

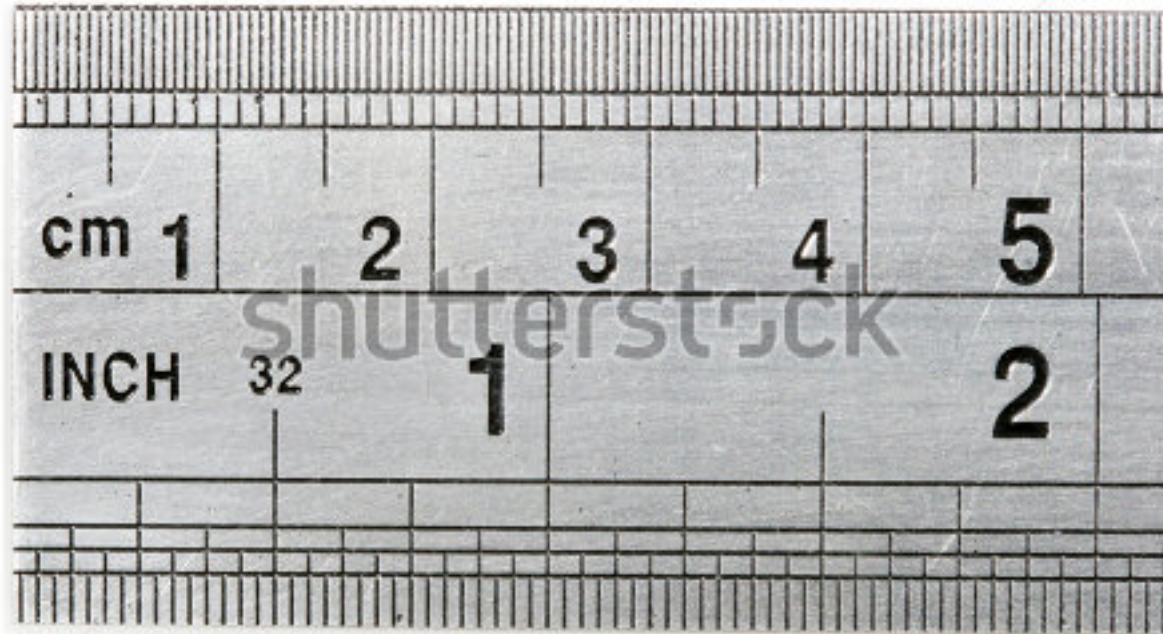
# The Emergence of Conventions in Online Social Networks

@farshadkt\* @nicesea† @nekozzang†

@kgummadi\* @winteram‡

MPI-SWS\* KAIST† Stevens Institute of Technology‡

Metric



Imperial

# Linguistic conventions



**Hey**



**Hello**



**Good day**



**How's it  
going**



# Why retweeting convention?


- Information-sharing channels are **explicit** in Twitter
- **Specific** to Twitter: exposures within the community
- **Contained** in Twitter, hence capturing all usages

# Twitter dataset

- Crawled **near-complete** data from 03-2006 to 09-2009
  - 54 million users
  - 1.9 billion tweets
  - 1.7 billion follow links
- Follow links are a snapshot of the network

# The retweeting variations

- Searched for syntax  
token @username
- “**Adopter**” refers to a user using the variation at least once

Variation	# of adopters	# of retweets
RT	1,836 K	53,221 K
via	751 K	5367 K
Retweeting	50 K	296 K
Retweet	36 K	110 K
HT	8 K	22 K
R/T	5 K	28 K
	3 K	18 K
<b>Total</b>	<b>2,059 K</b>	<b>59,065 K</b>



**Origins**



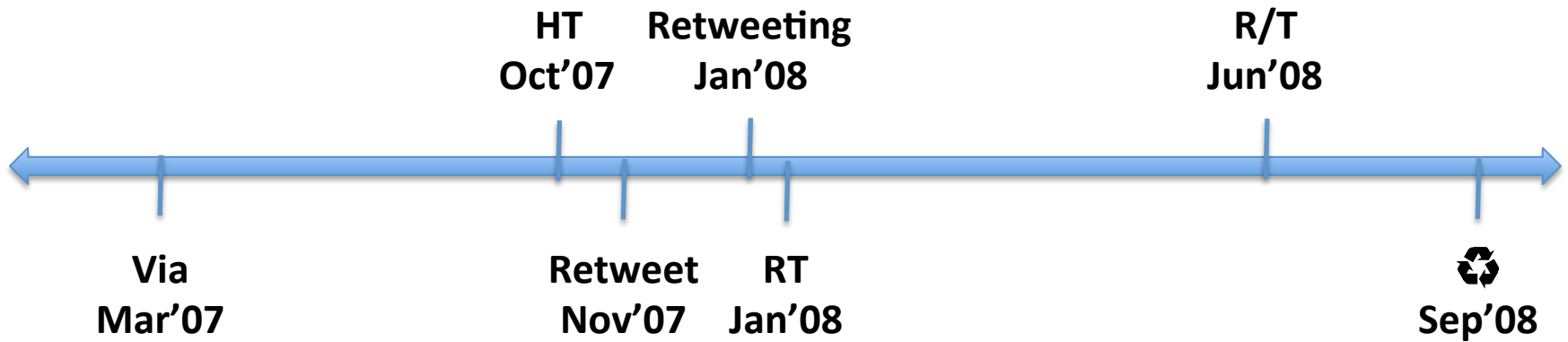
**Early adopters**



**Majority  
acceptance**



# What are the very first use cases?



# Via started from natural language



**tagami**

@tagami

@JasonCalacanis (via @kosso) - new Nokia N-Series phones will do Flash, Video and YouTube

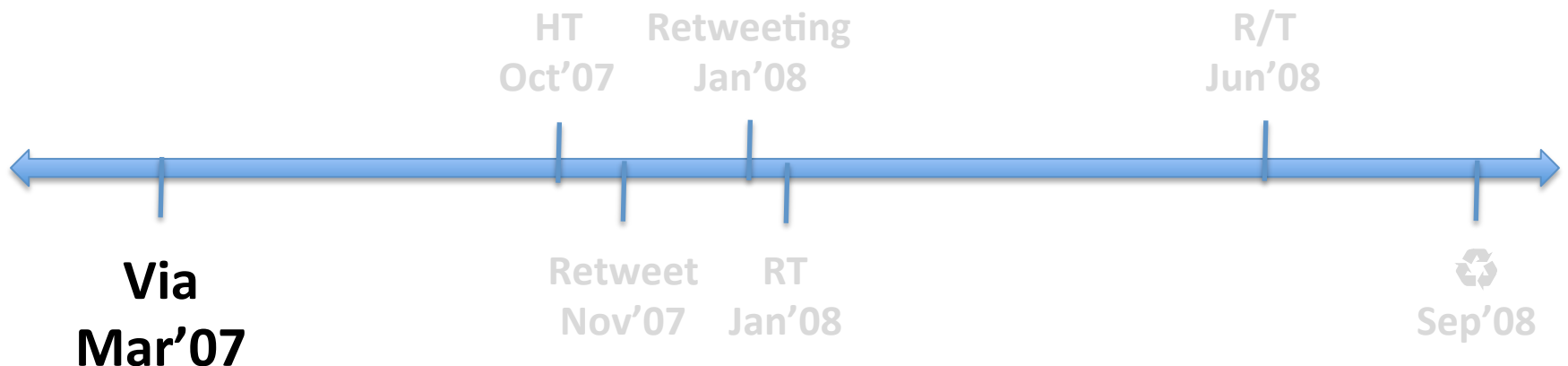
Follow



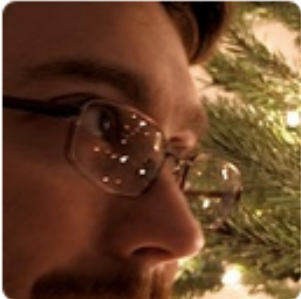
2,053 TWEETS

1,738 FOLLOWING

1,581 FOLLOWERS



# HT started from blog communities



**Travis Seidler**  
@TravisSeidler

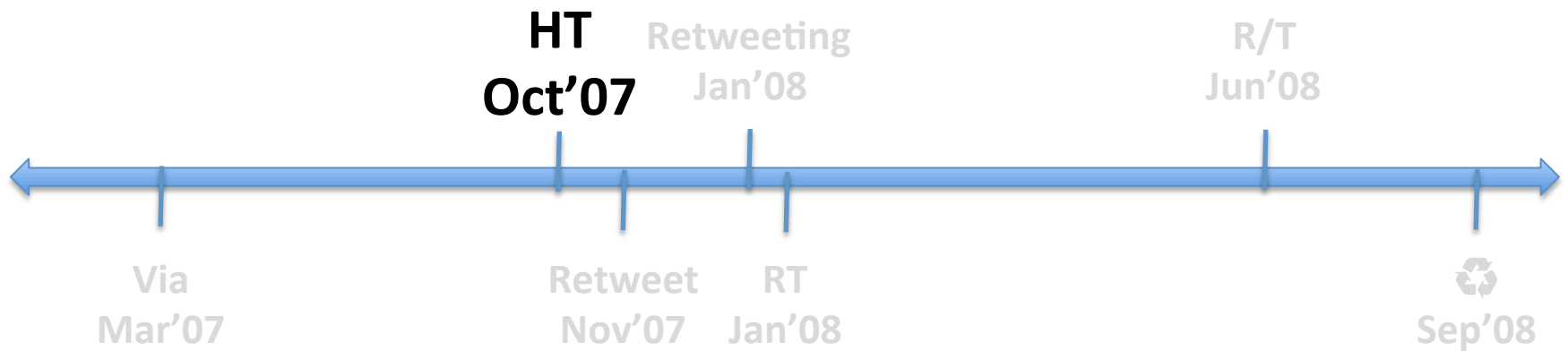
The Age Project: how old do I look? <http://tweetl.com/21b> ( HT @technosailor )

Follow

5,225 TWEETS

145 FOLLOWING

374 FOLLOWERS



# The first Twitter-specific variation



**Rocketboom**

@Rocketboom

Retweet @HealthyLaugh she is in the Boston Globe today, for a Stand up show she's doing tonight. Add the funny lady on Tweeter!

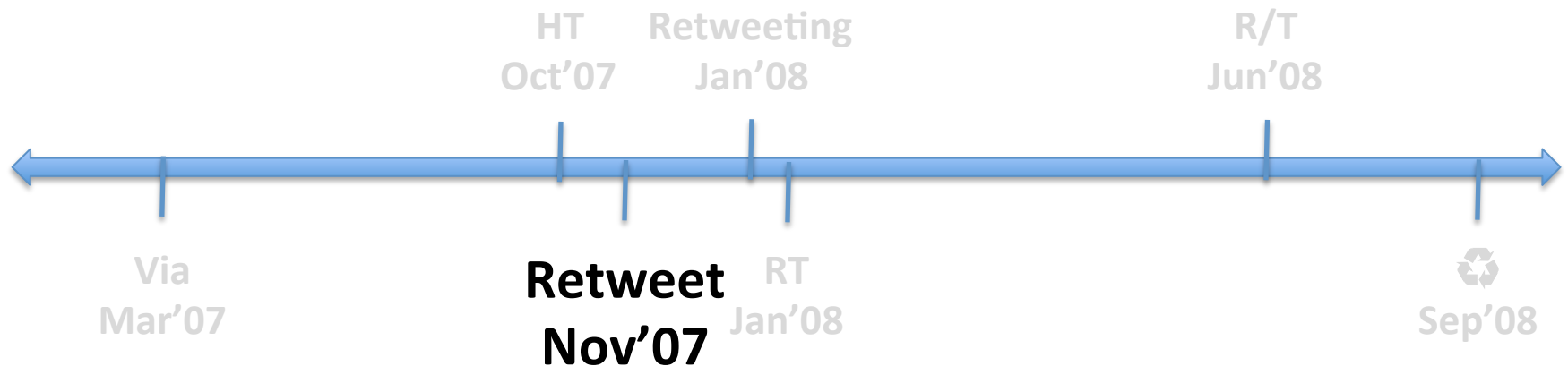
 Follow



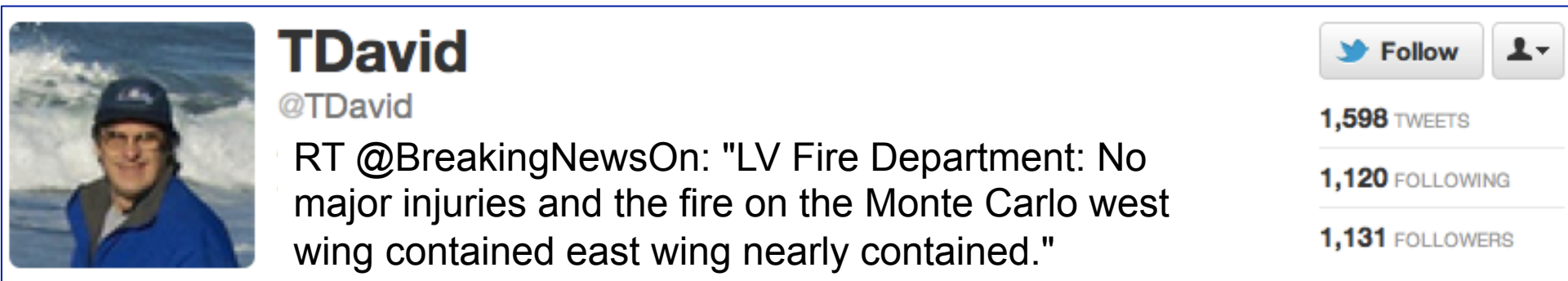
2,302 TWEETS

4,626 FOLLOWING

12,387 FOLLOWERS



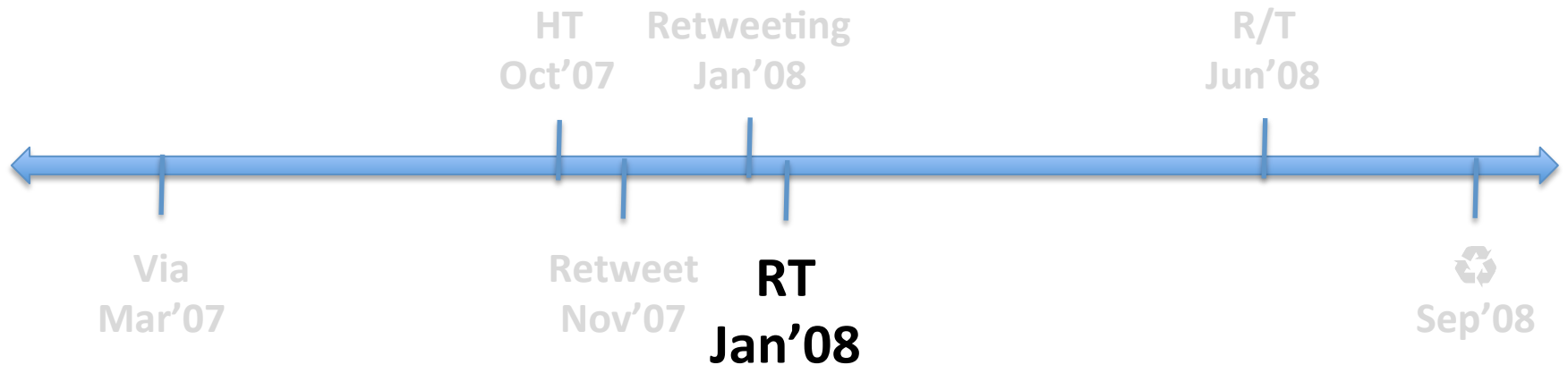
# RT was an adaption to constraints




**TDavid**  
@TDavid

RT @BreakingNewsOn: "LV Fire Department: No major injuries and the fire on the Monte Carlo west wing contained east wing nearly contained."


1,598 TWEETS  
1,120 FOLLOWING  
1,131 FOLLOWERS





# Some start from explicit discussions



**Clay Newton**   
@claynewton

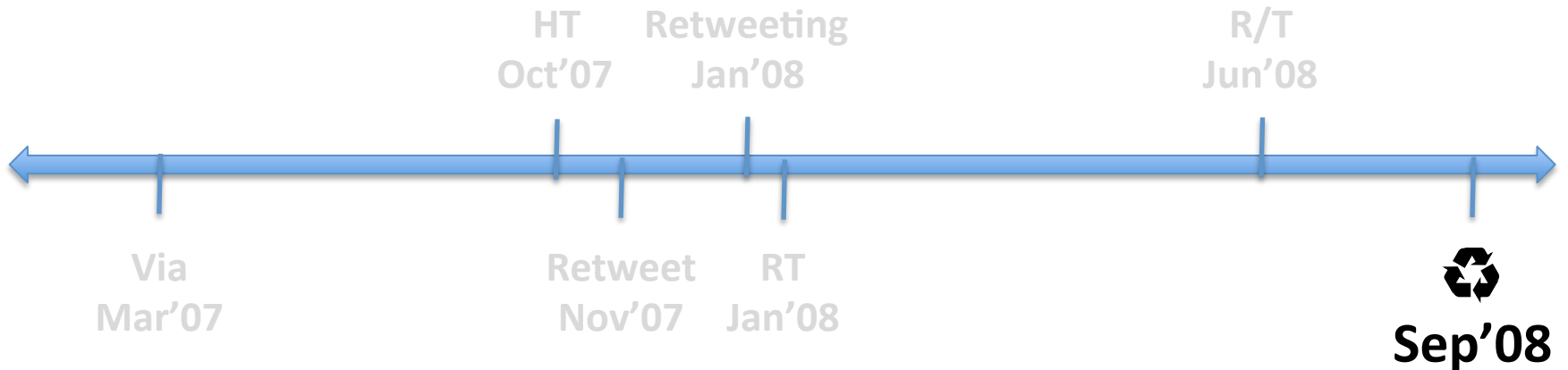
 @ev of @biz re: twitterkeys ★ <http://twurl.nl/fc6trd>

 Follow 

17,340 TWEETS

1,794 FOLLOWING

2,170 FOLLOWERS





**Origins**



**Early adopters**



**Majority  
acceptance**

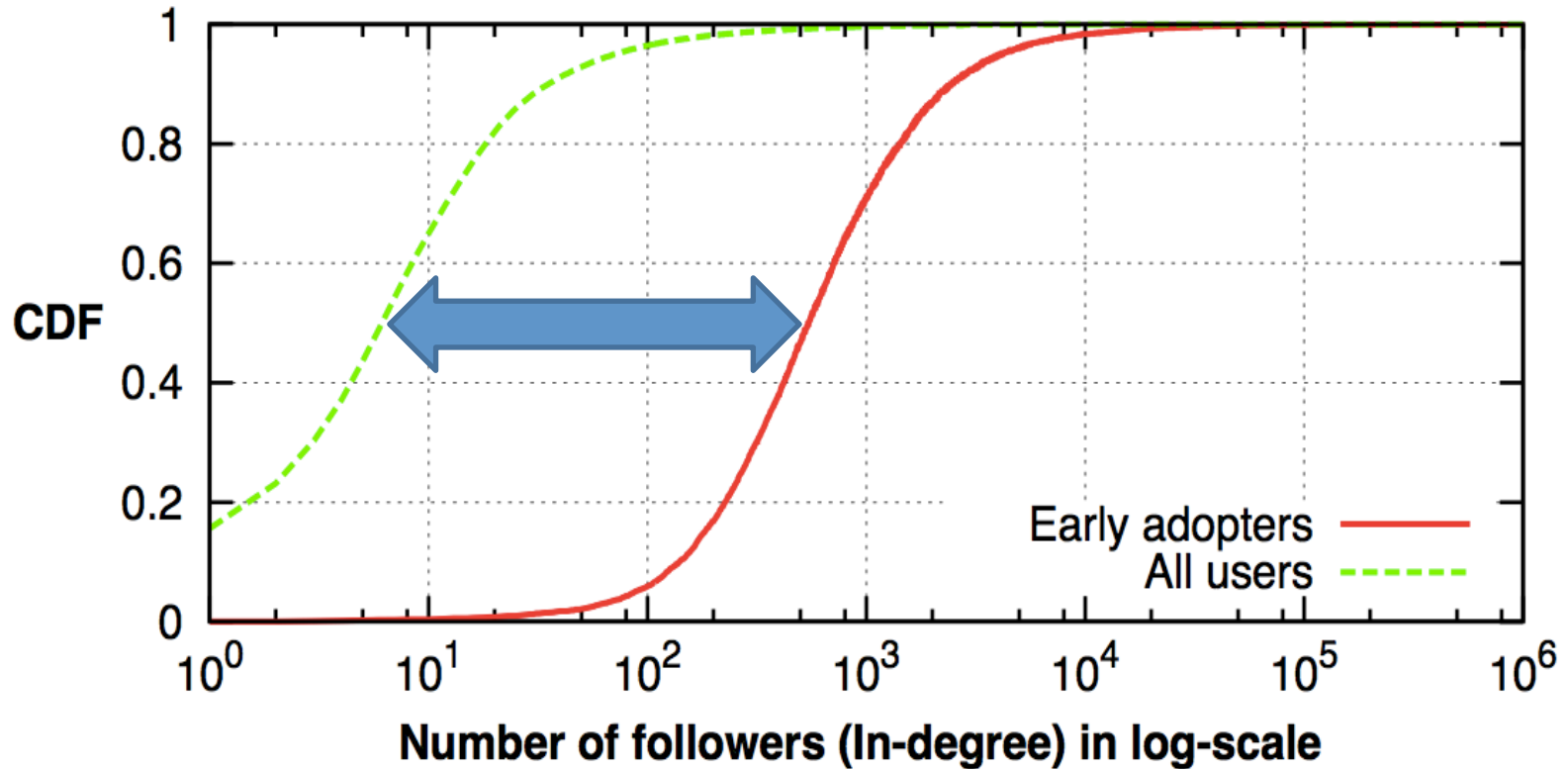




# Early adopters are more innovative

	Early adopters	Random users
Has Bio	94%	25%
Profile Pic	99%	50%
Changed profile theme	91%	40%
Has Location	95%	36%
Has Lists	57%	4%
Has URL	85%	14%

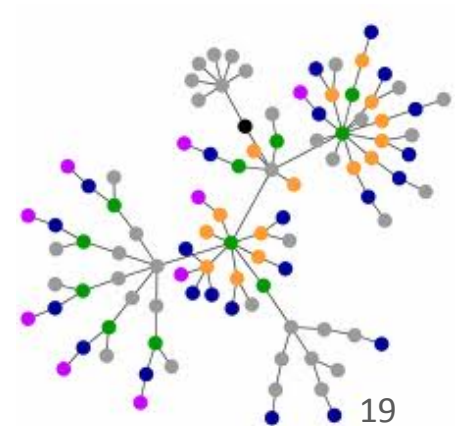
# Early adopters are more popular



- Much higher number of followers
- 80% of early adopters in top 1% based on PageRank

# Defining the diffusion network

- Each adopter is a node in the graph.
- There is a link from A to B if A was exposed to the variation by B.



# Diffusion network of first 500 adopters of Retweet



# Diffusion network of first 500 adopters of RT



# Early adopter network

- Average number of exposures: 2.9 – 6.4
- Average clustering coefficient: 0.233 - 0.320
- **Criticality**: fraction of users who were only exposed because of the most critical user: 0.5% - 4.9%

Early adopters' diffusion networks are **dense** and **clustered**. There is **no single critical** user.

# Convention had different spread patterns from the URLs

- URLs' early adopters are **not necessarily core users**
- The diffusion network is **not dense and clustered**
- There are **critical users** in the process



**Origins**

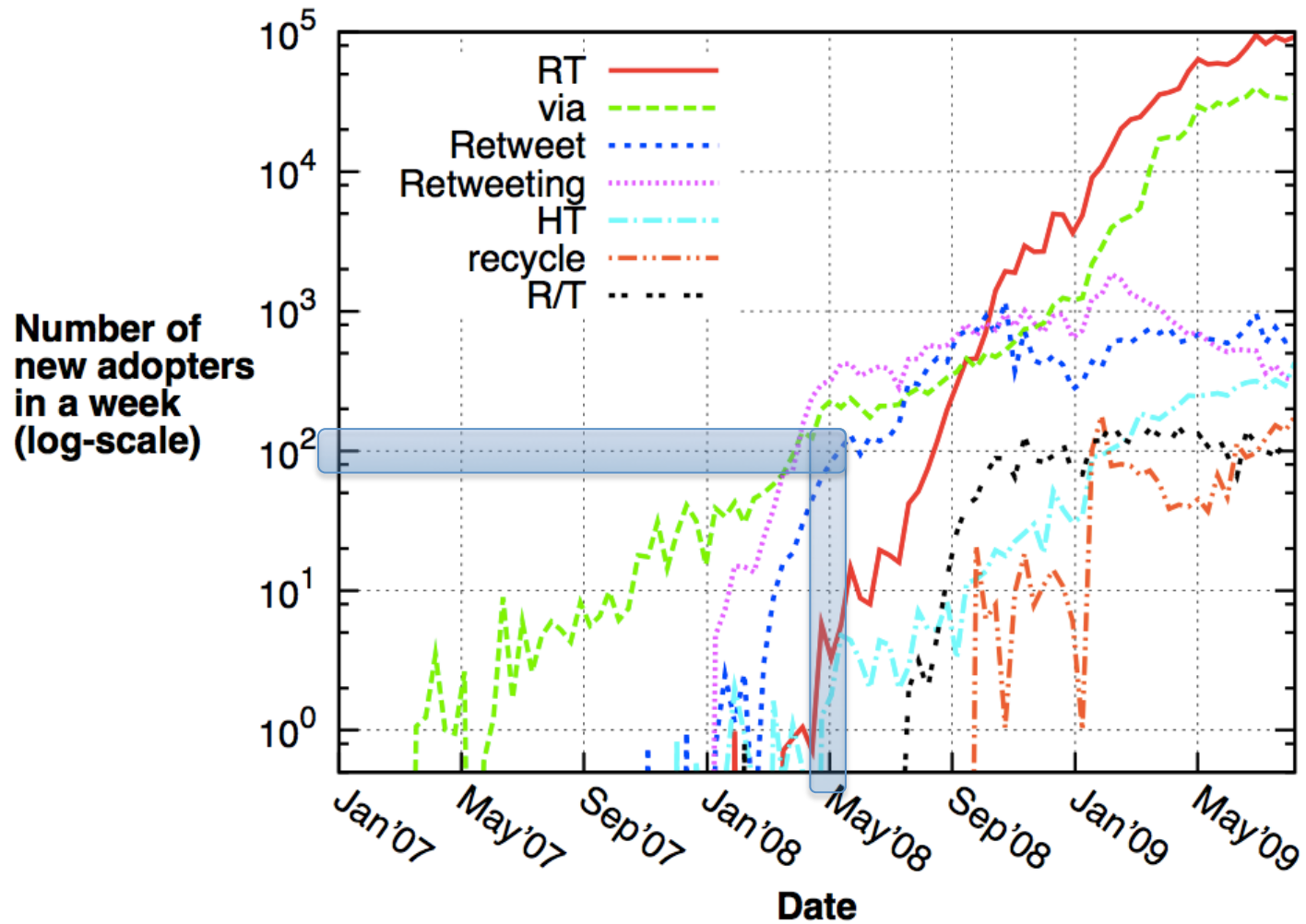


**Early adopters**

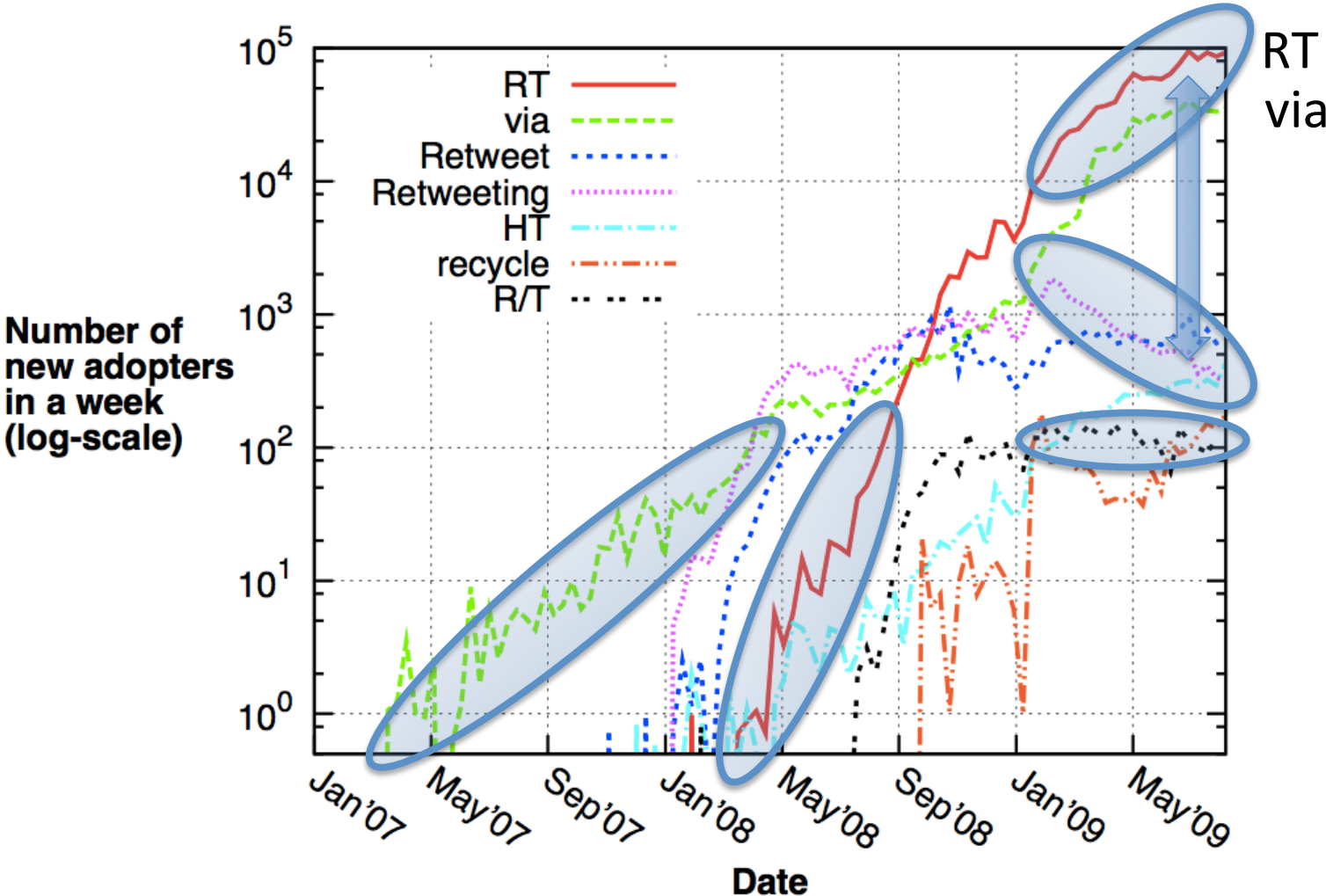


**Majority  
acceptance**

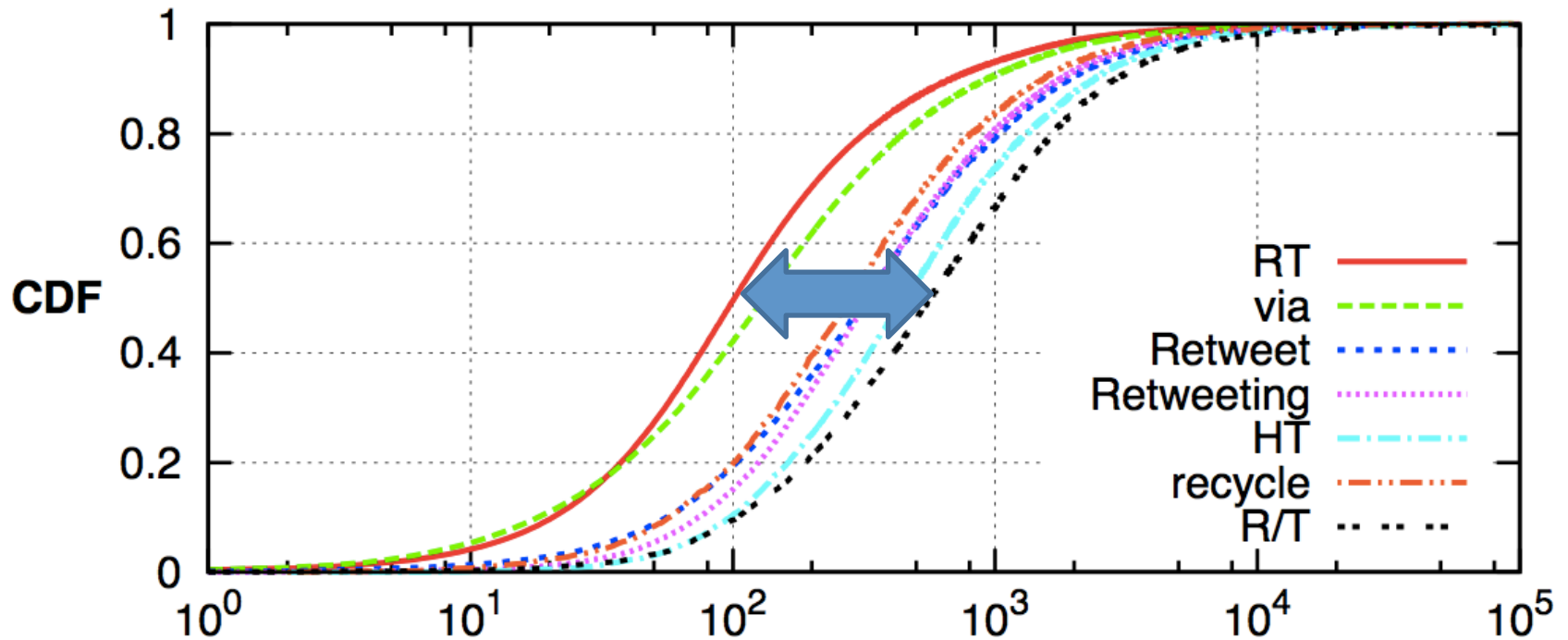




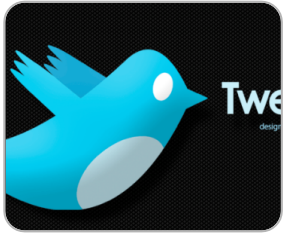
# Only two variations became dominant



# Wide-spread vs normal adoptions



- Successful variations reached **peripheral users**
- In tune with **two-step flow** theory

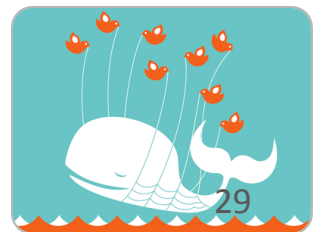


# Summary

- Conventions emerged in an organic, bottom-up manner
- Early adopters are core members of the community:  
Active, tech-savvy, popular, and innovative
- Social conventions start spreading through dense and clustered networks and there is no critical user
- When variations got popular, they reached out side of core community

Thank you!

Twitter data shared at [twitter.mpi-sws.org](https://twitter.mpi-sws.org)



# Back up slides...

# Future work:

## Predicting convention adoption

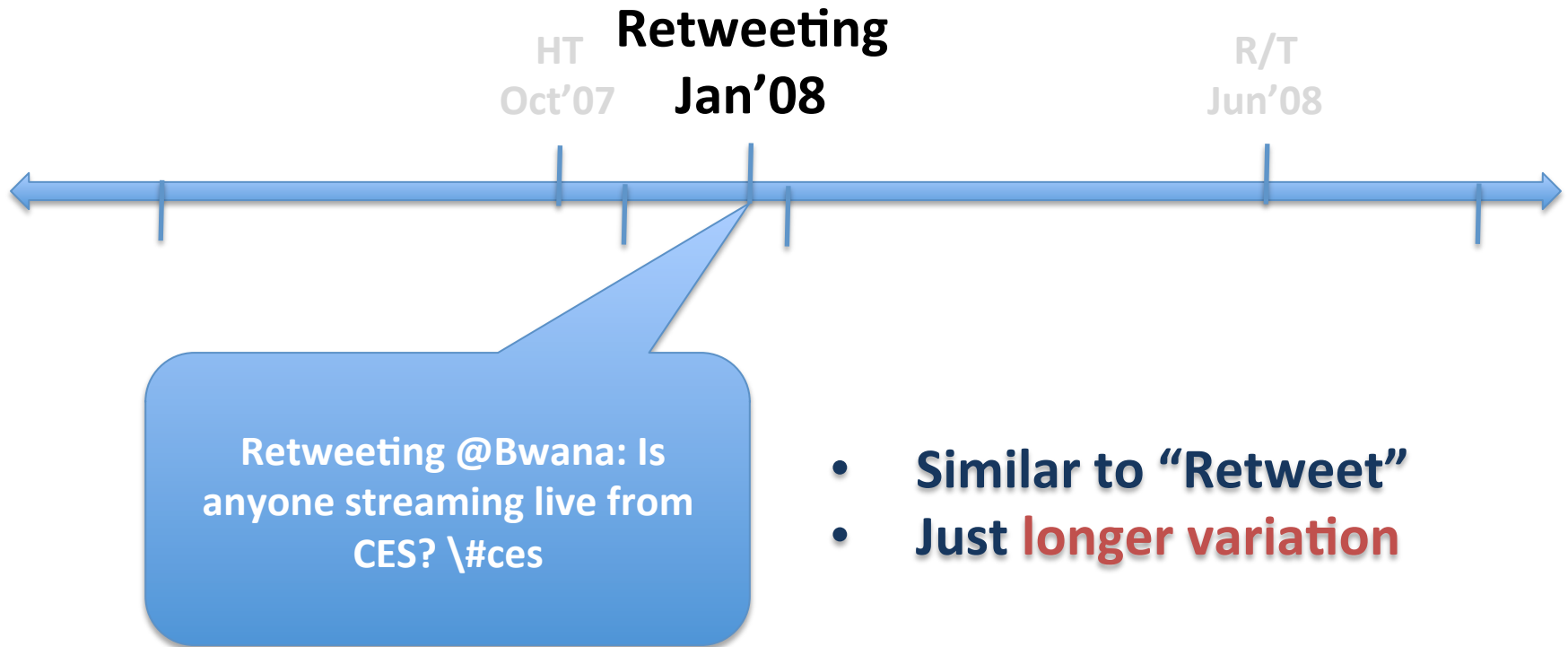
- Can we predict growth rates of adoption?
- Can we predict which convention a user will adopt?
- Can we predict which conventions succeed and which fail?

# Opportunity

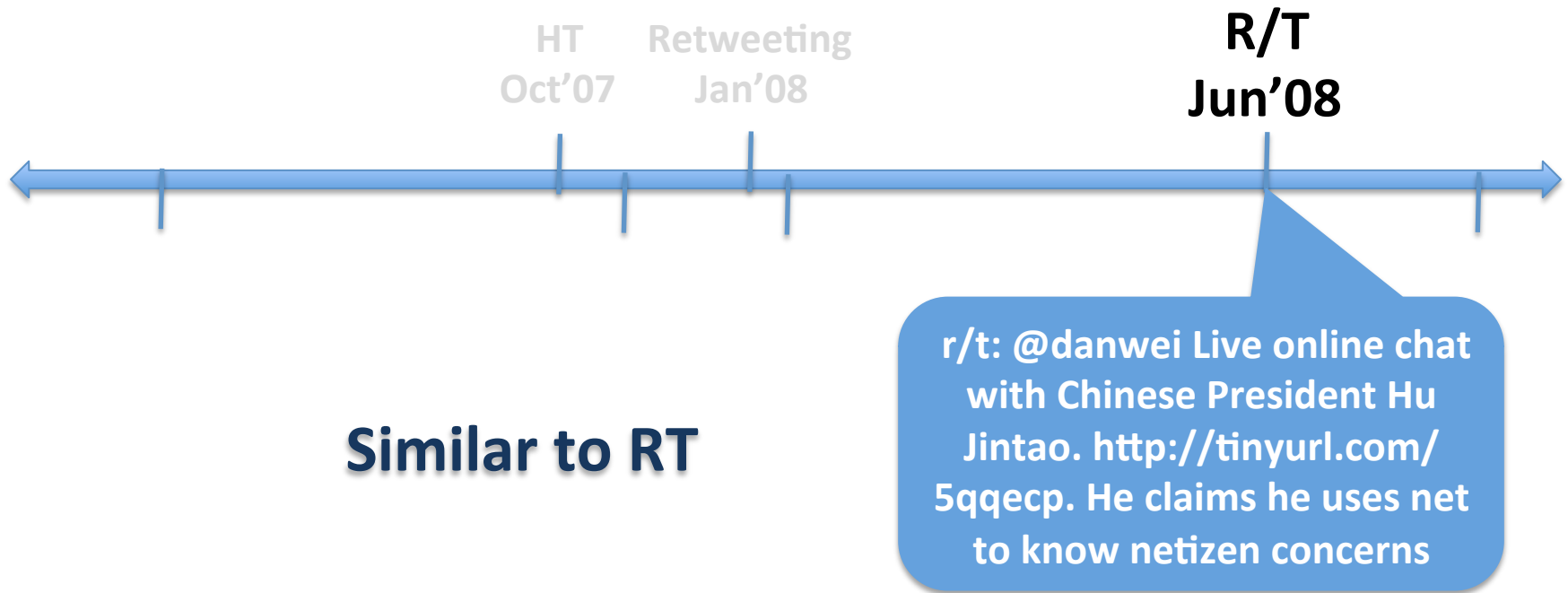
- Traditional approach: small scale surveys
- New approach: use data from online social networks to study/test earlier theories
- Twitter information from March 2006 till September 2009:
  - 54 million users
  - 1.9 billion tweets
  - 1.7 billion “follow” links




# How do social conventions arise?



# How do social conventions arise?

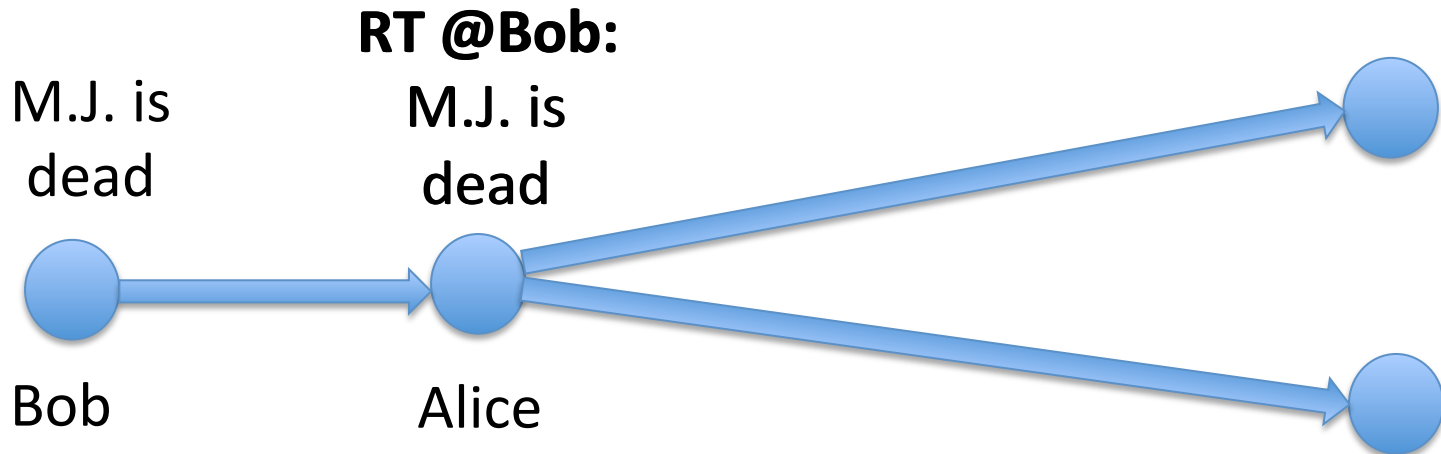


# Early adopters' diffusion network

Variation	Avg. # of Links	Average Clustering	Most Critical
via	3.58	0.233	2%
HT	4.22	0.253	1.8%
Retweet	2.91	0.241	1.1%
Retweeting	5.00	0.225	2.4%
RT	6.37	0.293	0.5%
R/T	5.00	0.319	1.6%
	4.07	0.320	4.9%

# The retweeting convention



- The way in which users attribute a tweet to its original author.



# Questions

1. Origin: how do social conventions arise naturally?
2. Early stages: how is the diffusion process in early stages?
3. Spread: how do conventions become established and widely accepted?



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HT	@TravisSeitler	2007-10-22	The Age Project: how old do I look? <a href="http://tweetl.com/21b">http://tweetl.com/21b</a> ( HT @technosailor )
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R/T	@samflemming	2008-06-20	r/t: @danwei Live online chat with Chinese President Hu Jintao. <a href="http://tinyurl.com/5qqecp">http://tinyurl.com/5qqecp</a> . He claims he uses net to know netizen concerns
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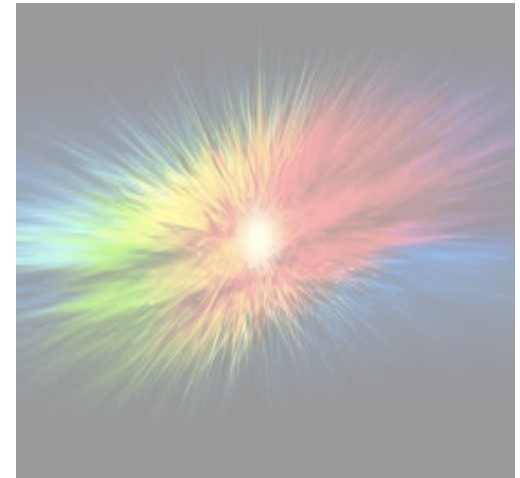
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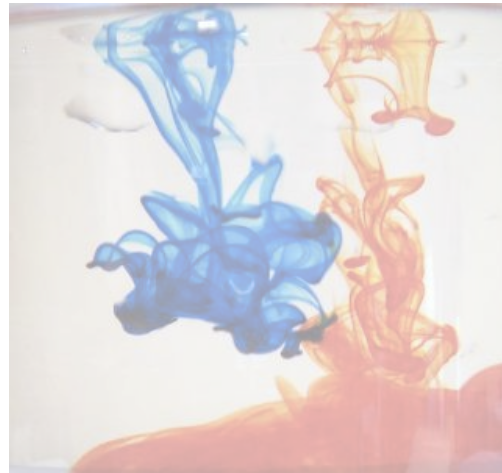
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