

Twittering Dissent

*Social Web Data Streams as a Basis for
Agent Based Models of Opinion Dynamics*

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The Challenge

To gain

valid, representative, relevant

insight into human behavior

from online data.

Audience Dissent at SXSW Conference

"Never, ever have I seen such a train wreck of an interview," said Jason Pontin on Twitter.

"Talk about something interesting," one attendee yelled about halfway through the keynote. The remark was met with waves of cheering and applause

— Wired.com article about the event

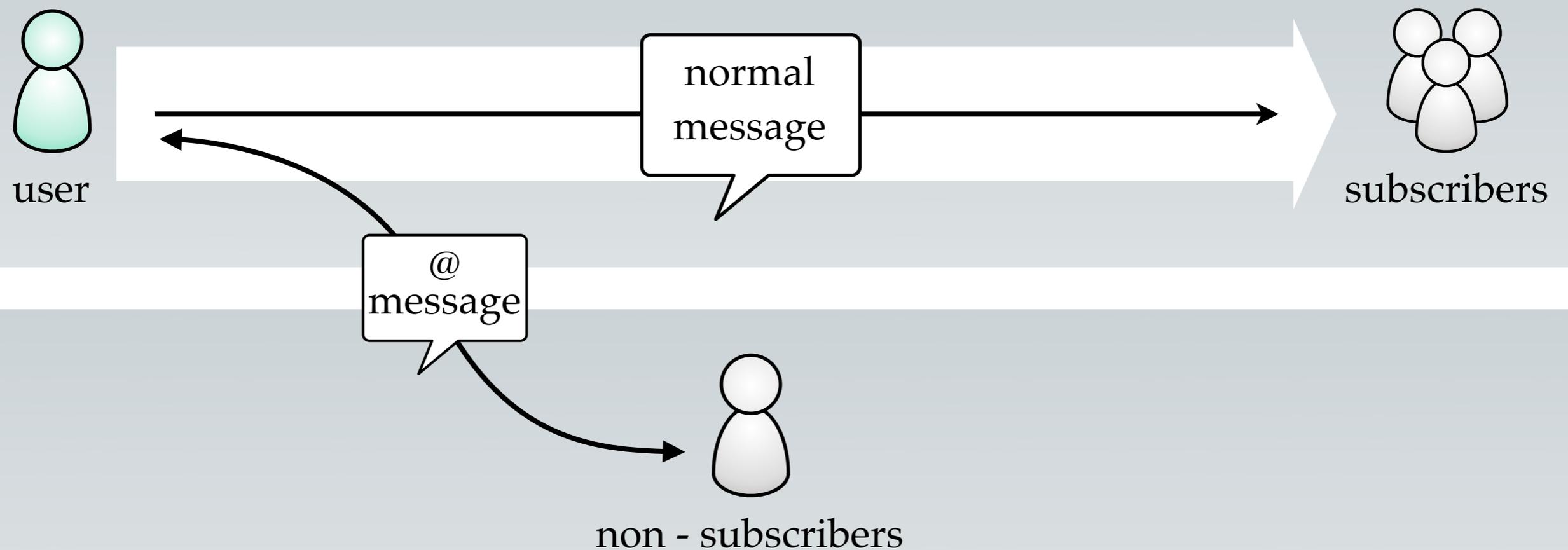
The Event of Interest

- Interview with Mark Zuckerberg of Facebook at SXSW conference, Austin (Tx), March 9th, 2008
- During the interview, negative comments posted by audience members spread through the microblogging service Twitter
- Unrest from the electronic backchannel spills over into the room, leading to booing, shouted interjections and eventually the abortion of the interview



Microblogging Overview

1. long term, one-way, mass audience communication



2. ad hoc, bidirectional, mass audience + select recipient communication

The Event:

Interesting Aspects

- Unique interaction of online / offline behavior
- Backchannel (invisible communication)
- Ad-hoc formation and group action in a small group setting
- Possibly an example of “augmented reality”
- All within strict spatial and temporal constraints

Research Challenges

- Problem: Ex Post proof of causality is difficult (qualitative in-depth interviews might be an option)
- Goal: Relate online data to offline situation without data
- Therefore: Our approach: Infuse online data into mathematical model on the basis of established social-psychological theories - then use model as basis for hypothesis generation



Data — Benefits

- (mostly) unique users
- Central data repository
- User-coded intents:
replies (@user), topics (#topic)
- Low syntactical complexity
as a result of limited message length (140 characters)

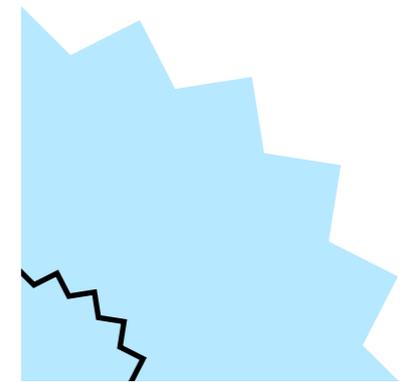
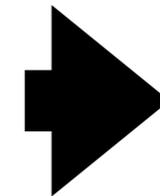
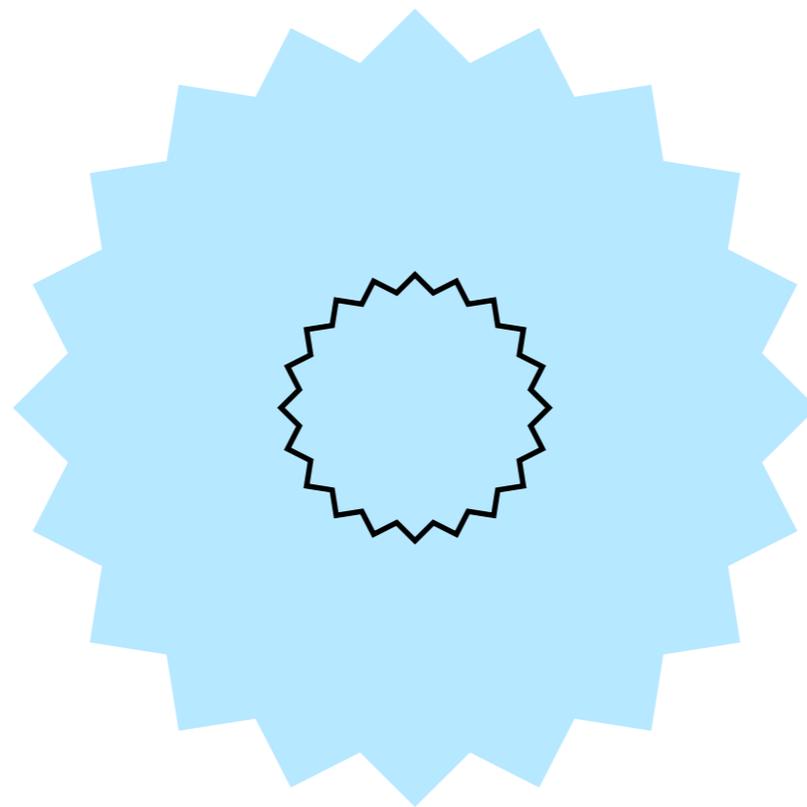
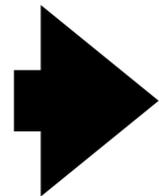
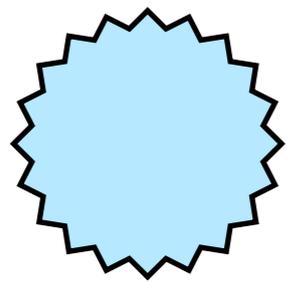


Data — Risks

- No guarantee of data availability
- Usage limit — limited data acquisition
- Message size may discourage complex issues as conversation topics
- Low temporal resolution (time zone ambiguity, latencies)

twitter

Our Data Set



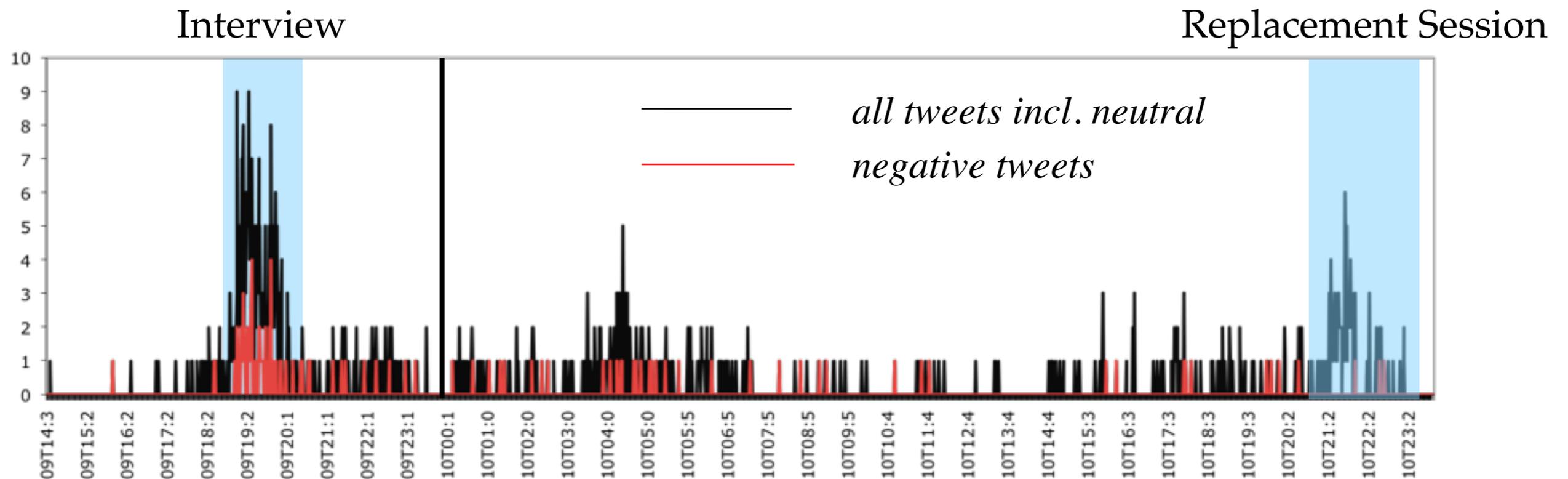
Robert Scoble
(well connected blogger)
over 2700 subscribers

All users directly addressed
by R. Scoble (@-messages)

Messages during
interview (N = 259)



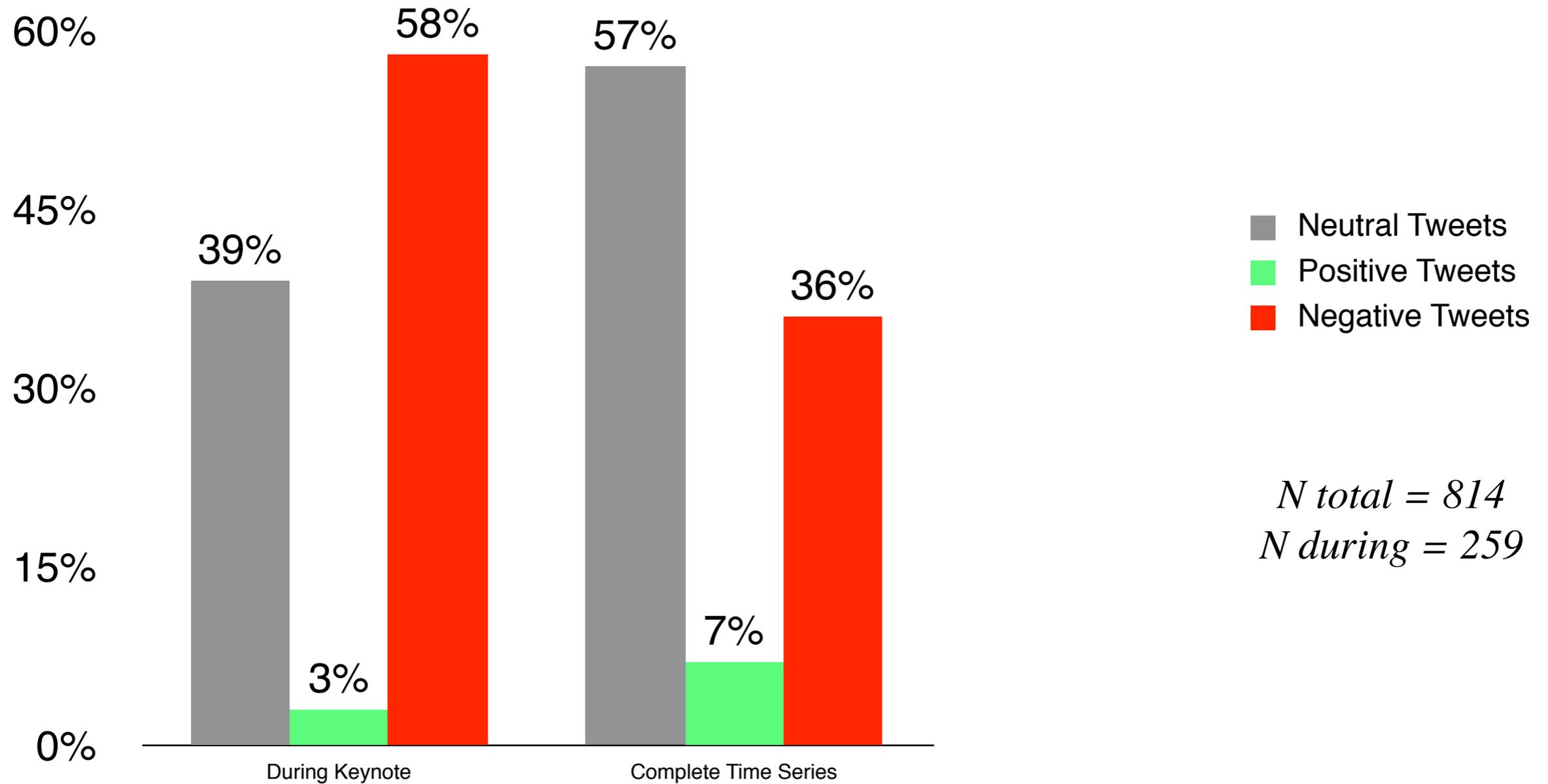
Our Data Set



- Messages hand-coded for relevance and negativity
- Time series supports role of backchannel

twitter

Our Data Set



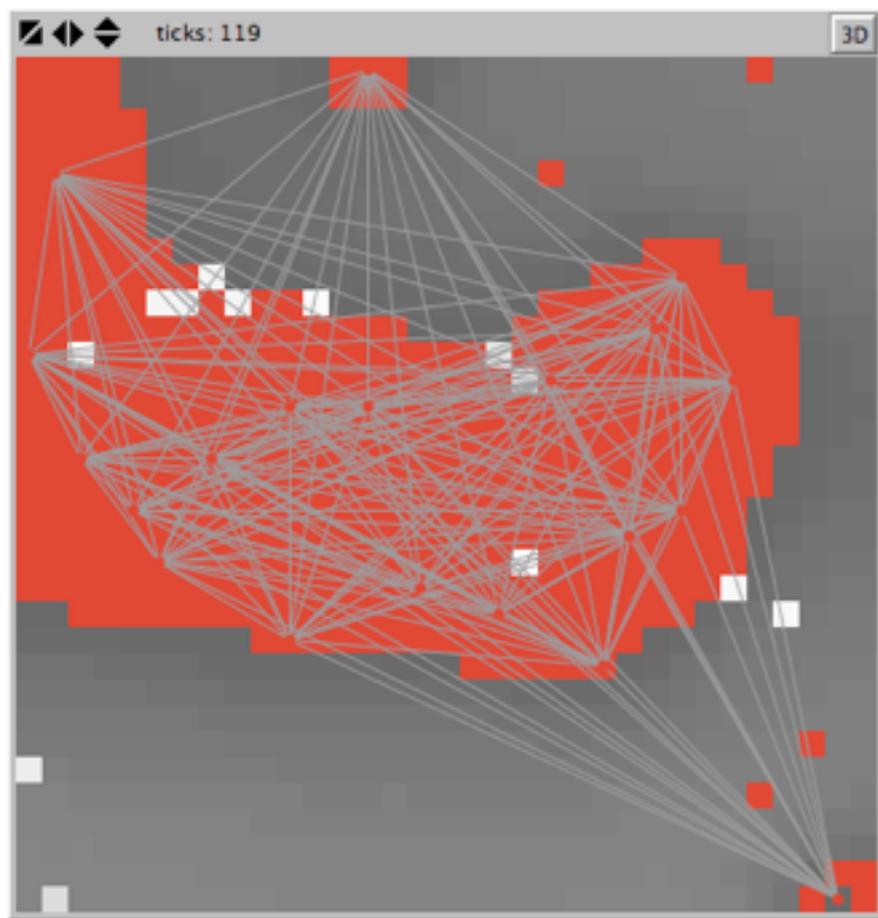
Modeling

- Known from physics, economics, recently spawned field of “econophysics”
- Roots in game theory, particle simulation
- Limited number of variables, Monte Carlo approach to find out behavior
- Good in conditions of high uncertainty regarding interplay of factors (explorative theory building)
- Bad for forecasts, establishing causality

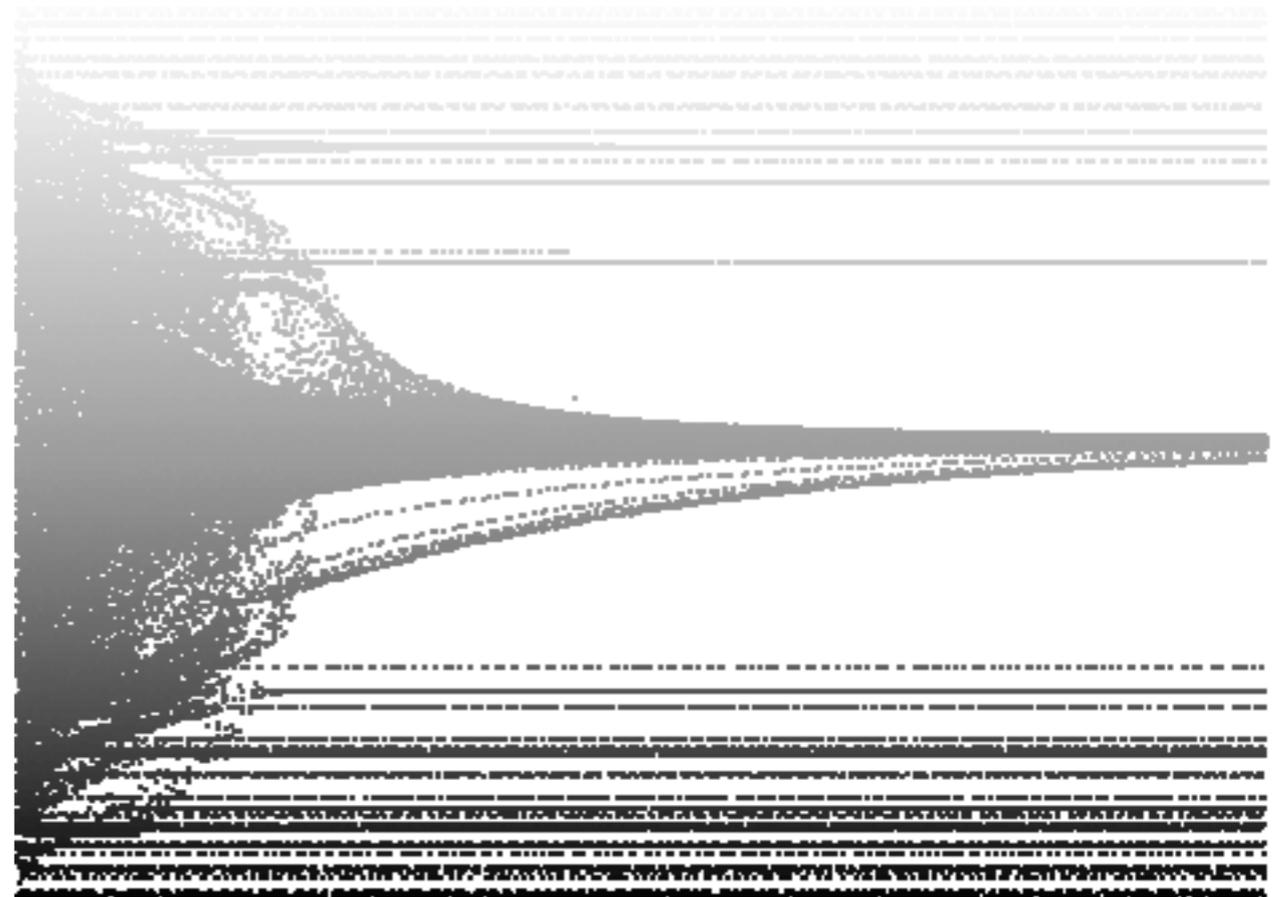
Established Models of Communication

- Models of Opinion Dynamics and Formation
- Hegselmann / Krause Model: Repeated averaging of opinions with neighbors
- “In the HK model, each agent moves to the average opinion of all agents which lie in her area of confidence (including herself).” (Lorenz 2007)

Building the Model



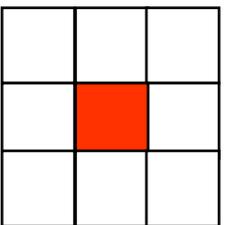
Snapshot:
Grid with backchannel



Time plot:
Opinion space over time

Model Step-by-Step

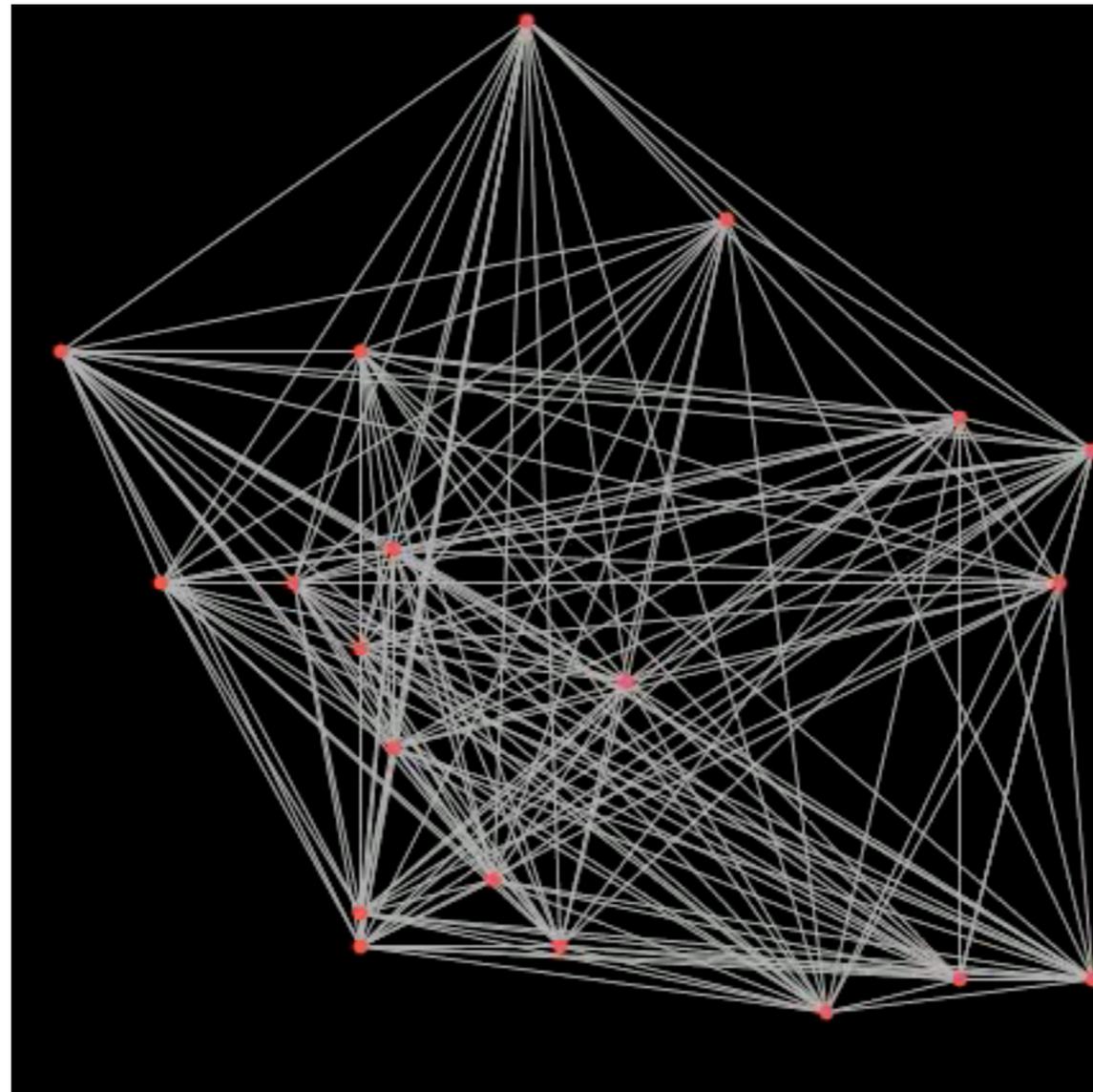
- Start with random distribution of opinions (gauss distribution) on 32 x 32 grid
- Twenty randomly chosen agents are interconnected via a backchannel. Each of those agents is connected to ten peer agents
- On each tick, every agent builds a new opinion O_j from the current opinions O_i of her eight immediate neighbors and her own
- Connected agents build a new opinion from the eight neighbors **and** all connected agents



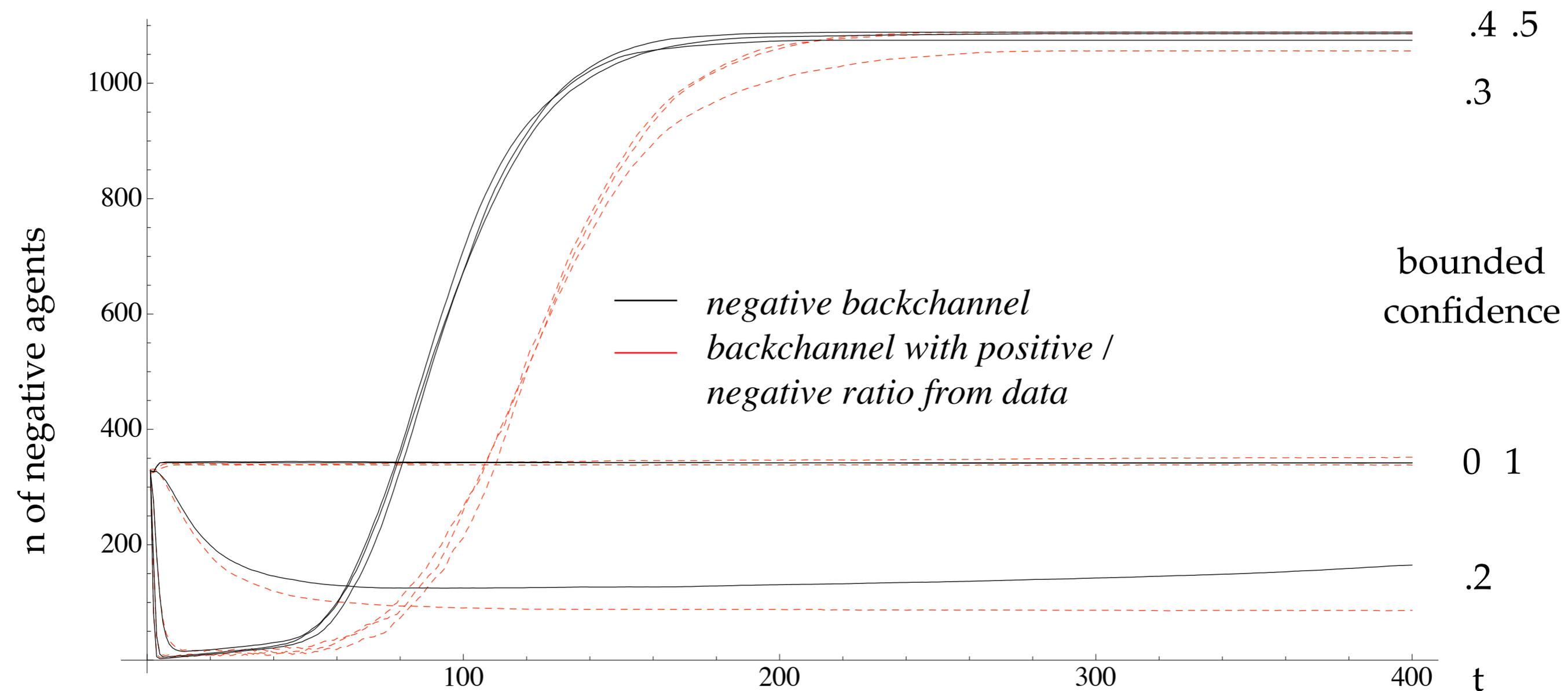
Introducing Tolerance

- Tolerance = acceptance or rejection of opinions
- Rejected opinions are disregarded in the process of opinion formation
- In modeling: **bounded confidence (ϵ)**
- Only agents within a certain distance on the one-dimensional opinion space are considered

Sample Model Run



Model Performance



Model Findings

- Tolerance of agents (bounded confidence) is the key factor for consensus / overwhelming
- The number of connected agents (connection density) speeds up the process, but does not affect the final outcome
- A surprisingly simple model captures social interaction under the influence of pervasive electronic communication

Modeling for Hypothesis Generation from Online Data

- Similar operationalizations
- Can be based on empirical data
- Based on existing theories / models
- Good science workflow (explicit assumptions)
- Known / measured factors can be plugged in

Further Investigations

- Bifurcation analysis of model design: create general description and describe relevant factors and their turning points
- Controlled experimental corroboration
- Events with longer time-scale and without spatial restrictions

Thank you!

For your interest

Logistics: Lessons Learned

In early summer 2008, Twitter cut access to archives before april 2008 (subsequently extended).

➔ Corroboration requires published data sets

Both data acquisition and modeling require substantial computational capacity. Some data is only accessible through special agreements with companies.

➔ Joined research efforts might be needed

Literature

- Why we twitter: understanding microblogging usage and communities. Proceedings of the 9th WebKDD and 1st SNA-KDD 2007 workshop on Web mining and social network analysis (2007) pp. 56-65
- Rainer Hegselmann and Ulrich Krause. Opinion Dynamics and Bounded Confidence, Models, Analysis and Simulation. Journal of Artificial Societies and Social Simulation, 5(3), 2002.
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- Photo credit: “Zuckerberg Keynote” by pescatello (CC Attribution 2.0)