

# LECTURE 12: STATUS AND USER EVALUATION

Prof. Pan Hui

CSIT 6000K: Social Networks and Social Computing: A Data Science Perspective

Thursdays 07:30 PM - 10:20 PM

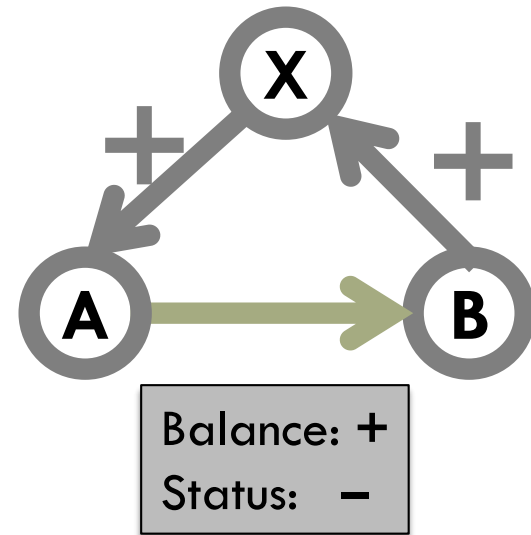
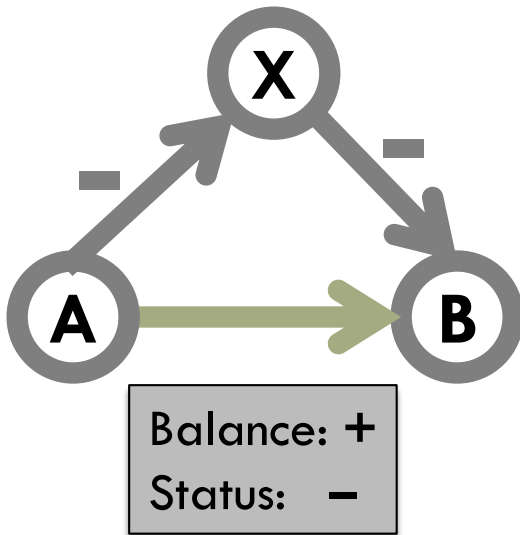
# Status Theory

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- **Directed networks**
  - ▣ Trust, opinion, friendship
- **Status in a network** [Davis-Leinhardt '68]
  - ▣  $A \xrightarrow{+} B :: B$  has **higher** status than  $A$
  - ▣  $A \xrightarrow{-} B :: B$  has **lower** status than  $A$
  - ▣ **Apply this principle transitively over paths**
    - Can replace each  $A \xrightarrow{-} B$  with  $A \xleftarrow{+} B$
    - Obtain an all-positive network with same status interpretation

# Status vs. Balance

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**Status and balance give  
different predictions!**

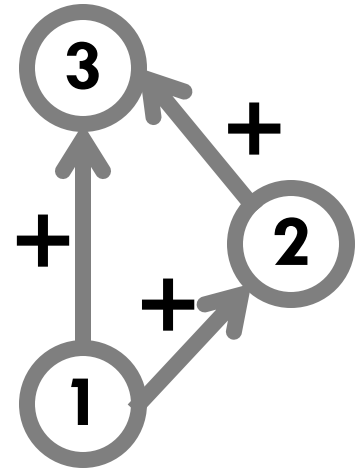
# Status vs. Balance

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**At a global level:**

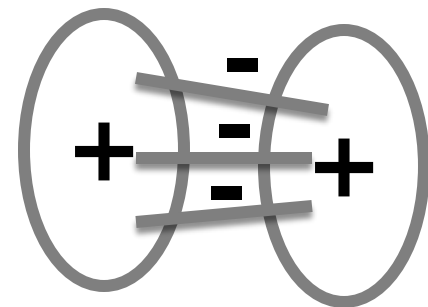
## □ **Status $\Rightarrow$ Hierarchy**

- All-positive directed network should be (approximately) **acyclic**



## □ **Balance $\Rightarrow$ Coalitions**

- Balance ignores directions and implies that subgraph of negative edges should be (approximately) **bipartite**



# Theory of Status

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- Edges are **directed and created over time**

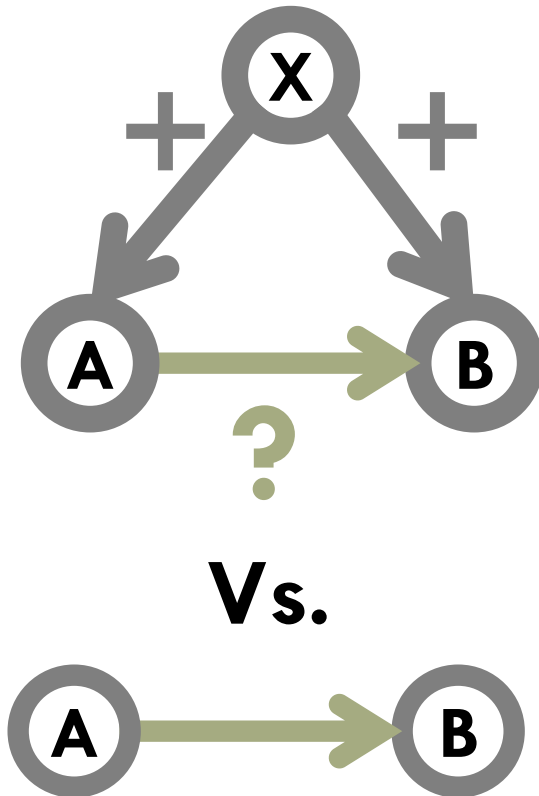
- X has links to A and B
- Now, A links to B (triad A-B-X)

- **How does sign of  $A \rightarrow B$  depend signs from/to X?**

$$P(A \xrightarrow{+} B \mid X) \text{ vs. } P(A \xrightarrow{+} B)$$

- **We need to formalize:**

- 1) Links are **embedded in triads**:  
Triads provide context for signs
- 2) Users are **heterogeneous** in their **linking behavior**



# Heterogeneity in linking behavior

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- Users differ in frac. of + links they **give/receive**
- **For a user U:**
  - **Generative baseline:** Frac. of + **given by U**
  - **Receptive baseline:** Frac. of + **received by U**

## Basic question:

- How do **different link contexts** cause users to **deviate from their baselines**?
  - Link contexts as modifiers on a person's predicted behavior
  - **Surprise**: How much behavior of A/B **deviates** from his/her **baseline** when A/B is in **context X**

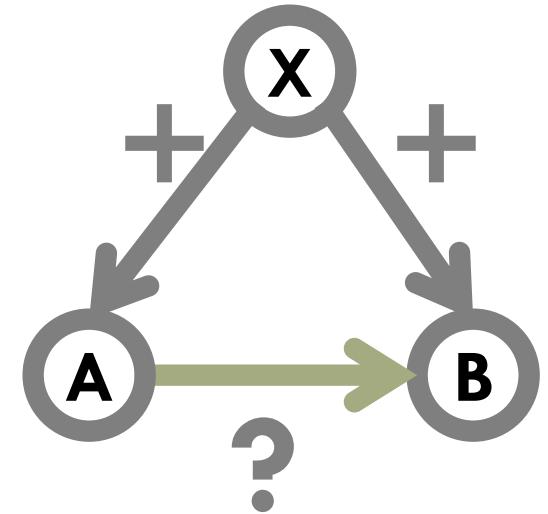
# Joint Positive Endorsement

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- X positively endorses A and B
- Now A links to B

**A puzzle:**

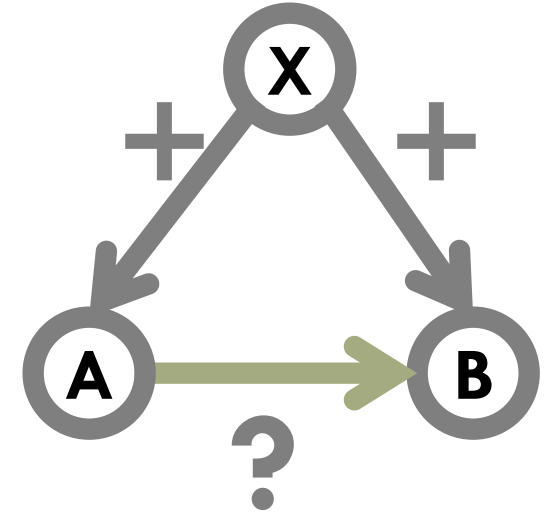
- In our data we observe:  
Fraction of positive links deviates
  - Above generative baseline of A:  $s_g(X) > 0$
  - Below receptive baseline of B:  $s_r(X) < 0$
- Why?



# A Story: Soccer Team

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- Ask every node: **How does skill of B compare to yours?**
  - ▣ Build a signed directed network
- We haven't asked A about B
- But we know that X thinks A and B are both better than him
- What can we infer about A's answer?



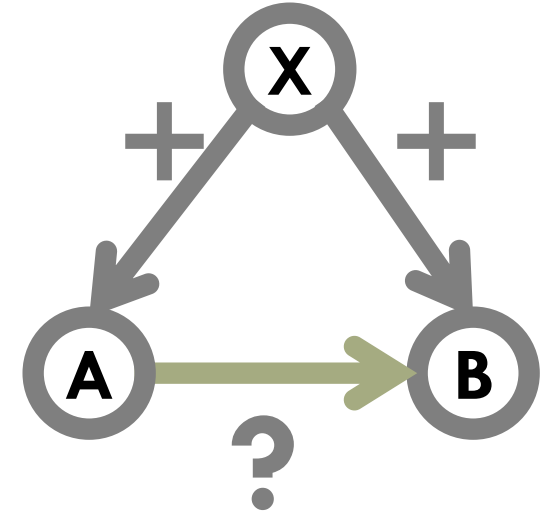


# A Story: Soccer Team

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## □ A's viewpoint:

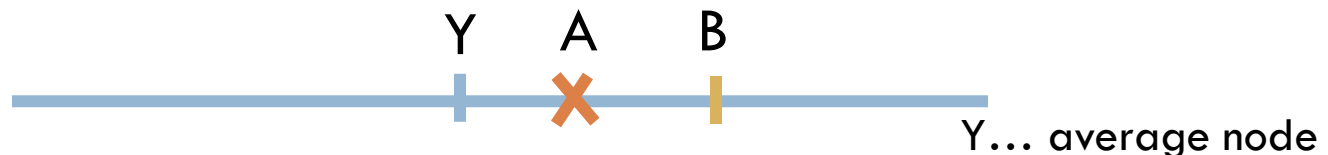
- Since B has positive evaluation, B is high status
- Thus, evaluation A gives is **more likely to be positive** than the baseline



### How does A evaluate B?

A is evaluating someone who is better than avg.

→ A is **more positive than average**

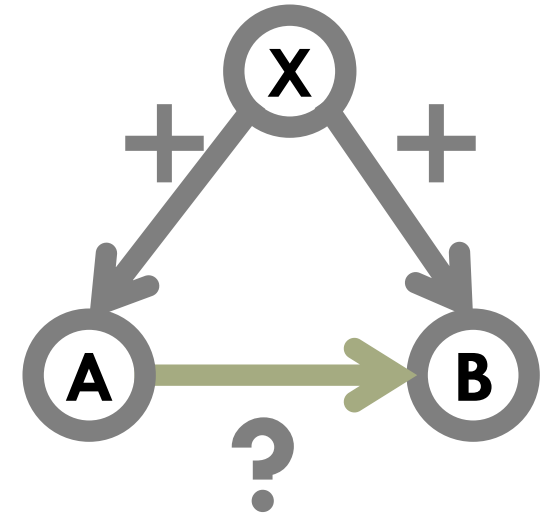


# A Story: Soccer Team

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## □ B's viewpoint:

- Since A has positive evaluation, A is high status
- Thus, evaluation B receives is **less likely to be positive** than the baseline



**How is B evaluated by A?**

B is evaluated by someone better than average.

→ They will be **more negative to B than average**

Y   B   A

**Sign of  $A \rightarrow B$  deviates in different directions depending on the viewpoint!**

... average node

# Consistency with Status

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## □ Determine node status:

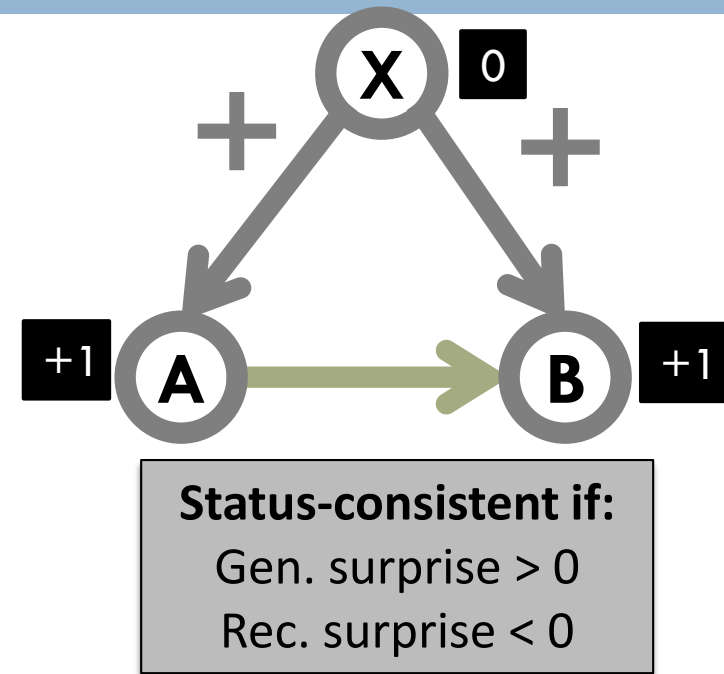
- Assign X status 0
- Based on signs and directions of edges set status of A and B

## □ Surprise is **status-consistent**, if:

- Gen. surprise is status-consistent if it has **same** sign as status of B
- Rec. surprise is status-consistent if it has the **opposite** sign from the status of A

## □ Surprise is **balance-consistent**, if:

- If it completes a balanced triad

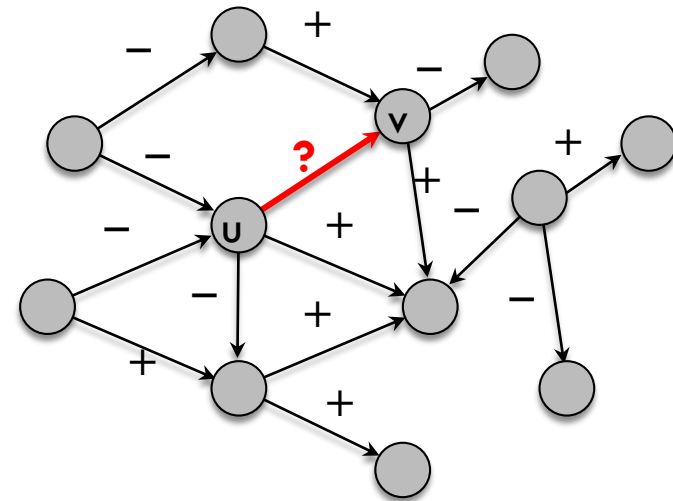


# Predicting Edge Signs

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## Edge sign prediction problem

- Given a network and signs on all but one edge, predict the missing sign
- Friend recommendation:
  - ▣ Predicting whether you know someone vs. Predicting what you think of them



# People Express Opinions

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In many online applications users express positive and negative attitudes/opinions:

- Through actions:
  - ▣ Rating a product
  - ▣ Pressing a “like” button
- Through text:
  - ▣ Writing a comment, a review
- Success of these online applications is built on people expressing opinions
  - ▣ Recommender systems
  - ▣ Wisdom of the Crowds
  - ▣ Ranking

amazon.com



WIKIPEDIA  
The Free Encyclopedia



last.fm  
the social music revolution



# People & Evaluations

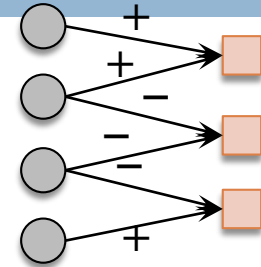
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## □ About items:

- Movie and product reviews



amazon.com.



## □ About other users:

- Online communities

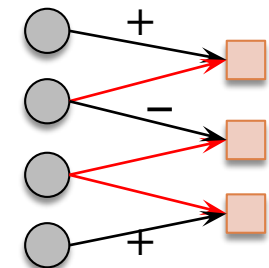
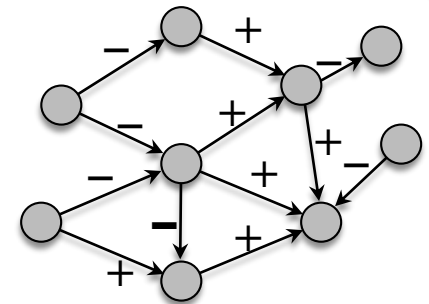


## □ About items created by others:

- Q&A websites



YAHOO! ANSWERS



# User-User Evaluations

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- **Many on-line settings where one person expresses an opinion about another (or about another's content)**
  - ▣ **I trust you** [Kamvar-Schlosser-Garcia-Molina '03]
  - ▣ **I agree with you** [Adamic-Glance '04]
  - ▣ **I vote in favor of admitting you into the community** [Cosley et al. '05, Burke-Kraut '08]
  - ▣ **I find your answer/opinion helpful** [Danescu-Niculescu-Mizil et al. '09, Borgs-Chayes-Kalai-Malekian-Tennenholtz '10]

# Evaluations: Some Issues

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## Some of the central issues:

- **Factors:**

**What factors drive one's evaluations?**

- **Synthesis:**

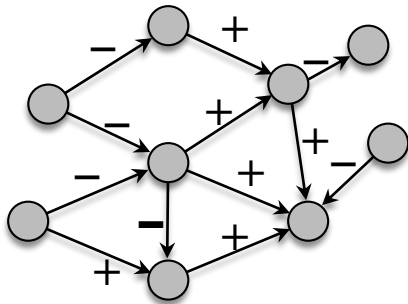
**How do we create a composite description that accurately reflects cumulative opinion of the community?**



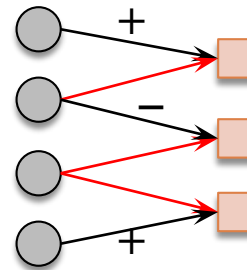
# Evaluations: the Setting

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- **People evaluate each other:**



**Direct**



**Indirect**

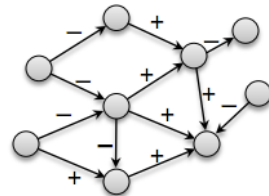
- **Direct:** User to user [ICWSM '10]
- **Indirect:** User to content (created by another member of a community) [WSDM '12]
- **Where online does this explicitly occur on a large scale?**

# Evaluations: the Data

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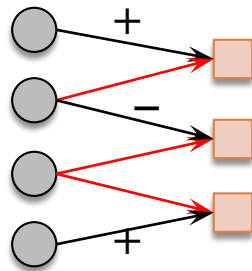
## □ Wikipedia adminship elections

- Support/Oppose (120k votes in English)
- 4 languages: EN, GER, FR, SP



## □ Stack Overflow Q&A community

- Upvote/Downvote (7.5M votes)



## □ Epinions product reviews

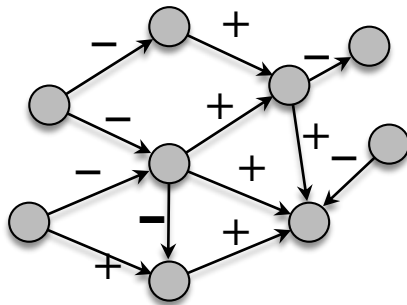
- Ratings of others' product reviews (13M)
  - 5 = positive, 1-4 = negative

# The New Setting

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## □ Relation to the previous class:

**We still talk about one person evaluating the other via a  $+/-$  evaluation**



**So far we focused  
on evaluations in  
the context of a  
network**



**Now we focus on a  
single evaluation  
(without the context of  
a network)**

# Human Evaluations

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## □ What drives human evaluations?



## □ How do properties of **evaluator A** and **target B** affect A's vote?

- **Status** and **Similarity** are two fundamental drivers behind human evaluations

# Definitions

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## □ **Status:**

- ▣ Level of recognition, merit, achievement, reputation in the community
  - Wikipedia: # edits, # barnstars
  - Stack Overflow: # answers

## □ **User-user Similarity:**

- ▣ Overlapping topical interests of A and B
  - **Wikipedia:** Similarity of the articles edited
  - **Stack Overflow:** Similarity of users evaluated

# Relative vs. Absolute Assessment

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- How do properties of **evaluator A** and **target B** affect A's vote?



- Two natural (but competing) hypotheses:
  - ▣ (1) Prob. that B receives a positive evaluation depends primarily on the characteristics of B
    - There is some objective criteria for user B to receive a positive evaluation

# Relative vs. Absolute Assessment

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- How do properties of **evaluator A** and **target B** affect A's vote?

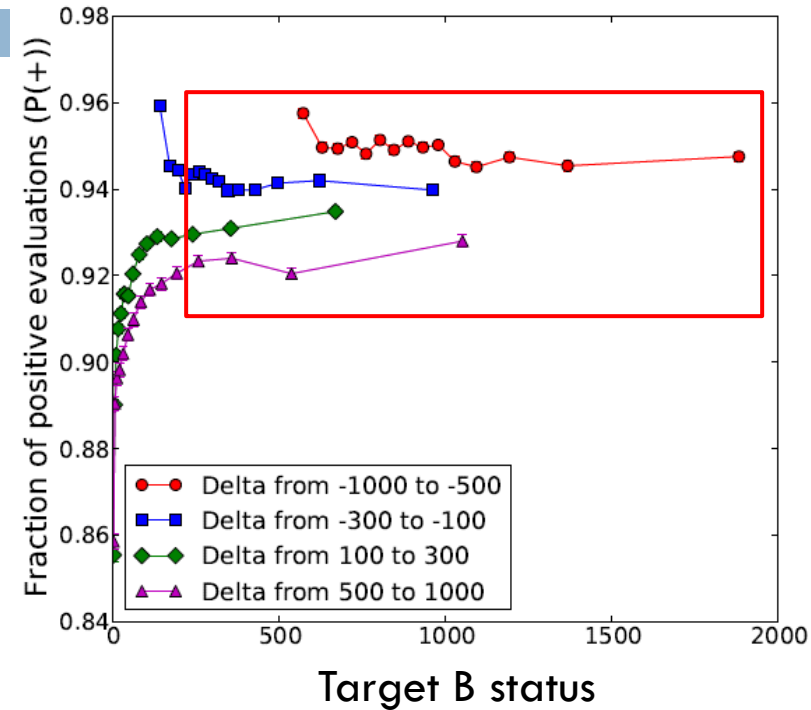


- Two natural (but competing) hypotheses:
  - ▣ (2) Prob. that B receives a positive evaluation depends on relationship between the characteristics of A and B
    - User A compares herself to user B and then makes the evaluation

# Effects of Status

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- How does status of B affect A's evaluation?
  - ▣ Each curve is fixed status difference:  $\Delta = S_A - S_B$
- Observations:
  - ▣ **Flat curves:** Prob. of positive eval.  $P(+)$  doesn't depend on B's status
  - ▣ **Different levels:** Different values of  $\Delta$  result in different behavior



**Status difference**  
remains salient even as  
A and B acquire more  
status



# Effects of Similarity

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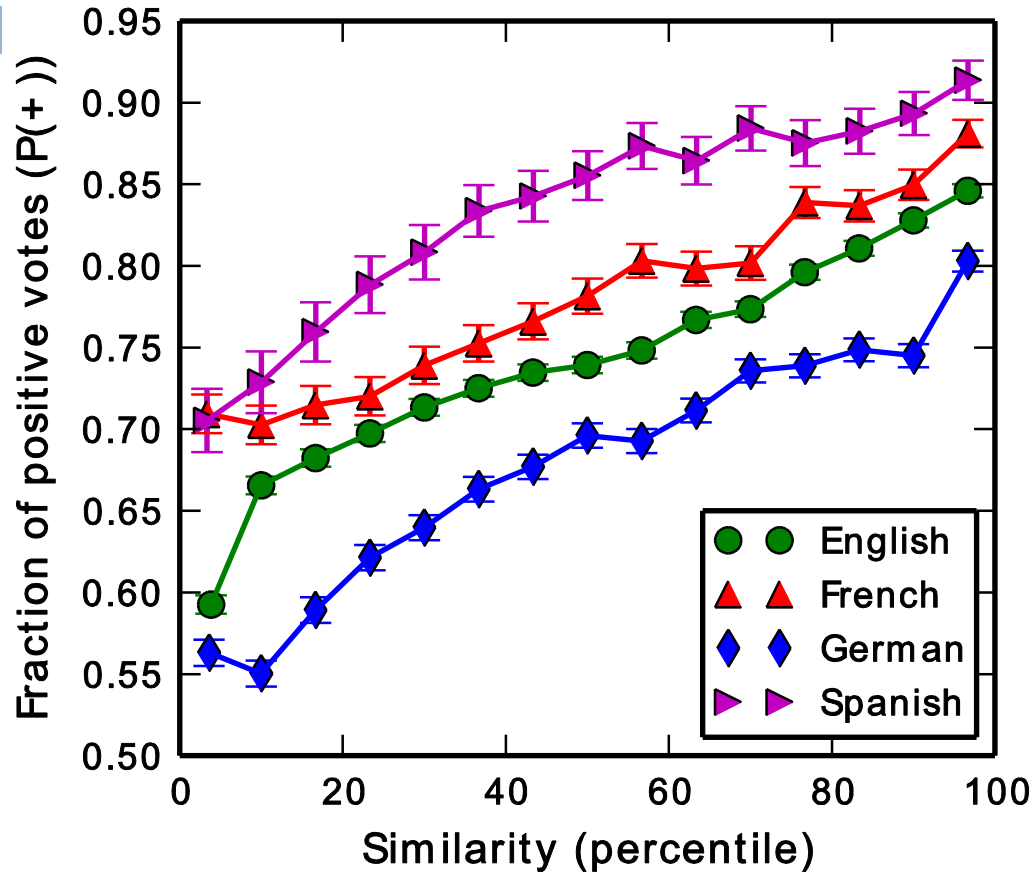
## □ How does prior interaction shape evaluations? 2

### hypotheses:

- ▣ (1) Evaluators are more supportive of targets in their area
  - “The more similar you are, the more I like you”
- ▣ (2) More familiar evaluators know weaknesses and are more harsh
  - “The more similar you are, the better I can understand your weaknesses”

# Effects of Similarity

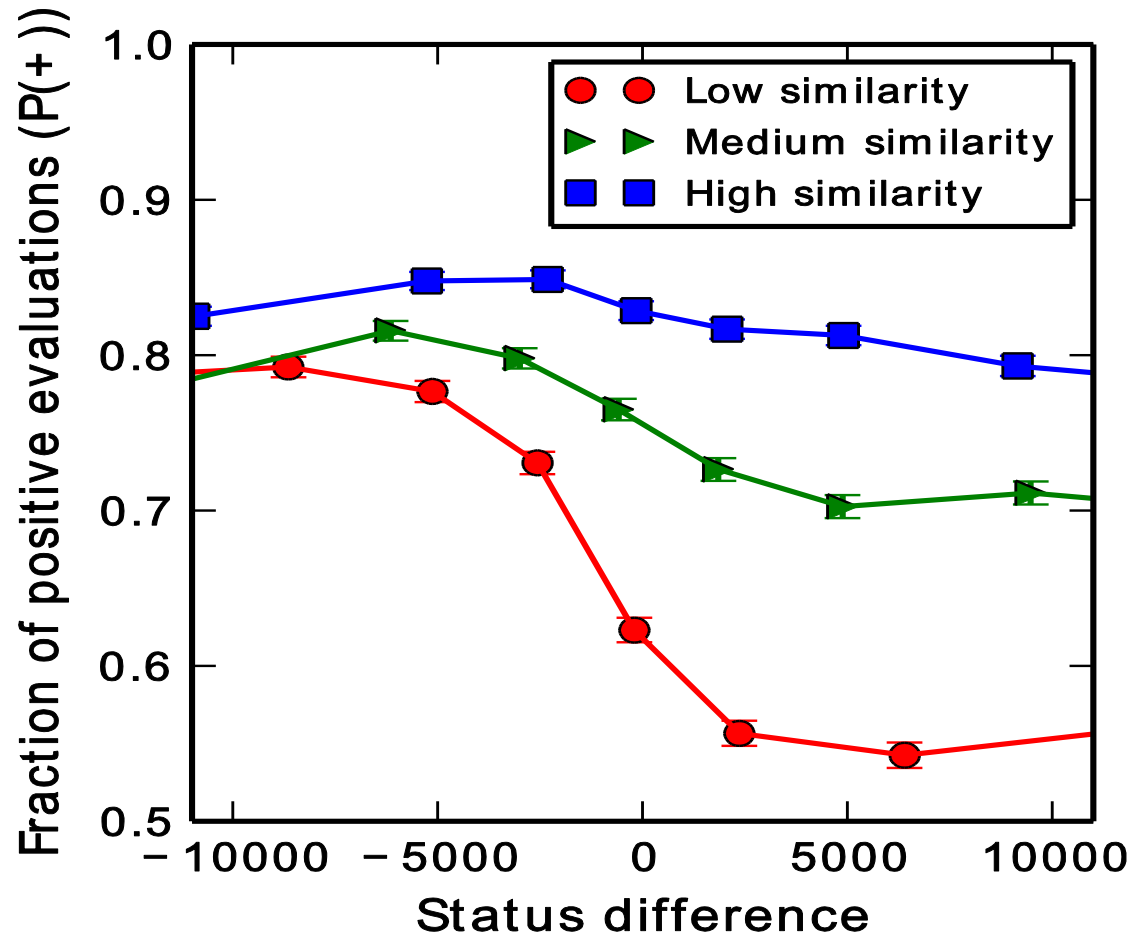
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Prior interaction/ similarity boosts positive evaluations

# Status & Similarity

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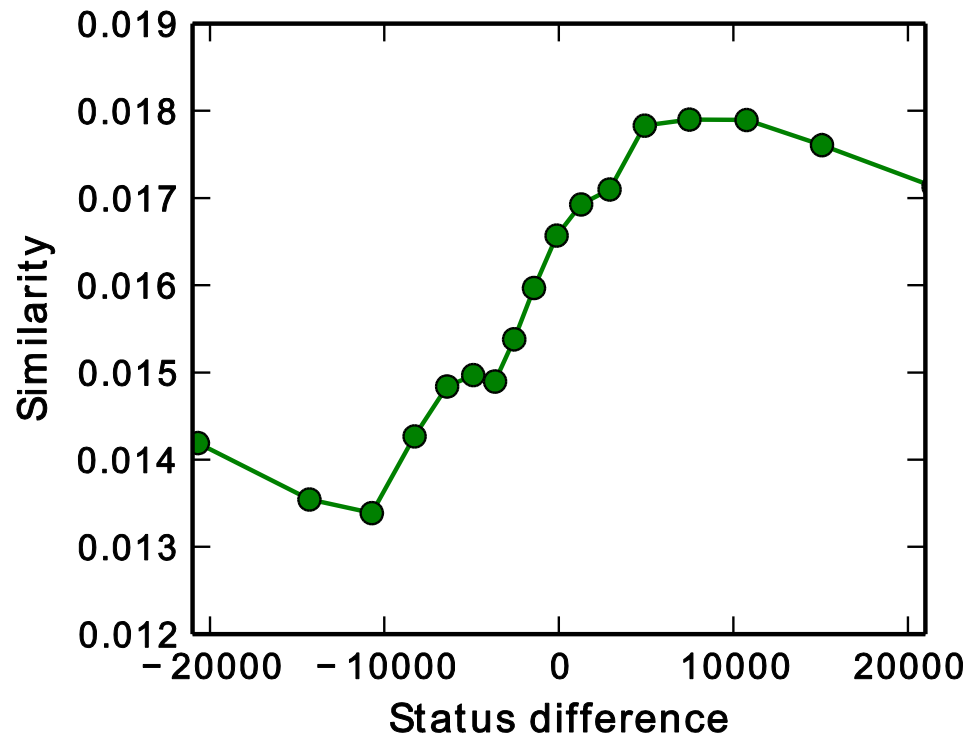


Status is a proxy for quality when evaluator does not know the target

# Status & Similarity

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## □ Who shows up to evaluate?



Elite evaluators vote  
on targets in their  
area of expertise

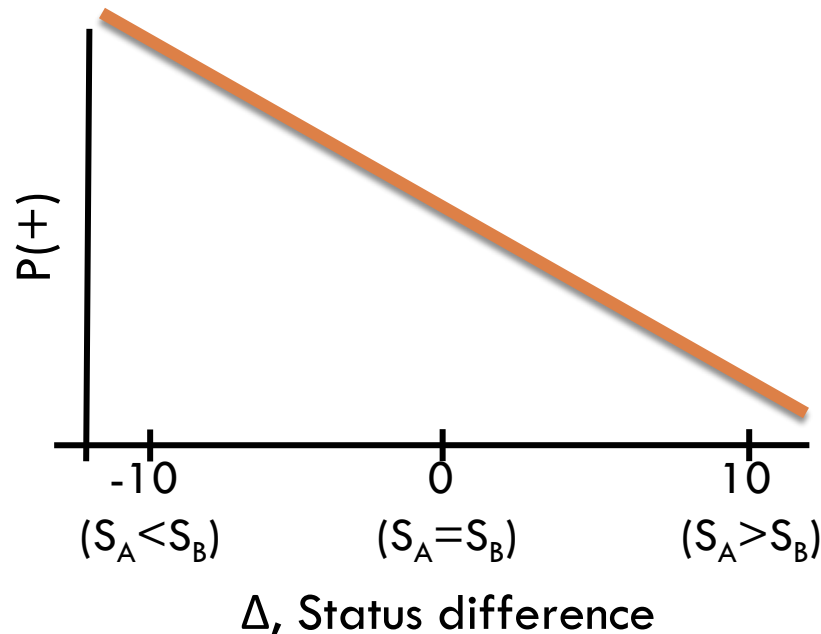
## □ Selection effect in who gives the evaluation

▣ If  $S_A > S_B$  then A and B are highly similar

# A Puzzle

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- What is  $P(+)$  as a function of  $\Delta = S_A - S_B$ ?
- ▣ Based on findings so far:  
**Monotonically decreasing**



# Summary

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- Social media sites are governed by (often implicit) user evaluations
- Wikipedia voting process has an explicit, public and recorded process of evaluation
- Main characteristics:
  - ▣ Importance of relative assessment: **Status**
    - Social media sites are governed by (often implicit) user evaluations
  - ▣ Importance of prior interaction: **Similarity**
    - **Similarity** plays important role