Revolutionizing Digital Marketing with Big Data

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CIKM 2012
Oct 29 - Nov 2, 2012
Sheraton, Maui Hawaii
Today’s Agenda

- Digital marketing – the Marketer’s perspective
- Digital marketing – the Adobe perspective
- Digital marketing – the Technologist’s perspective
  - Technology building blocks
  - 3 use cases
  - 3 issues and opportunities
Digital Marketing – the Marketer’s perspective

The New Marketing Funnel

- Awareness
- Consideration
- Conversion
- Loyalty
- Advocacy

Word of Mouth
Digital Marketing – the Marketer’s perspective (2)

Transaction Infrastructure
- Multi-channel commerce
- Personalization, Recommendations
- Conversion optimization

MARKETING TECHNOLOGY
(site operations – earned and owned)

OFFICE OF THE DIGITAL CMO

Advertising Buy/Sell Optimization
- Campaign centric analytics & reporting
- 360 view of campaign
- Transient customer info

Customer Master Record
(Financials, name, billing, SSN, etc.)

- Customer centric analytics & reporting
- 360 view of customer
- Persistent customer info

Transaction Infrastructure
- Multi-channel commerce
- Personalization, Recommendations
- Conversion optimization
Digital Marketing – the Marketer’s perspective (3)

PERSONALIZE

COMMUNICATE

GATHER DATA

PREDICT

ANALYZE
Digital Marketing – the Marketer’s perspective

Task breakdown

COMMUNICATE
- Web site personalization
- Search campaign management
- Web site management
- Email campaign management
- (Other) campaign management

PERSONALIZE
- Social engagement
- Ad targeting
- Visitor intent
- Search optimization
- (Other) campaign optimization

PREDICT
- Community reaction
- Clickstream analysis
- Web site analysis

ANALYZE
- Segmentation
- Social influence identification
- Trend/anomaly detection
Digital Marketing Today – The Adobe Perspective

Adobe® Marketing Cloud

Adobe Analytics
Adobe Target
Adobe Social
Adobe Media Optimizer
Adobe Experience Manager

Emerging Solutions: Video, Mobile, Predictive, Campaign Management, Digital Readiness, …
Digital Marketing – the Technologist’s perspective
Digital Marketing – the Technologist’s perspective
Technology building blocks

PERSONALIZE
- Web site personalization
- Search campaign management
- Ad targeting
- Visitor intent
- Search optimization
- (Other) campaign optimization

COMMUNICATE
- Web site management
- Email campaign management
- (Other) campaign management
- Cloud infrastructure
- Event processing
- Database management
- Recognition technologies

GATHER DATA
- Consumer profile management
- Privacy management
- Ontology building
- Econometric modeling
- Visualization
- Machine Learning
- Text mining
- Optimization
- Data mining
- Clickstream analysis
- Web site analysis
- Social influence identification
- Trend/anomaly detection
- Community reaction
- Recognition technologies
- Database management
- Event processing
- Cloud infrastructure

PREDICT
- Website optimization
- Visitor intent
- Search optimization
- (Other) campaign optimization

ANALYZE
- Econometric modeling
- Statistical Methods
- Text mining
- Optimization
- Data mining
- Clickstream analysis
- Web site analysis
- Social influence identification
- Trend/anomaly detection
- Community reaction
3 use cases, 3 issues and opportunities

- **Use cases**
  - Social media marketing
  - Content targeting
  - Search ad optimization

- **Issues and opportunities**
  - Targeting vs. privacy
  - Attribution
  - Understandability
Social Media Marketing

**Publishing & Engagement**
Create content once and publish to all your communities

**Measurement & Analytics**
Real-time insights into what’s working

**Listening & Moderation**
Identify trends and keep on top of questions and issues

**Social Advertising**
Promote content to Sponsored Stories Ads in a couple of clicks
A digital marketer wants to learn about the reaction her post may generate.

She submits the post to the Community Analytics Module.

The Community Analytics Module provides the following metrics:

- Number of Comments
- Number of Likes
- Sentiment of Reactions
- Duration of Reactions

The Social Marketer creates a growing, engaged community that drives revenue/brand affinity.
Early results - Sentiment Reaction Prediction

MaxEnt based prediction of sentiment of reaction

Overall accuracy vs Hold off percentage

50 percent hold-off
- ExtNeg
- ModNeg
- MildNeg
- Neutral
- MildPos
- ModPos
- ExtPos

Predicted Labels

75 percent hold-off
- ExtNeg
- ModNeg
- MildNeg
- Neutral
- MildPos
- ModPos
- ExtPos

Predicted Labels

90 percent hold-off
- ExtNeg
- ModNeg
- MildNeg
- Neutral
- MildPos
- ModPos
- ExtPos

Predicted Labels

95 percent hold-off
- ExtNeg
- ModNeg
- MildNeg
- Neutral
- MildPos
- ModPos
- ExtPos

Predicted Labels
Early results - Sentiment Reaction Prediction

Longer than 2 months training lowers the accuracy.
Content Targeting

Default Experience

Alternate Experience
Content targeting – the present

A/B Testing

1. Site Visitor
2. Company Server
3. BigStore.com
4. Text&Target Campaign Servers
5. Test Pages
6. BigStore.com

Test Pages
A-Default
B-Test
C-Test
Content targeting – the present
One-shot behavioral targeting
Content targeting – the future
Modeling landing to conversion across multiple sessions

Sequence of Consumer’s visits

Consumer
Visit Start

Purchase!

FUTURE
## Content targeting – the future

### Technical approaches

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<th>State is fully observable</th>
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<td>Markov Chain</td>
<td>Markov Chain</td>
<td>Markov Decision Process</td>
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**Markov Chain**: A sequence of random variables with the Markov property

**MDP**: A Markov chain in which state transitions depend on the current state and the previous action

![Markov Chain Diagram](image)
Content targeting – the future (3)

- Early results promising
- Exploring reinforcement learning techniques as well as MDP
- Likely constraints and issues
  - Durable relationship with consumer
  - Changes in behavior by marketers
Search ad optimization - the present

User Flow

AD
impressions

MERCHAND
clicks

TRANSACT
conversions

$ Flow

User shows **intent** through keywords.
Ad relevant to searched keyword

Advertiser pays only if user shows **interest** and clicks on ad.

Combination of intent and interest can lead to better conversion.
Search ad optimization – the present (2)

- **Target Audience**
  - Choose keywords (preferably 1000s)

- **Create the message**
  - Create ad creative & landing pages and setup tracking

- **Buy media**
  - Determine “right” bid for each ad

- **Optimize Ad Campaign**
  - Launch campaigns, check performance and optimize
A customer has $10,000 daily budget and 1M keywords. “Bids for keyword” is the only control.
Search ad optimization – the present

Technical approach

\( i \) - keyword combination index (1, 2,..., I)

\( j \) - position (ad slot) index (0, 1, 2,..., J)

\( R_{ij} \) - total daily expected revenue for keyword combination \( i \) when displayed at position \( j \)

\( C_{ij} \) - total daily expected cost for keyword combination \( i \) when displayed at position \( j \)

\( B \) - Advertiser's daily budget

**Decision Variable**

\( x_{ij} \) - \( \{0,1\} \rightarrow 1 \), if keyword \( i \) is allocated to position \( j \)

\( \rightarrow 0 \), otherwise

\[
\text{Max} \quad \sum_{i=1}^{I} \sum_{j=1}^{J} R_{ij} x_{ij}
\]

s.t. \[
\sum_{j=1}^{J} x_{ij} \leq 1; \forall i \quad - (1)
\]

\[
\sum_{i=1}^{I} \sum_{j=1}^{J} C_{ij} x_{ij} \leq B; \quad - (2)
\]

\( x_{ij} \in \{0,1\} \quad - (3) \)

**Integer Programming Problem**

**NP-Complete – Knapsack problem**
Search ad optimization – the future
Improving estimates of cost and return

- Baseline information
  - Cost data from search engines
    - Number of searches
    - Click-through-rate
    - Bid
    - Position
  - Revenue data from advertiser

- Plus contextual data
  - E.g. Tracking social media streams

- Plus targeting data
  - Consumer profiles
## Search ad optimization – the future

### Social media contextual information

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Search ad optimization – the future

Social media contextual information

Twitter

Recommended Keyword
Trending Information

Search Engine
Cost Data
Data Warehouse
Bids

Advertiser
Revenue Data

Click Models

Optimizer

Revenue Models
Budget & Goals
3 issues and opportunities

Targeting vs. Privacy       Attribution       Understandability
Mission
- Develop innovative technologies critical to the long term success of Adobe, and transfer these technologies into existing and new Adobe products

Organization
- ~ 70+ staff world-wide

Technology projects
- ~ 170+ active
Adobe Data Scientists

Data Scientist

Developer Skills

Digital Marketing Knowledge

Analysis Skills