Social Network Migration

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Currently many new services being created
  ○ Google+
  ○ Spotify
  ○ Pintrest
  ○ Imgur

Inherent social network aspects

Goal
  ○ How can increase adoption to new services?
  ○ What factors are most important?
Related Works

- Group Formation in Large Social Networks: Membership, Growth, and Evolution.
- Used Machine Learning to find most important factors in users switching groups
- Clustering coefficient of a user's friends in the group was the most important factor in switching groups
Related Works

- The Spread of Behavior in an Online Social Network Experiment.
- Results from real users in a controlled social network
- Long Ties vs Clustering
- Signal Reinforcement
Design

- **SNAP network software**
  - Scales better (C++ implementation)
  - Availability of social network datasets
- **Multi-threaded algorithm**
- **Pseudo code**

  Pick $n$ seed adopters
  For $k$ iterations:
    For each node:
      if not in new social network and a neighbor has recently joined:
        switch to new social network with prob $p_1$
      else:
        notify neighbors of switch with prob $p_2$
Design

- Probability of switching
  - Number of neighbors in new network
  - Number of notifications received this iteration
  - Clustering coefficient of neighbors in the new network

\[ p_1 = \frac{\alpha \cdot neighbors' + \beta \cdot notifications + \gamma \cdot clustering}{total \ neighbors} \]

- Used as a probability rather than a threshold
  - Humans are unpredictable
Design

- Users only considered for switching to the new social network when a new neighbor joins the network
  - Otherwise, cascading will be complete every time

- Probability of notifications
  - Degrades over time
  - Represents users initial excitement about a new network making them more likely to talk about it

\[ p_2 = \text{notification threshold} \cdot \left( 1 - \frac{\text{iterations in new social network}}{\text{notification duration}} \right) \]
Design

- **Seeding Methods**
  - Random (baseline)
  - Degree
  - Eigenvector Centrality

- **Logging per iteration**
  - Total size of the new network

- **Edges in both social networks are never changed**
  - Friends in old network will be friends in the new network
Experiment

- Ran on LiveJournal Dataset
  - 4,847,571 nodes
  - 68,993,773 edges
- Looked at each variable individually
  - Weights for formula
  - Posting Probability
  - Length of Posting Duration
  - Seeding Method
- All data is collected as averages of runs
Results - Effect of Posting Threshold

Effect of Posting Threshold (10-D-0.4-0.9-0.1-128-\textasciitilde-50)
Results - Effect of Notification Iteration Length

Effect of Notification Iteration Length (10-D-0.4-0.9-0.1-128-0.5-)

Iterations

Users
Results - Effect of Weight on Neighbors in New Network

Effect of Weight on Neighbors in New Network (10-D^-0.1-0.1-128-0.5-100)
Results - Effect of Weight on Notifications
Results - Effect of Weight on Clustering Coefficient
Results - Comparison of Each Weight

Effects of Each Weight (10-D,",-",128-0.5-100)

- **Users**
  - **All Weights 0.1**
  - **Neighbors Weight 0.7**
  - **Notifications Weight 0.7**
  - **Clustering Coefficient Weight 0.7**

- **Iterations**
  - Range: 0 to 50
Future Work

- Get snapshots of user growth from two real social networks
- New seeding methods
  - Greedy method for influence maximization
- Expand on switching probability algorithm
  - Apply dynamic weights for factors
  - Add more inputs
- Psychological basis for weights
- Add functionality to simulate users leaving the new network if it loses momentum or becomes unattractive
Conclusion

- Created a complex simulation for network migration
- How different factors affect adoption
  - Clustering coefficient
  - Neighbors in the new network
- Tool that can be used by startups looking to create social networks
  - Helps focus advertising and budget
Questions?
Extra Slides
Results - Effect of Posting Threshold

Effect of Posting Threshold on SlashDot (10-D-0.2-0.9-0.01-128-^-200)