Gesundheit! Modeling Contagion through Facebook News Feed

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Motivation

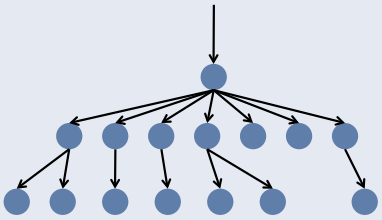
- How do ideas diffuse through a large social network?

- Prior models start with an isolated event and explore conditions under which this event triggers a global cascade
  - Little empirical evidence to assess the validity of the models

- We present the first empirical analysis of repeated large-scale diffusion over a global social network.

Theory of the Influentials

- Popular Wisdom: it's all about the "influentials" (Malcolm Gladwell, etc.)
- Idea: reach a tiny group of influential people, and you'll reach everyone else through them for free



Accidental Influencers

- Duncan Watts: anyone can be an "influencer".
- Ideas don't spread via influentials
  - Ideas spread like viruses: either you're susceptible, or you're not
- Success depends not on how persuasive the early adopter(s) are, but whether everyone else is easily persuaded

- Watts simulations: influential nodes are no more likely to trigger cascades than average nodes.

Questions

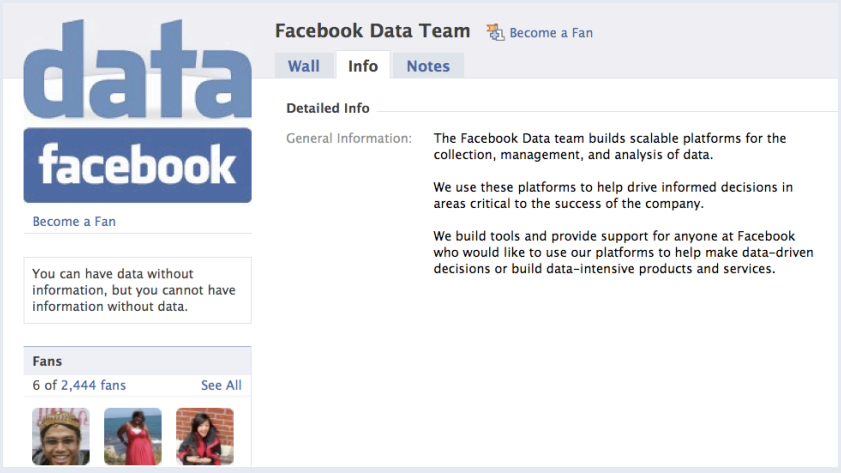
- In most network models of diffusion, contagion is triggered by a fairly small number of sources: is this a good assumption?
- What are some characteristics of diffusion chains on Facebook?
- Can we use demographic or behavioral characteristics to predict the size of diffusion chains that a particular user will create?

Data and Methodology

Spreading Ideas on Facebook

Empirical Study

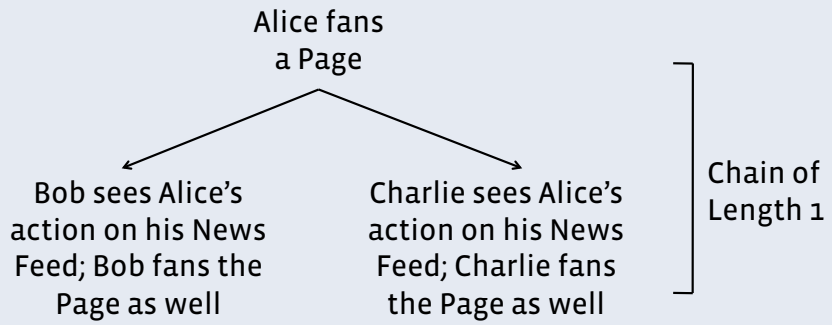
- Focus on one type of action for an empirical analysis: Page fanning



Sample News Feed story

- Aside: current model of Page fanning…

Mechanics of Page Fanning



Data

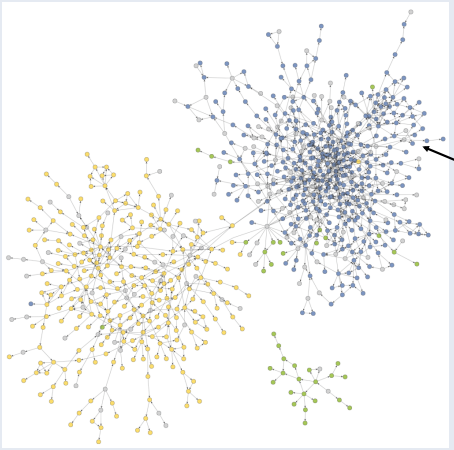
- Data include all actor → follower connections for 262,985 Facebook Pages between 2/19/08 and 8/19/08
- Main dataset: Page-level data
- Second dataset: select 10 random, representative Pages and analyze the users that start chains
  - Pages were at least 40 days old and had at least 5,000 fans

Prediction Model

- Response : *max_chain_length*
- Predictors:
  - gender
  - log age
  - log Facebook age
  - log *feed_exposure* (# friends who saw News Feed story)
  - log *friend_count*
  - log *activity_count* (wall posts + messages sent + photos added)
  - log popularity (controls for News Feed exposure)
- Method: zero-inflated negative binomial regression

Results

Large Connected Trees of Diffusion

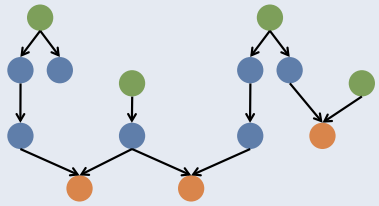


Link drawn if the follower fans a Page within 24 hours of first seeing a News Feed story that a friend has fanned the same Page

Diffusion chain for Stripy, a cartoon popular in Bosnia (blue), Slovenia (yellow), and Croatia (green).

Large Clusters Not Started by "One Guy"

- Roughly 15% of fans in the biggest cluster of each Page are start points
  - The variability in this percentage becomes very small as # fans increases



- Clusters are formed when many short diffusion chains merge
- 86.4% of paths of Page diffusion involve at least four individuals
  - Compare to 38% in real-life study (Brown and Reingen 1987)

Results of Chains Regression

Variable	*Intuition*	Fuddruckers	Cruise	Bolt	Zidane
(Intercept)	N/A	**2.574**	**1.419**	0.596	-0.105
age	?	**-0.537**	**-1.006**	**-0.386**	**-0.981**
gender==male	?	-0.011	-0.076	**-0.144**	**0.116**
Facebook_age	+	**-0.522**	-0.052	**-0.415**	**0.153**
activity_count	+	-0.102	**-0.142**	**-0.064**	**-0.100**
friend_count	+	**-0.220**	0.087	-0.023	0.009
feed_exposure	*control*	**1.279**	**1.008**	**0.860**	**1.053**
popularity	*control*	-0.014	**-0.245**	0.021	**-0.120**

- Recall: *max_chain_length* is the response variable
- Demographic characteristics not important
- Number of Facebook friends not important

Conclusions

- Facebook News Feed enables long-lasting chains of diffusion that may reach many more people than real-life diffusion chains.
- The Facebook network is very connected: ideas with good receptiveness will attract wide, long connected clusters.
- Long chains are not a function of Facebook age, activity, users' demographics, or even # of friends: it's only related to exposure.

Future Work

- Evaluate how accurately various theoretical models of diffusion account for the empirical phenomena uncovered
- Test experimental contagion events to better understand how different pieces of content and different start conditions determine the eventual structure of a diffusion cascade
- Test diffusion of other types of content

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