The Effect of User Features on Churn in Social Networks

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What is Churn??

• **Churn** is a risk (opposite to opportunities)
  – User retention vital to community health & functioning

• Hot topic in industries like telcos
  – Not clearly defined in online social networks
  – Full defect vs. partial

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Why Churn?

- Additional dimension
- Community & user value
- Personal needs & satisfaction
- Network effects observable

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1. What is Churn?
   – Proposed flexible definition, different types
2. Why Churn?
   – Identified features, community & user value
3. How to predict?!
   – How do we know if a user is going to churn?
   – Can we correlate a user’s value within a community with their churn probability?
• Set our future research agenda...
User Value & Churn Probability

• Like in telcom: start with feature-based approach
• But we’re sure: network effects have to be considered
• Correlation: features vs. churn probability

\[ P(\text{churn}|v_i) = \begin{cases} 0 & \mu_C(v_i) \geq \mu_{PA}(v_i) \\ 1 - \left( \frac{\mu_C(v_i)}{\mu_{PA}(v_i)} \right) & \text{otherwise} \end{cases} \]

– Features: structural and social network, reciprocity, persistence/productivity, popularity, sentiment, ...
Case Study

• Data provided by the largest Irish message board Boards.ie
• Used all data published within 2006
• Derived features at weekly increments
Analysis: Global Churn

<table>
<thead>
<tr>
<th>Threshold</th>
<th>$P$</th>
<th>$R$</th>
<th>$F_1$</th>
<th>$\kappa$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>0.638</td>
<td>0.639</td>
<td>0.635</td>
<td>0.266</td>
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<tr>
<td>0.5</td>
<td>0.668</td>
<td>0.666</td>
<td>0.649</td>
<td>0.286</td>
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<tr>
<td>0.7</td>
<td>0.734</td>
<td>0.741</td>
<td>0.733</td>
<td>0.410</td>
</tr>
</tbody>
</table>

![Graphs showing boxplots of correlation between features and class labels](image)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Out-degree</th>
<th>In-degree</th>
<th>Initialisations</th>
<th>Avg Posts in Parti</th>
<th>Popularity</th>
</tr>
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**Expected!?**

**Surprise?!**

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Analysis: Per Forum Churn

- Highest: After hours
- Median: Prime time cartoons
- Lowest: Japanese culture
- Mean: World of Warcraft

- Performance better than global, larger values better in forums with greater activity
- Distinct forums exhibit distinct behaviour
Towards Network Effects

• Unweighted Neighbourhood Churn:
  – Average churn probability of neighbours
• Weighted Neighbourhood Churn
  – Average weighted churn probability of neighbours
• Experiments over 4 forums from before
• Induced Linear Regression Model
  – Dependent variable: churn probability
  – Independent variables: unweighted and weighted neighbourhood churn probabilities
Analysis: Per Forum Neighbourhood Churn

Positive correlation between churn probability of a user and neighbourhood churns

...what about other features of the neighbourhood?!?
Conclusion

• Correlation existing, but significant differences:
  – Global vs. local
  – Between forums

• Advanced analysis of forum characteristics and these effects needed … classification/clustering

• Extend analysis (windows, filters, sample, …)

• Choice of features, integrate social roles

• Analysis of network effects

• …value, health, personal needs, … loads to do!