Beyond CPM and CPC: Determining the Value of Users on OSNs

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1. Introduction

- CPM and CPC

- Advertising on Web and OSNs
  - Google vs. Facebook
1. Introduction

- User Value
  - Direct impressions
    - advertising opportunities that a user provides by browsing OSN site pages
  - Indirect impressions
    - advertising opportunities that a user provides by enticing others to browse OSN site pages
    - Cascading effect
1.1 Data

- Detailed data from Facebook\(^1\)
  - Year: 2009
  - 90,269 users
  - New Orleans metropolitan area

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2. Background

- Facebook's Advertising Model
  - Targeting parameters (location, gender, interests)
  - CPM and CPC
  - Auction based selection of bids

- Problem?
  - Targeting users who are influential
3. USER VALUE FRAMEWORK

- First,
  - different actions produce different numbers of indirect impressions
  - How to measure that

- Next,
  - how users' characteristics affect their value

- Finally,
  - Proposing a comprehensive methodology for computing users' values that can be applied to many OSNs.
3.1 The Value of Actions

- measuring the value of actions
  - Estimating invisible actions
    *by considering visible actions as a proxy for invisible actions*
  - Using previous studies
    *that have access to private invisible actions*
    - How?
      - clickstream data (e.g., records of requests to the OSN)
<table>
<thead>
<tr>
<th>Category</th>
<th>Facebook Share</th>
<th>Category</th>
<th>Orkut Share</th>
<th>Category</th>
<th>Hi5 Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home</td>
<td>35 %</td>
<td>Profile,Friends</td>
<td>41%</td>
<td>Photos</td>
<td>45%</td>
</tr>
<tr>
<td>Profile</td>
<td>16 %</td>
<td>Photos</td>
<td>31%</td>
<td>Profile</td>
<td>20%</td>
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<tr>
<td>Photos</td>
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<td>Scrapbook</td>
<td>20%</td>
<td>Home</td>
<td>13%</td>
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<tr>
<td>Friends</td>
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<td>Other</td>
<td>3%</td>
<td>Friends</td>
<td>13%</td>
</tr>
<tr>
<td>Groups</td>
<td>3 %</td>
<td>Communities</td>
<td>1%</td>
<td>Groups</td>
<td>1%</td>
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</tbody>
</table>

Table 1: Comparison of popular user activities across three OSN sites [8, 28].
3.2 Users Characteristics and Interactions

- **Users Characteristics**
  - (gender, age, location, interests) public by default
  - direct impressions

- **Users Interactions**
  - generally possible to obtain some information about the social graph, such as the number of friends and their identities.
  - indirect impressions
3.3 Measuring User Value

- User characteristics ($u_c$)
  \[ u_c \propto t \cdot d \propto t \cdot \log (\# friends + 1) \]

- User activity in her own profile ($u_{a \text{ self}}$)
  \[ u_{a \text{ self}} \propto \sum_i w_i \# \text{action}_i \]

- Friends activity in a user's profile ($u_{a \text{ friends}}$)
  \[ u_{a \text{ friends}} \propto \sum_{v \in |u|} v_c \sum_i w_i \# \text{action}_i \]
3.3 Measuring User Value

\[ u_{value} \propto \left( u_{self} + u_{friends} + u_{visitor} \right) u_c \]
3.3 Measuring User Value

- Using different weights to:
  - privacy settings,
  - Circles
  - Groups or community activity
4. APPLYING USER VALUE

- **Dataset**
  - considering the 50,564 out of the 90,269 users.
    - users with public profile

- **Users who share:**
  - their age and gender,
  - have at least one interest
  - have at least one post on their wall

- 23,950 users have at least one interest
- 7,054 users have any posts
4. APPLYING USER VALUE

- Choosing Weights
  - Categories:
    - posts, **0.75**
    - multimedia, **0.21**
    - and communities, **0.04**
4.3 Value Distributions
4.3 Value Distributions
5.2 Collecting Data

- query Facebook's Ads platform for the suggested bid of each of the 4,265 users

- First,
  - distribution is remarkably even,
  - CPC of 99% of users' interests ranging between $0.62 and $1.53
  - CPM for 99% of users' interests ranging between $0.07 and $0.31.

- No specific interests are significantly more highly valued by advertisers than others.
5.2 Collecting Data

- Second,
  - Prices are quite stable over time
  - Indicating that our methodology is likely to hold over at least short periods of time.
Figure 3: Facebook’s suggested CPM bids from one particular set of parameters over three days, showing price stability over time (note y-axis in log-scale).
Leveraging user value

- the OSN provider is able to:
  - make accurate estimates of user value
  - encourage "high value" behavior by its users by directly rewarding them
  - charge higher prices for advertising to such users,