Leveraging Online Social Networks

- Online communities in the Web 2.0 era
  - Facebook – ~90 million users
  - Myspace – ~110 million users
  - Orkut – ~60 million users
- Question: can friends-of-friends networks be leveraged outside social networks?
- Examples
  - Internet Search
  - Spam Filtering
  - Online marketplaces...?
    - Enhanced reputation systems
    - Sybil Protection
What’s Wrong With Online Marketplaces?

- **Man arrested in huge eBay fraud** – MSNBC 2003
- **eBay urged to tackle fraud better** – BBC 2006
  - [http://news.bbc.co.uk/1/hi/uk/4749806.stm](http://news.bbc.co.uk/1/hi/uk/4749806.stm)
- **Fraud abroad remains 'uphill battle' for eBay** – CNET 2008
- **Tacoma woman’s house emptied after Craigslist hoax** – The Seattle Times 2007
  - [http://seattletimes.nwsource.com/html/localnews/2003652872_webhouse05m.html](http://seattletimes.nwsource.com/html/localnews/2003652872_webhouse05m.html)
- **Escrow fraud ruining Craigslist?** – ZDNet 2008

**Bottom Line** –

- Online markets plagued by fraud
- Feedback-based reputation systems ineffective
Social Marketplaces and Overstock.com

- Online marketplaces that incorporate social networks
- Hypothesis: transactions with social friends will have higher satisfaction.
  - Are people actually using this capability?
    - Measure transaction volume vs. path length
  - Do social networks actually improve satisfaction?
    - Measure satisfaction vs. path length

- Overstock Auctions
  - Started in 2004
  - Similar to eBay
    - Buyers leave feedback after each transaction
  - Incorporates social components
    - Comment and leave ratings on friend’s profiles
    - Message boards
    - “How am I connected?” button
Methodology

- **Analyze overall network structure of Overstock**
  - Connectivity of all 431,705 users provided by Overstock
  - Two networks:
    - “Personal” – connecting friends
    - “Business” – automatically connects users who transact

- **Correlating structure with transactions**
  - Two questions:
    1. What correlates transactions: Business or Social connectivity?
    2. What is the impact of path length on transaction satisfaction?
  - Crawled transaction history of ~10,000 users
  - ~18,000 total transactions
    - Overall feedback for each user
    - Feedback for individual transactions
Do Social Networks Improve e-Commerce?

Outline

1. Connectivity graph analysis
2. What correlates transactions?
   - Social vs. Business path lengths
3. Impact of path lengths on transaction satisfaction
Connectivity Graph Analysis

<table>
<thead>
<tr>
<th></th>
<th>Business Network</th>
<th>Social Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Nodes</td>
<td>398,989</td>
<td>85,200</td>
</tr>
<tr>
<td>Total Links</td>
<td>1,926,553</td>
<td>1,895,100</td>
</tr>
<tr>
<td>Avg. Node Degree</td>
<td>4.82</td>
<td>22.24</td>
</tr>
</tbody>
</table>

- 82% of users have < 1% overlap

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Connectivity is Heterogeneous

50% of users have less than 10 friends and/or transaction partners.

Business network has lesser degree overall.

OS Business Network
OS Social Network
Orkut In-degrees
Orkut Out-degrees

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Do Social Networks Improve e-Commerce?

Outline

1. Connectivity graph analysis
2. What correlates transactions?
   - Social vs. Business path lengths
3. Impact of path lengths on transaction satisfaction
Question: is there a correlation between social distance and buying decisions?

Compare transaction volume to network path length

- For each transaction, compute hops between buyer and seller
- Business network – Connectivity is almost guaranteed
  - For partners with multiple transactions, path length = 1
  - Otherwise, remove 1-hop edge and calculate distance
- Social network – Connectivity is NOT guaranteed!
  - Not all users are present in the Social Network
Observations on Transaction Volume

Volume vs. path lengths for 17,376 transactions

- At most, 20% of transactions occur between repeat buyers.
- Most transactions occur between close Business network neighbors.
- Almost no transactions occur between friends.
- Social network is smaller; is underutilized for making transaction decisions.
Do Social Networks Improve e-Commerce?

Outline

1. Connectivity graph analysis
2. What correlates transactions?
   - Social vs. Business path lengths
3. Impact of path lengths on transaction satisfaction
Question: does social distance influence transaction satisfaction?

Transaction success percentage vs. path lengths for 17,376 transactions

Example transactions:

<table>
<thead>
<tr>
<th>Seller</th>
<th>Buyer</th>
<th>Transaction ID</th>
<th>Date</th>
<th>Rating (-2 to +2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>123</td>
<td>2/19/2005</td>
<td>+2</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>234</td>
<td>12/17/2004</td>
<td>+2</td>
</tr>
<tr>
<td>A</td>
<td>C</td>
<td>345</td>
<td>12/15/2004</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>D</td>
<td>456</td>
<td>12/2/2004</td>
<td>-1</td>
</tr>
</tbody>
</table>

Satisfied = [+1, +2]
Observations on Personal Network

Friendship is a choice!

Bad sellers/fraudsters are naturally excluded from Social network. Chain of satisfaction holds at long social distances.

Near 100% satisfaction rate between friends.

90% average satisfaction for distances <= 5.
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Business connections are automatic!

Business networks includes all transaction partners ever. This includes partners who you were unsatisfied with! Chain of satisfaction does not hold at long distances.
Conclusions

- Social links underutilized for making transaction decisions
  - Most users do not participate in the social marketplace
    - 8% of users are purely social
    - 80% users not present in the Social network
  - Those who do separate business from friends
    - Very few transactions between friends
    - Little overlap of between Social and Business networks

- Room for growth!
Conclusions, cont.

- Social networks increase user satisfaction
  - Success rates at long distances are higher on Social network
  - Social linkage is a choice, cheaters are quickly excluded
    - Fraudsters necessarily must use many fake accounts
    - These accounts rarely become well connected in Social network
Conclusions, cont.

- Social networks are an excellent way to avoid bad sellers
  - User education is needed
    - Get more people involved socially
    - Encourage businesses to interact socially
  - Better advertising, more features for existing services
    - Ebay: Favorite sellers and Neighborhoods
    - Amazon Profiles
    - Facebook Marketplace
Questions?

Thanks for Listening!