laptops?
- Phone numbers (paradigm should be “I want to initiate a voice com with person X, at whatever device they desire”)
Mobile + sensor

http://www.ot-2.com/

Standard interface to car computer (OBD) + WiFi server

Display on Iphone
“Square” credit card reader
What can change the game?  
Inference from noisy data

- What can you infer from lots of people reporting their position every few seconds?
  - Real time traffic … (see [http://www.waze.com/](http://www.waze.com/))
  - Opening hours …
  - Night clubs going out of fashion …
  - Very accurate life-style predictions
  - Amazing gossip 😊
It is hard to predict the future, especially before it happens …


1. Money Transfer
2. Location-Based Services
3. Mobile Search
4. Mobile Browsing
5. Mobile Health Monitoring
6. Mobile Payment
7. Near Field Communication Services
8. Mobile Advertising
9. Mobile Instant Messaging
10. Mobile Music
Summary
Summary

- **Highlights**
  - Mobile advertising is growing
  - Technical aspects:
    - Requires immediacy
    - Enables LBA
    - Many new matching features
  - Plenty of innovation opportunities
  - Computational advertising techniques essential, very fertile area for research

- **Lowlights** …
  - Very fragmented market …
    - Lots of small players
    - Lots of self proclaimed experts
    - Lots of VC money chasing very few ideas …
  - Strange role for telecom providers …
  - Need to deal with wide variety of hardware, operating systems, bandwidth, etc
  - Fluid legal landscape wrt regulation, privacy, etc.
Further readings

- Oldie but goodie general intro
  http://www.iab.net/media/file/mobile_platform_status_report.pdf

- Mobile barcodes

- The Google “Understanding Smartphone Users” report – download from
  http://www.thinkwithgoogle.com/insights/library/studies/?
  (many other interesting studies)

- General sources:
  - http://www.mobilemarketer.com
  - http://www.mobilemarketingwatch.com/
### Social ad revenue

#### Key eMarketer Numbers—Social Network Ad Revenues

<table>
<thead>
<tr>
<th>Social network ad revenues (billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Worldwide</strong></td>
</tr>
<tr>
<td>2011</td>
</tr>
<tr>
<td>$5.54</td>
</tr>
<tr>
<td><strong>US</strong></td>
</tr>
<tr>
<td>2011</td>
</tr>
<tr>
<td>$2.74</td>
</tr>
</tbody>
</table>

#### Ad revenues worldwide (billions)

<table>
<thead>
<tr>
<th>Facebook</th>
<th>Twitter</th>
<th>LinkedIn</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>$3.80</td>
<td>$5.78</td>
<td>$7.00</td>
</tr>
<tr>
<td>$0.14</td>
<td>$0.26</td>
<td>$0.40</td>
</tr>
<tr>
<td>$0.14</td>
<td>$0.20</td>
<td>$0.25</td>
</tr>
</tbody>
</table>

*Source: eMarketer, Sep 2011*
### US Social Network Ad Revenues, 2009-2013

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social network ad revenues</td>
<td>$1.44</td>
<td>$2.00</td>
<td>$2.74</td>
<td>$3.90</td>
<td>$4.81</td>
</tr>
<tr>
<td>Total US online ad spending</td>
<td>$22.70</td>
<td>$26.00</td>
<td>$31.30</td>
<td>$36.80</td>
<td>$41.20</td>
</tr>
</tbody>
</table>

**Social network % of total** 6.3% 7.7% 8.8% 10.6% 11.7%

*Note: includes paid advertising appearing within social network sites, social network games and social network applications; excludes spending by marketers that goes toward developing or maintaining a social network presence*

*Source: eMarketer, Sep 2011*

---

### Social Network Ad Revenues Worldwide, 2009-2013

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social network ad revenues</td>
<td>$2.38</td>
<td>$3.56</td>
<td>$5.54</td>
<td>$8.04</td>
<td>$9.99</td>
</tr>
<tr>
<td>Total online ad spending worldwide</td>
<td>$55.20</td>
<td>$68.40</td>
<td>$80.20</td>
<td>$94.20</td>
<td>$106.10</td>
</tr>
</tbody>
</table>

**Social network % of total** 4.3% 5.2% 6.9% 8.5% 9.4%

*Note: includes paid advertising appearing within social network sites, social network games and social network applications; excludes spending by marketers that goes toward developing or maintaining a social network presence*

*Source: eMarketer, Sep 2011*
## Top sites

<table>
<thead>
<tr>
<th></th>
<th>Visits</th>
<th>% share</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Facebook</td>
<td>1,758.1</td>
</tr>
<tr>
<td>2.</td>
<td>YouTube</td>
<td>530.1</td>
</tr>
<tr>
<td>3.</td>
<td>Twitter</td>
<td>33.1</td>
</tr>
<tr>
<td>4.</td>
<td>Yahoo! Answers</td>
<td>28.0</td>
</tr>
<tr>
<td>5.</td>
<td>Tagged</td>
<td>19.7</td>
</tr>
<tr>
<td>6.</td>
<td>LinkedIn</td>
<td>17.8</td>
</tr>
<tr>
<td>7.</td>
<td>Myspace</td>
<td>16.3</td>
</tr>
<tr>
<td>8.</td>
<td>Google+</td>
<td>15.0</td>
</tr>
<tr>
<td>9.</td>
<td>myYearbook</td>
<td>10.6</td>
</tr>
<tr>
<td>10.</td>
<td>ivillage</td>
<td>10.3</td>
</tr>
</tbody>
</table>

Note: excludes mobile traffic or traffic from the Google Notification Bar
Source: Experian Hitwise as cited in company blog, Sep 26, 2011
Landscape (shares of visits)
We start with a big number first: 53.5 billion minutes per month. Facebook is dominating the web brands.

In looking at a data snapshot of monthly aggregate time spent on a site for Facebook and the ROW (rest of the web), Facebook has toppled some big names. The Nielsen Company data show that even Yahoo users come in a distant second with an average of 17.2 billion minutes per month, less than one-third Facebook’s total.

YouTube ranks sixth, claiming 9.1 billion user minutes per month.

Source: "The Social Media Data Stacks", MarketingCharts.com, via HubSpot.com
Looking specifically at social networking/blogging sites, the others trail Facebook much more dramatically. None even come close to 1 billion minutes per month. Blogger ranks second with about 724 million monthly minutes, which is more than double the roughly 325 million monthly minutes spent by users of number five social networking/blogging site LinkedIn.

Top 5 U.S. Social Networks and Blogs
Total minutes (000), home and work, May 2011

Source: The Nielsen Company

Facebook dominates monthly minutes

Source: "The Social Media Data Stacks", MarketingCharts.com, via HubSpot.com
Looking at the top 10 U.S. social networking/blogging sites during Q3 2011, Nielsen reports that Facebook, with an average monthly audience of more than 140 million, almost triples the average monthly audience (50 million) of its nearest competitor, Blogger. With this audience, Facebook reaches 70% of active internet users.

Source: "The Social Media Data Stacks", MarketingCharts.com, via HubSpot.com
Facebook Ad Revenues Worldwide, 2009-2013
billions and % change

<table>
<thead>
<tr>
<th>Year</th>
<th>Facebook ad revenues</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>$0.74</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>$1.86</td>
<td>152.0%</td>
</tr>
<tr>
<td>2011</td>
<td>$3.80</td>
<td>104.3%</td>
</tr>
<tr>
<td>2012</td>
<td>$5.78</td>
<td>52.1%</td>
</tr>
<tr>
<td>2013</td>
<td>$7.00</td>
<td>21.1%</td>
</tr>
</tbody>
</table>

Note: paid advertising only; excludes spending by marketers that goes toward developing or maintaining a Facebook presence
Source: eMarketer, Sep 2011
## Comparative Trends

### Change in Ad Spending on Select Social Networks According to US Advertisers/Marketers, Feb 2011

<table>
<thead>
<tr>
<th>% of respondents</th>
<th>Increase significantly</th>
<th>Increase somewhat</th>
<th>No change</th>
<th>Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook</td>
<td>40%</td>
<td>49%</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>YouTube</td>
<td>33%</td>
<td>49%</td>
<td>13%</td>
<td>4%</td>
</tr>
<tr>
<td>Twitter</td>
<td>26%</td>
<td>51%</td>
<td>13%</td>
<td>8%</td>
</tr>
<tr>
<td>LinkedIn</td>
<td>20%</td>
<td>51%</td>
<td>18%</td>
<td>9%</td>
</tr>
<tr>
<td>foursquare</td>
<td>10%</td>
<td>36%</td>
<td>23%</td>
<td>14%</td>
</tr>
<tr>
<td>Flickr</td>
<td>6%</td>
<td>37%</td>
<td>31%</td>
<td>17%</td>
</tr>
</tbody>
</table>

Note: n=500 AAF Ad Club members; in the next 3-5 years; numbers may not add up to 100% due to rounding
## Low CTR

### Clickthrough and "Like" Rate* of Facebook Display Ads Among US Internet Users, by Age and Gender, 2011

<table>
<thead>
<tr>
<th></th>
<th>Clickthrough rate</th>
<th>&quot;Like&quot; rate*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>18-29</td>
<td>0.025%</td>
<td>0.026%</td>
</tr>
<tr>
<td>30-39</td>
<td>0.024%</td>
<td>0.028%</td>
</tr>
<tr>
<td>40-49</td>
<td>0.026%</td>
<td>0.031%</td>
</tr>
<tr>
<td>50+</td>
<td>0.030%</td>
<td>0.034%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>0.026%</strong></td>
<td><strong>0.029%</strong></td>
</tr>
</tbody>
</table>

*Note: *based on people who had clicked on the ad
*Source: SocialCode, Aug 30, 2011*
Twitter

Twitter Ad Revenues Worldwide, 2010-2013

Note: paid advertising only; excludes spending by marketers that goes toward developing or maintaining a Twitter presence
Source: eMarketer, Sep 2011
## Mixed feelings

### Attitude of US Twitter Users Toward Promoted Tweets, Aug 2011

<table>
<thead>
<tr>
<th>% of respondents</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I see Promoted Tweets from brands that are relevant to me</td>
<td>48%</td>
</tr>
<tr>
<td>I've gotten discounts from Promoted Tweets</td>
<td>42%</td>
</tr>
<tr>
<td>I've found out about new brands through Promoted Tweets</td>
<td>41%</td>
</tr>
<tr>
<td>I've retweeted a Promoted Tweet</td>
<td>27%</td>
</tr>
<tr>
<td>They are annoying and take away from the Twitter experience</td>
<td>21%</td>
</tr>
<tr>
<td>I haven't noticed them</td>
<td>8%</td>
</tr>
<tr>
<td>I don't know what Promoted Tweets are</td>
<td>7%</td>
</tr>
</tbody>
</table>

Note: n=500; Promoted Tweets are clearly labeled but otherwise ordinary tweets that are paid for by advertisers in order to reach a wide group of users or to spark engagement from their existing followers. Source: Lab42 survey as cited in company blog, Aug 20, 2011
LinkedIn Ad Revenues Worldwide, 2009-2013

Note: figures represent revenue from LinkedIn's Marketing Solutions business segment
Source: eMarketer, Sep 2011
Social engagement
Trust in the channel

Global Consumer Trust in Advertising by Channel (Q1 2009)

- Recommendations from people I know: 34%
- Brand websites: 57%
- Consumer opinions posted online: 59%
- Editorial content such as a newspaper article: 59%
- Brand sponsorships: 54%
- Ads on TV: 53%
- Ads in newspapers: 54%
- Ads in magazines: 53%
- Ads in radio: 49%
- Billboards and other outdoor advertising: 49%
- Emails I signed up for: 49%
- Ads before movies: 48%
- Ads served in search engine results: 47%
- Online video ads: 30%
- Online banner ads: 34%
- Text ads on mobile phones: 22%

Colors: Blue = Trust completely, Orange = Trust somewhat, Green = Don't trust much, Light Blue = Don't trust at all

Indirect social brand promotion

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Became a fan/follower of some other company/brand</td>
<td>52%</td>
</tr>
<tr>
<td>Said something good about a brand/company</td>
<td>46%</td>
</tr>
<tr>
<td>Said something bad about a brand/company</td>
<td>23%</td>
</tr>
<tr>
<td>Promoted some other company/brand</td>
<td>18%</td>
</tr>
<tr>
<td>Promoted your own business</td>
<td>12%</td>
</tr>
</tbody>
</table>

Note: n=1,000
Source: Anderson Analytics, "Social Network Service (SNS) A&U Profiler," provided to eMarketer, July 13, 2009
Social network users – interesting demographics?

<table>
<thead>
<tr>
<th>Products/Services Purchased Online* by US Social Network Users vs. Nonusers, May 2009 (% of respondents in each group)</th>
<th>Social network users</th>
<th>Nonusers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing</td>
<td>50%</td>
<td>39%</td>
</tr>
<tr>
<td>Books</td>
<td>47%</td>
<td>40%</td>
</tr>
<tr>
<td>Music</td>
<td>42%</td>
<td>23%</td>
</tr>
<tr>
<td>Movies</td>
<td>41%</td>
<td>23%</td>
</tr>
<tr>
<td>Electronics</td>
<td>41%</td>
<td>24%</td>
</tr>
<tr>
<td>Shoes</td>
<td>32%</td>
<td>25%</td>
</tr>
<tr>
<td>Airline tickets</td>
<td>31%</td>
<td>24%</td>
</tr>
<tr>
<td>Food (steaks, cheese, fruit, etc.)</td>
<td>31%</td>
<td>22%</td>
</tr>
<tr>
<td>Cosmetics--makeup and skin care</td>
<td>25%</td>
<td>13%</td>
</tr>
<tr>
<td>Photo prints</td>
<td>15%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Note: n=1,000 social network users; n=250 nonusers; *within the past 12 months
Source: Anderson Analytics, "Social Network Service (SNS) A&U Profiler," provided to eMarketer, July 13, 2009
Social networks, upper class or early adopters?

<table>
<thead>
<tr>
<th>Category</th>
<th>Active luxury buyers</th>
<th>Not luxury buyers</th>
<th>Index (All adults = 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creators</td>
<td>24%</td>
<td>12%</td>
<td>171</td>
</tr>
<tr>
<td>Critics</td>
<td>28%</td>
<td>18%</td>
<td>140</td>
</tr>
<tr>
<td>Collectors</td>
<td>13%</td>
<td>6%</td>
<td>186</td>
</tr>
<tr>
<td>Joiners</td>
<td>23%</td>
<td>16%</td>
<td>135</td>
</tr>
<tr>
<td>Spectators</td>
<td>56%</td>
<td>47%</td>
<td>117</td>
</tr>
<tr>
<td>Inactives</td>
<td>36%</td>
<td>46%</td>
<td>80</td>
</tr>
</tbody>
</table>

Base: 7,624 online European consumers

Source: European Technographics* Retail, Customer Experience, And Travel Online Survey, Q3 2008

Source: Forrester Research, Inc.
### Use of Facebook Pages vs. Google+ Pages Among the Top 100 Brands Worldwide, Nov 2011

- **93%** of top 100 brands have a company page on Facebook.
- **53%** of top 100 brands with a company page on Facebook have a link to it on their homepage.
- **61%** of top 100 brands have a company page on Google+.
- **12%** of top 100 brands with a company page on Google+ have a link to it on their homepage.


---

### Effective Social Media Marketing Tools According to US Small Businesses, Oct 2011

<table>
<thead>
<tr>
<th>Tool</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facebook</strong></td>
<td>36%</td>
</tr>
<tr>
<td><strong>Twitter</strong></td>
<td>21%</td>
</tr>
<tr>
<td><strong>Video-sharing</strong></td>
<td>23%</td>
</tr>
<tr>
<td><strong>LinkedIn</strong></td>
<td>3%</td>
</tr>
<tr>
<td><strong>Review sites</strong></td>
<td>10%</td>
</tr>
<tr>
<td><strong>Photo-sharing</strong></td>
<td>8%</td>
</tr>
<tr>
<td><strong>Google+</strong></td>
<td>7%</td>
</tr>
<tr>
<td><strong>Local/daily deals</strong></td>
<td>6%</td>
</tr>
<tr>
<td><strong>Geolocation services</strong></td>
<td>7%</td>
</tr>
<tr>
<td><strong>MySpace</strong></td>
<td>7%</td>
</tr>
</tbody>
</table>

*Note: among respondents who said social media marketing is effective; numbers may not add up to 100% due to rounding. Source: Constant Contact, "Fall 2011 Small Business Attitudes & Outlook Survey," Nov 15, 2011.*

---

**Very effective**

**Moderately effective**

**Neither effective nor ineffective**

**Do not use**

**Moderately ineffective**

**Very ineffective**
## Metrics


<table>
<thead>
<tr>
<th>Metric</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers linking as friends, followers, &quot;likes&quot;</td>
<td>60%</td>
</tr>
<tr>
<td>Sharing, forwarding, retweeting or posting brand content</td>
<td>39%</td>
</tr>
<tr>
<td>Qualified leads from social media</td>
<td>35%</td>
</tr>
<tr>
<td>Visits or time spent with branded social content</td>
<td>30%</td>
</tr>
<tr>
<td>Incremental sales attributable to social media</td>
<td>25%</td>
</tr>
<tr>
<td>Brand awareness/favorability (measured by surveys)</td>
<td>18%</td>
</tr>
</tbody>
</table>


### Attitude of Their Clients Toward Social Media Marketing's Ability to Produce ROI at Budget Time According to US Agencies and Consultancies, Feb 2011

<table>
<thead>
<tr>
<th>Attitude</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social marketing is a promising tactic that will eventually produce ROI; let's invest but do it conservatively</td>
<td>64%</td>
</tr>
<tr>
<td>Social marketing is producing a measurable ROI; let's continue to invest in this tactic</td>
<td>20%</td>
</tr>
<tr>
<td>Social marketing is basically free; let's keep it that way</td>
<td>10%</td>
</tr>
<tr>
<td>Social marketing is unlikely to produce ROI; why invest more?</td>
<td>6%</td>
</tr>
</tbody>
</table>

Summary
Summary

- Huge amounts of time spent in social media, growing
- Social advertising is growing
- Technical aspects:
  - Low attention
  - Matching mostly based on declared demographics
  - Use of social graphs is still unclear/controversial
  - Some social media are becoming platforms, monetization via 3rd party applications
- Non technical aspects
  - Demographics biased towards particular segments
  - Privacy
  - Regulatory activities
- Another good area for research
Questions?

We welcome suggestions about all aspects of the course:

msande239-aut1112-staff@lists.stanford.edu
Thank you!

broder@yahoo-inc.com
vanjaj@yahoo-inc.com

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