

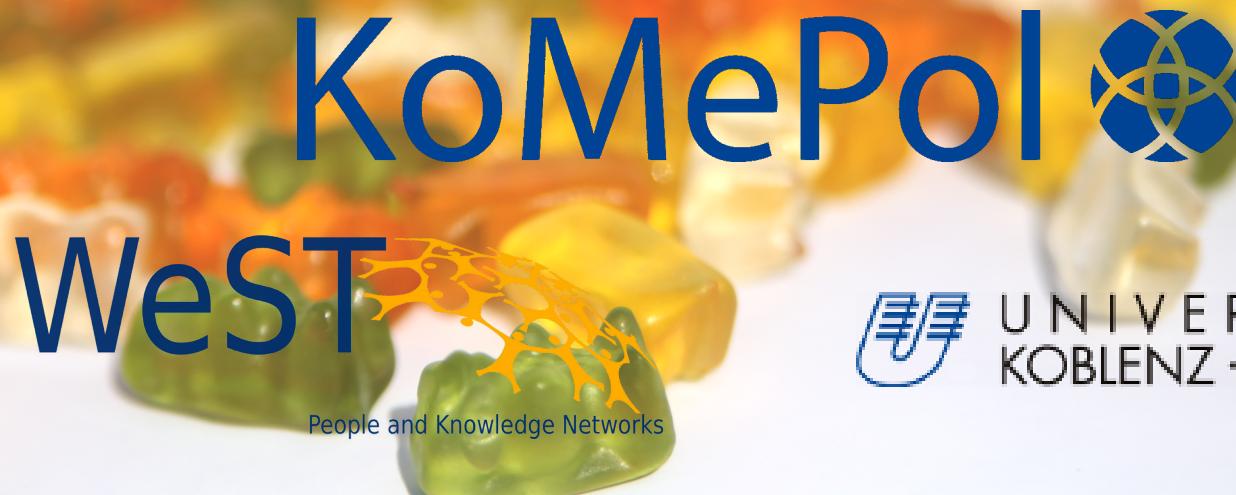
Trust in Networks

Jérôme Kunegis

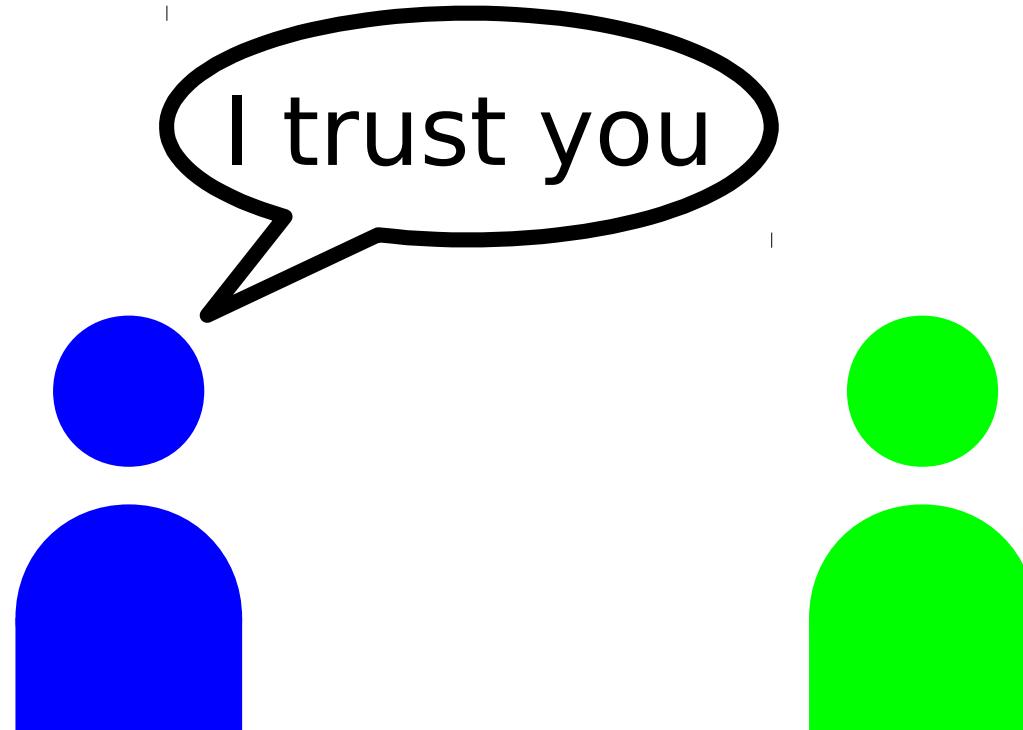
Institute for Web Science and Technologies (WeST), University of Koblenz–Landau

Based on work with Andreas Lommatzsch, Christian Bauckhage, Christoph Carl Kling,
Julia Perl, Eiko Yoneki and Valentin Dalibard

“Growing graph” generated by random graph models
Images are owned by their respective owners



What Is Trust?



eBay.com: Trust in Sellers



[323 ★]

Positive Feedback (last 12 months): 97.4%

[How is Feedback percentage calculated?]

Member since: Dec-01-05 in United States

Recent Feedback ratings (last 12 months)



	1 month	6 months	12 months
Positive	14	27	43
Neutral	0	0	0
Negative	1	1	1

Detailed seller ratings (last 12 months)

Criteria	Average rating	Number of ratings
Item as described	★★★★★	18
Communication	★★★★★	17
Shipping time	★★★★★	15
Shipping and handling charges	★★★★★	17

Feedback as a seller

Feedback as a buyer

All Feedback

Feedback left for others

284 Feedback received (viewing 1-25)

Epinions.com: Trust in Other Users' Product Reviews

Dataset available at: <http://konect.uni-koblenz.de/networks/epinions>

(Massa & Avesani 2005)



Certificate levels: Apprentice / Journeyer / Master
(Massa & al 2009)

lloydwood is currently certified at Journeyer level.

Name: Lloyd Wood

Member since: 2005-04-04 14:17:52

Last Login: 2013-09-22 09:16:59



Homepage: <http://personal.ee.surrey.ac.uk/Personal/L.Wood/>

Notes:

You'd rather read
[everyone else's diary entries](#).

Projects

- Lead Developer on [SaVi](#)
- Contributor on [Geomview](#)

lloydwood certified others as follows:

- lloydwood certified [lloydwood](#) as Journeyer
- lloydwood certified [dannyobrien](#) as Apprentice

Others have certified lloydwood as follows:

- [lloydwood](#) certified lloydwood as Journeyer
- [berend](#) certified lloydwood as Journeyer
- [mwh](#) certified lloydwood as Journeyer
- [mirwin](#) certified lloydwood as Master
- [Denny](#) certified lloydwood as Apprentice
- [negative](#) certified lloydwood as Journeyer
- [realblades](#) certified lloydwood as Apprentice
- [wspace](#) certified lloydwood as Apprentice
- [fxn](#) certified lloydwood as Journeyer
- [mpr](#) certified lloydwood as Journeyer
- [fzort](#) certified lloydwood as Master
- [adulau](#) certified lloydwood as Master

Dataset available at: <http://konect.uni-koblenz.de/networks/advogato>

Essembly.com: Trust in Other Users' Political Opinions

The screenshot shows the homepage of Essembly.com. At the top, there's a blue header bar with the website's name. Below it, a large white box contains a statement: "Hummers are ugly and ridiculous cars." To the left of this statement is a small thumbnail image of a person. Below the statement are two smaller boxes: one green containing a quote from a user about driving an H2 car, and one pink containing a quote from another user about the beauty of Hummers. At the bottom of this section is a call-to-action: "Where do you stand? Vote now." To the right of this is a "Sign in" form with fields for "Email" and "Password", and links for "Forgot your password?" and "Not a member? Register.". A descriptive text box below the sign-in form explains what Essembly is: "assembly is a friendly non-partisan social network that allows politically interested individuals to connect with one another, engage in constructive discussion, and organize to take action."

Relationship types:

- Friend
- Ally
- Nemesis

This screenshot shows the campaign page for John Edwards in the 2008 presidential election. The top navigation bar includes links for "Home", "Profile", "Members", "Resolves", and "Discussions". The main content area features a banner for "John Edwards, President 2008" with a photo of him. Below the banner, sections include "John Edwards, President 2008's Message" (with a link to "Metaphorical Presidency"), "There are currently no resolves on this platform.", "Affiliate Groups" (with a link to "Coalition Partners"), and "People in John Edwards, President 2008" (listing Edwards and Elizabeth Edwards). On the right side, there's a sidebar for "Join Groups" featuring a photo of John Edwards and a note about the group being the official presence of his campaign. At the bottom, there's a note about statements made by users and supporters of the group.

(Brzozowski & al 2008)

LiquidFeedback: Delegation as Trust

Issue #3557 - LiquidFeedback • Piratenpartei, Bund - Mozilla Firefox

Firefox ▾ Issue #3557 - LiquidFeedback... + <https://lqfb.piratenpartei.de/lf/issue/show/3557.html> ★ ⓘ Wikipedia (SSL) ⌂ ⌃

LiquidFeedback Piratenpartei, Bund Abstimmen Search ⓘ CCK

Bundesebene

Haushalt, Finanzen und Steuern

Meinungsbild / Beschlussvorlage #3557

Voting · 4 days 09:01:46 left

Vote now · Do not vote directly · Delegate issue · Discussion on issue · Short URL: lfpp.de/t3557

i6502: Ablösung von Staatsleistungen an Religionsgesellschaften

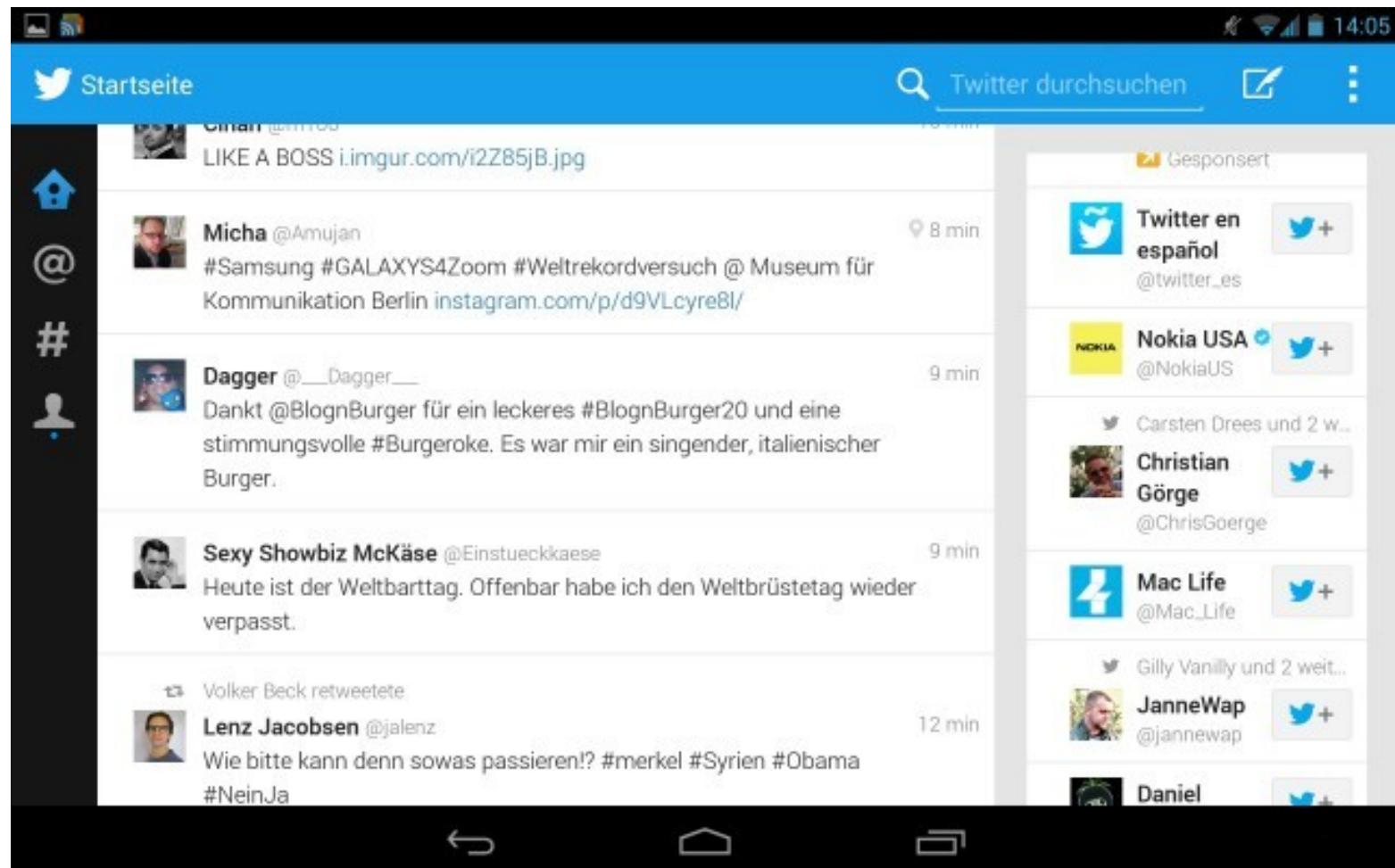
Interested members

Michael Ebner + 85	NeoXtrim + 21	BurkhardHH + 4	Franz-Josef + 4
moonopool + 4	Orca + 3	suchenwi + 3	danebod + 2
Björn Glienke + 1	Michael Konrad (@icke2A) + 1	Ano111	Christian Steinbrenner
Christoph67	DeK	DonAlexandro	Flauschpolizei

(Kling & al 2014)

Twitter.com: Trust in News Sources (among other uses)

(Cha & al 2010, Kwak & al 2010)



Dataset available at: http://konect.uni-koblenz.de/networks/twitter_mpi

PGP (Pretty Good Privacy): Public Key Certificate Network

(Boguñá & al 2004)

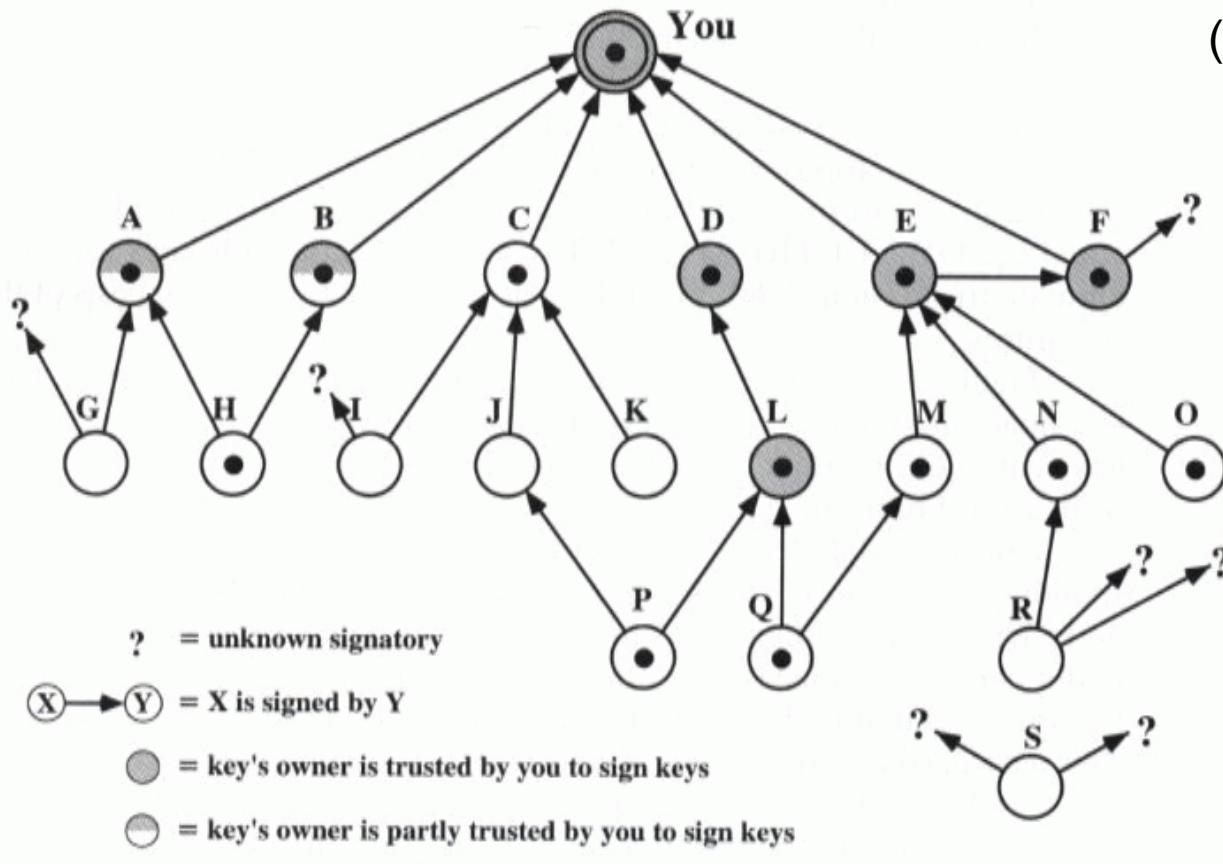


Figure 15.7 PGP Trust Model Example

Dataset available at: <http://konect.uni-koblenz.de/networks/arenas-pgp>

Distrust

Web of Trust



[Trust Dr.P](#)



[Block Dr.P](#)

[Whom should I trust?](#)

Epinions.com

Essembly.com: Nemesis

Slashdot.org

Your Relationship with eldavojohn (898314)

[Info](#) | **Relation** | [Journal](#) | [Firehose](#) | [Friends](#) | [Fans](#) | [Foes](#) | [Freaks](#)

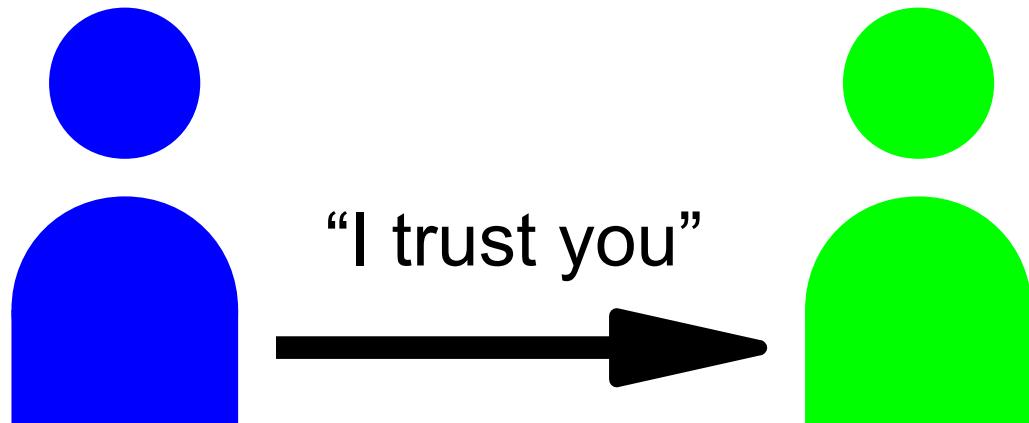
[Friends of Friends](#) | [Foes of Friends](#)

Friend

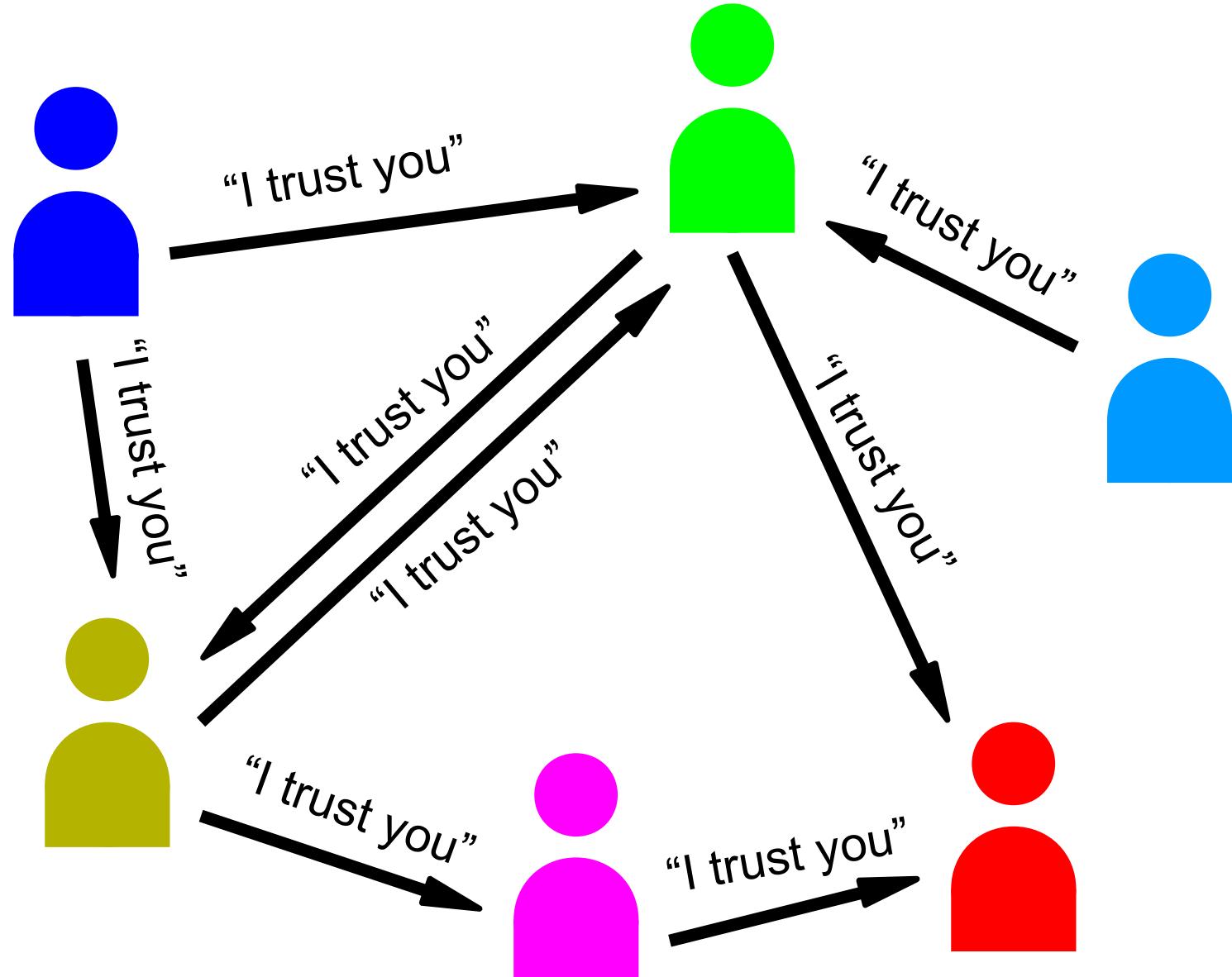
Change this? Neutral Foe Yup, I'm positive

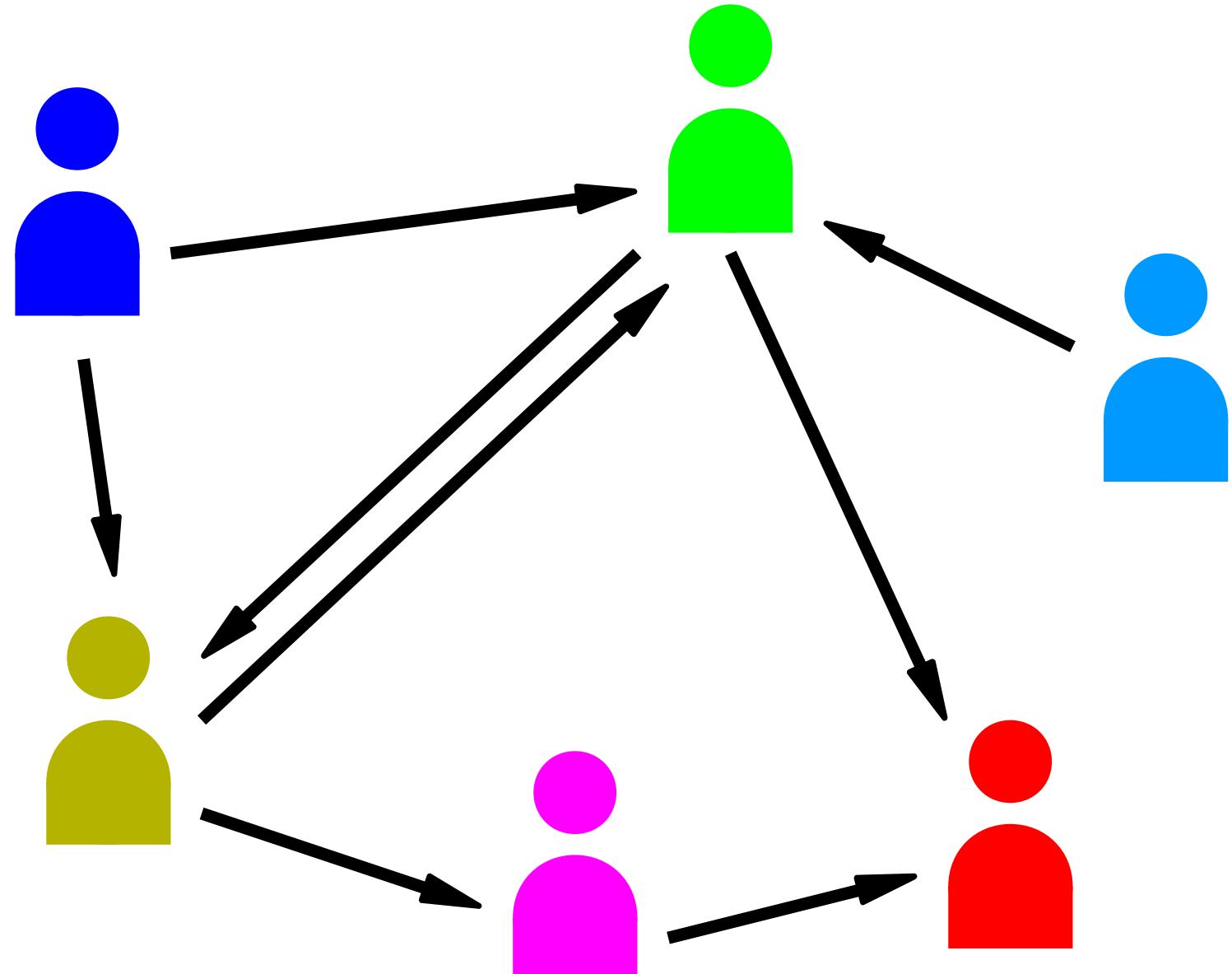
(Kunegis & al 2009)

Dataset available at: <http://konect.uni-koblenz.de/networks/slashdot-zoo>

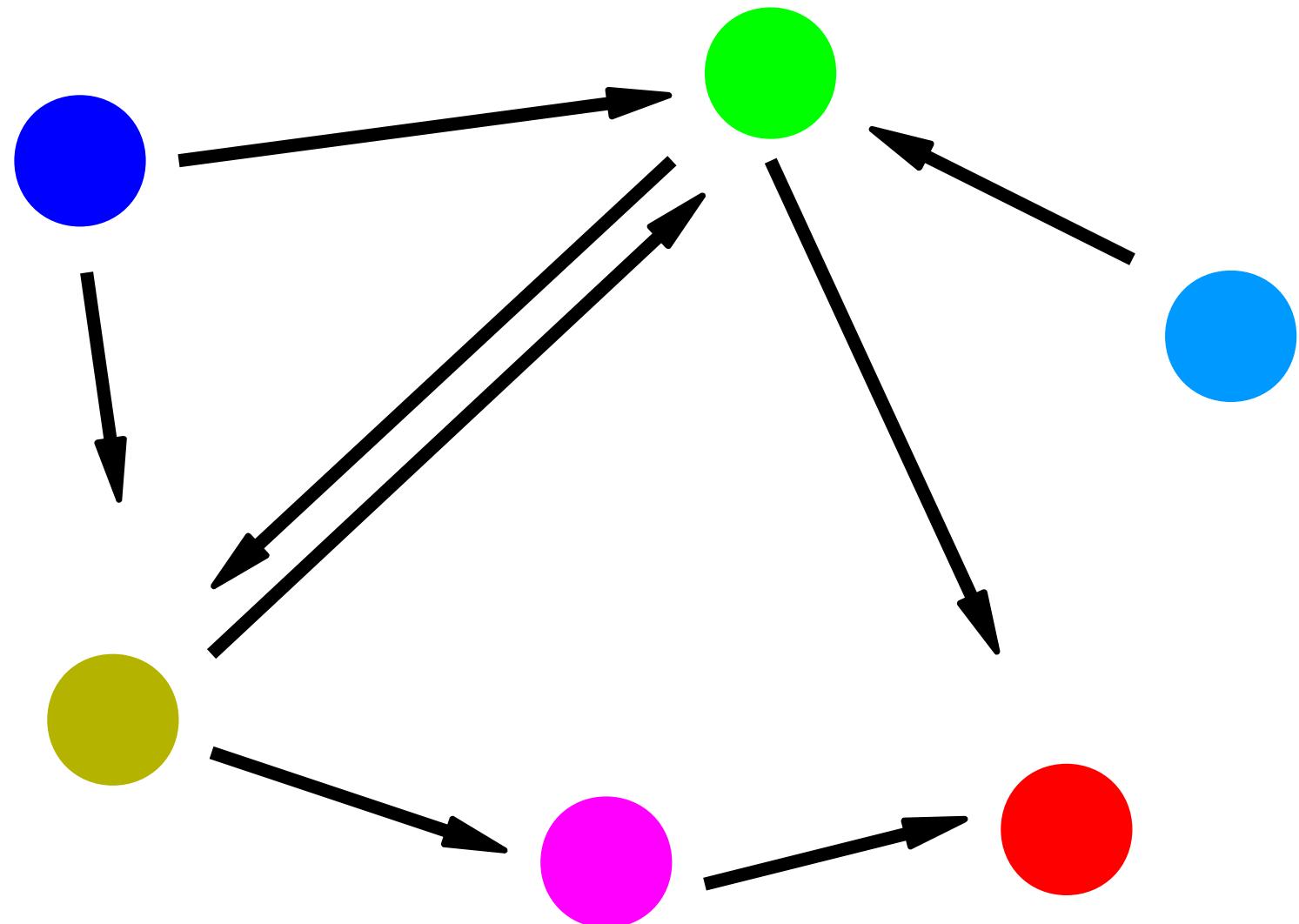


Trust within a Community

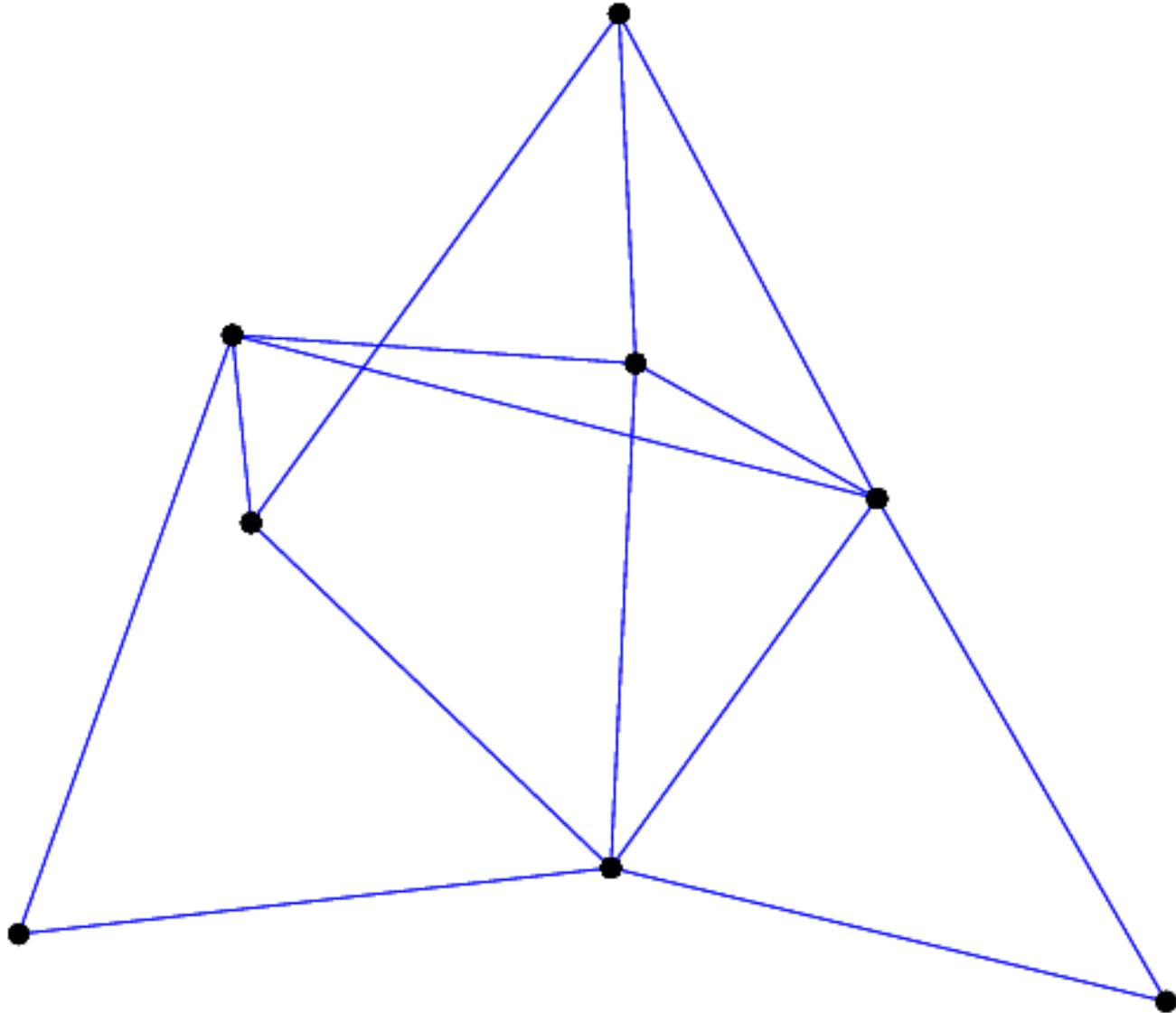




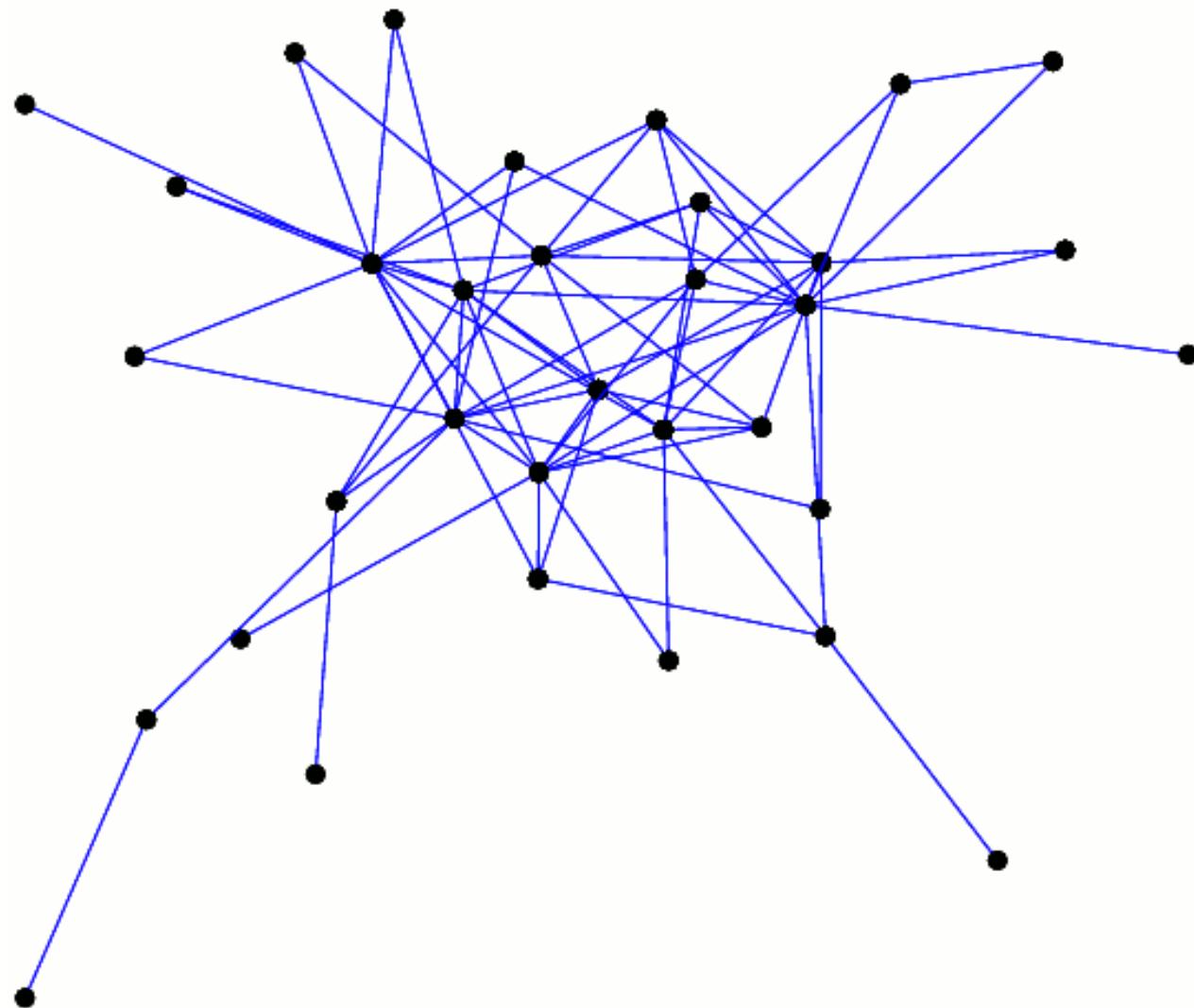
Abstract a Bit More



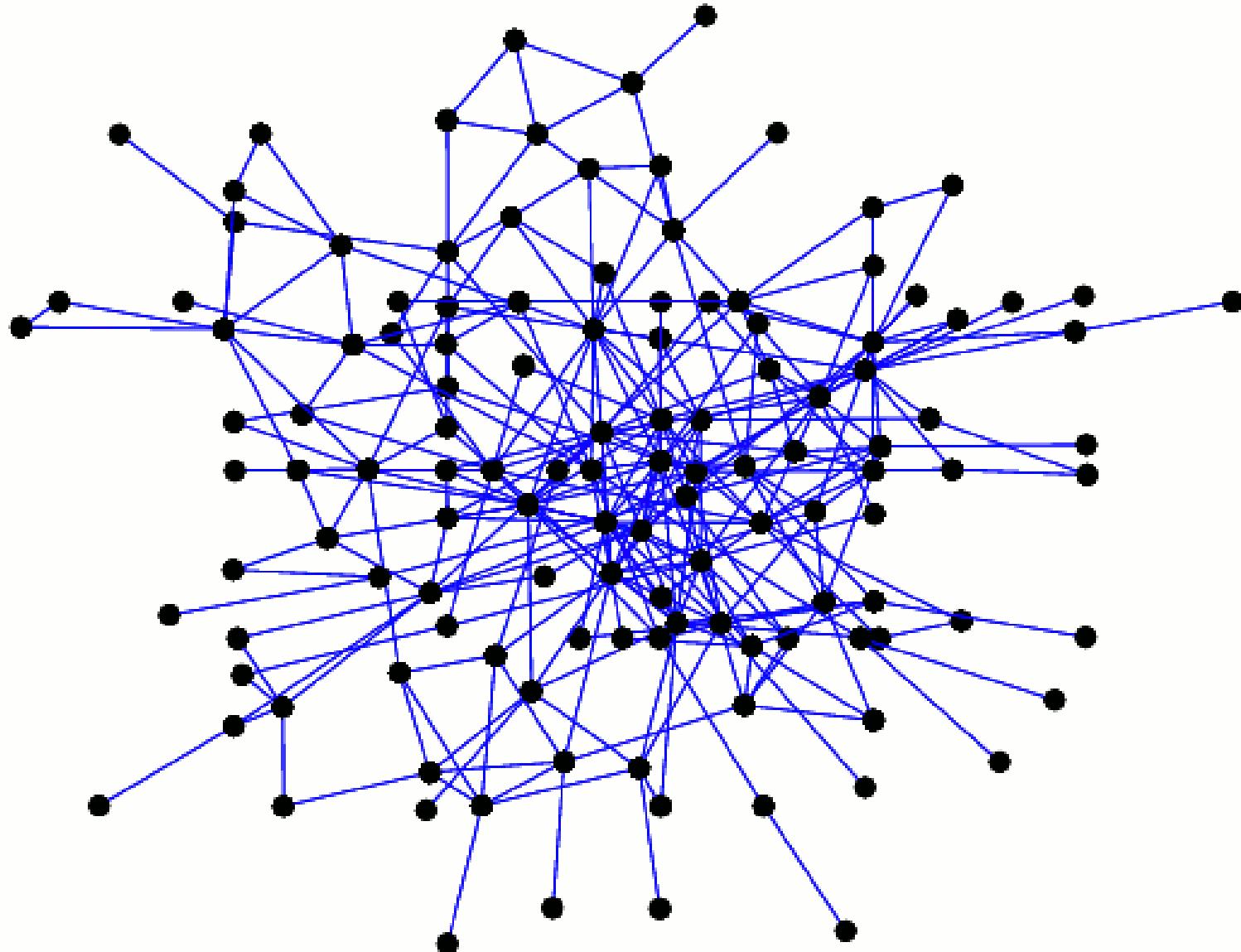
This Network Is Not Realistic



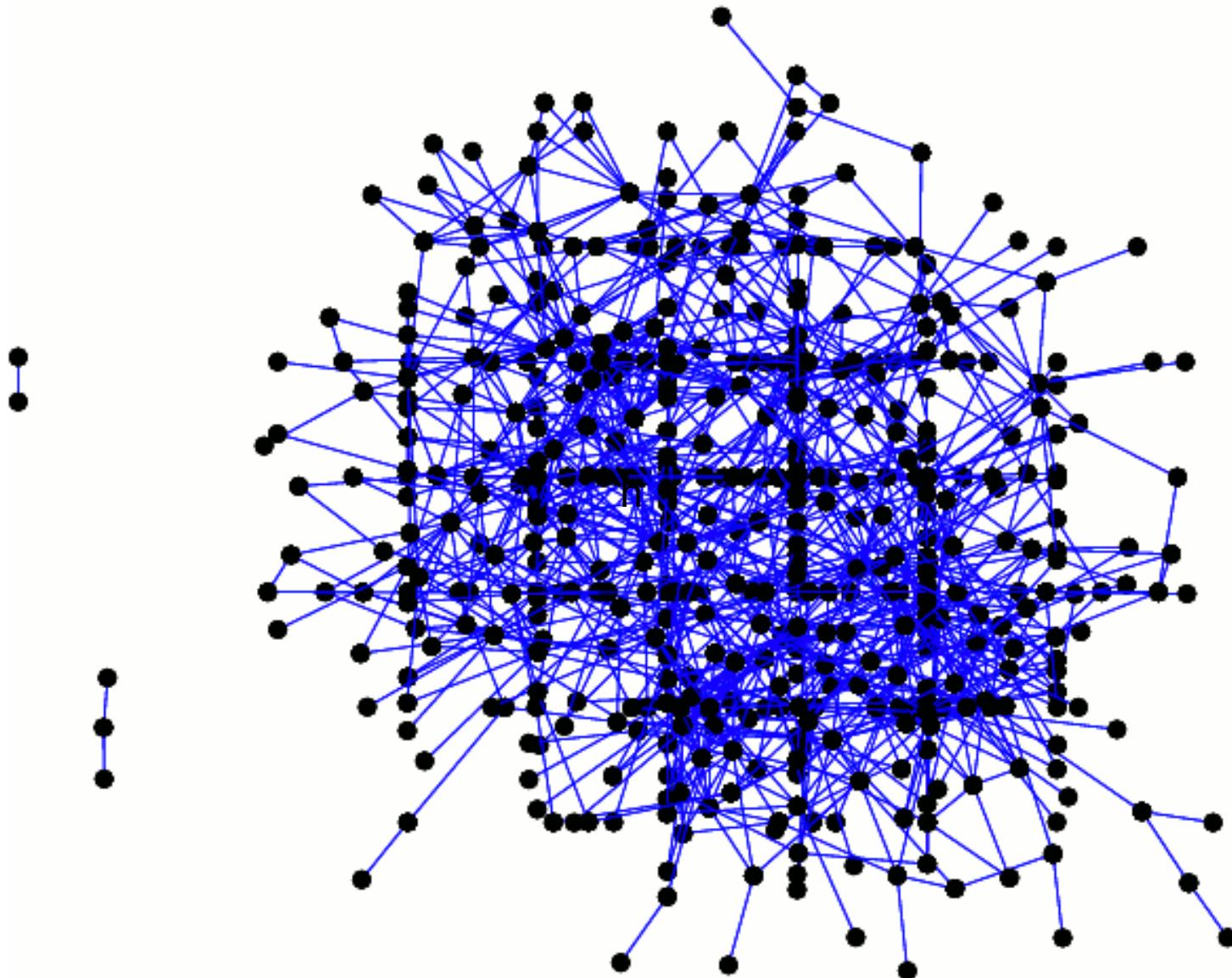
Real Networks Are Bigger



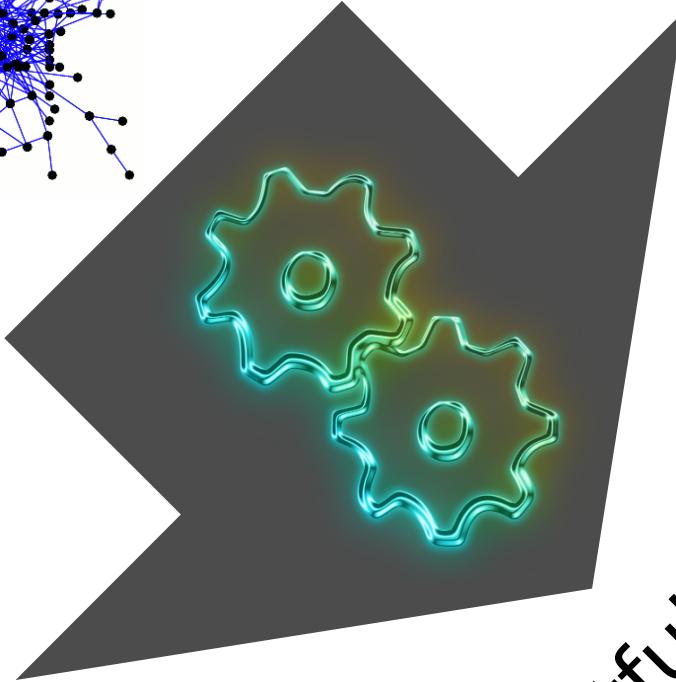
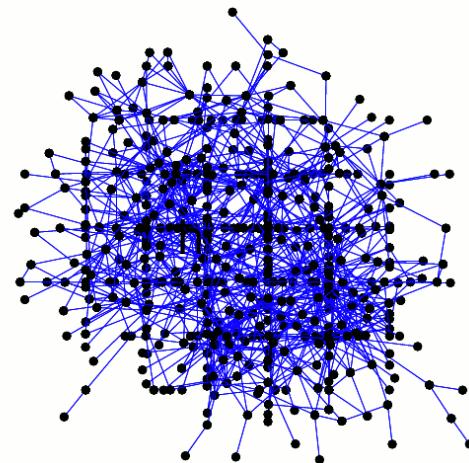
Even More Bigger



Wait, We Don't See Anything Anymore...

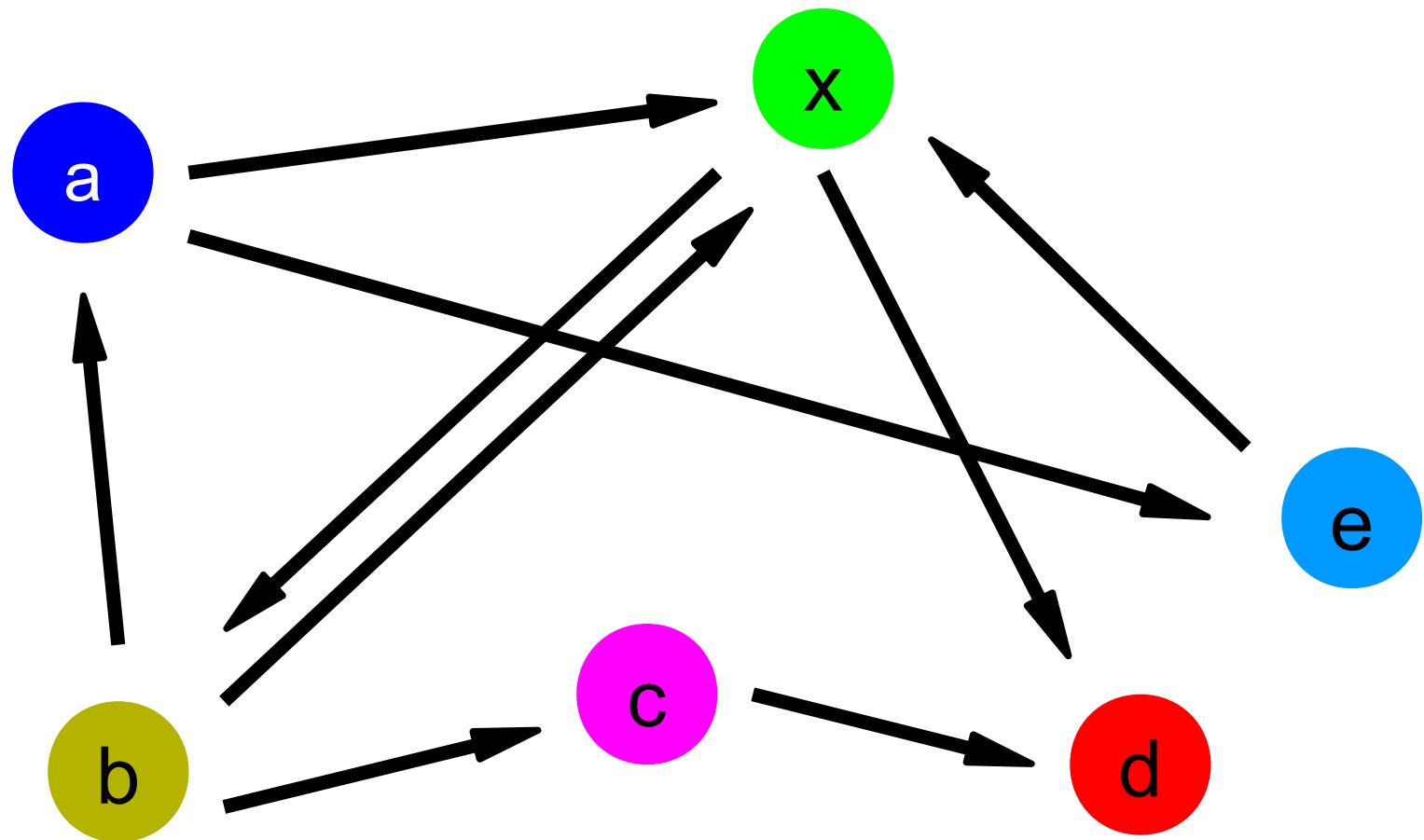


We Need Tools to Analyse Networks



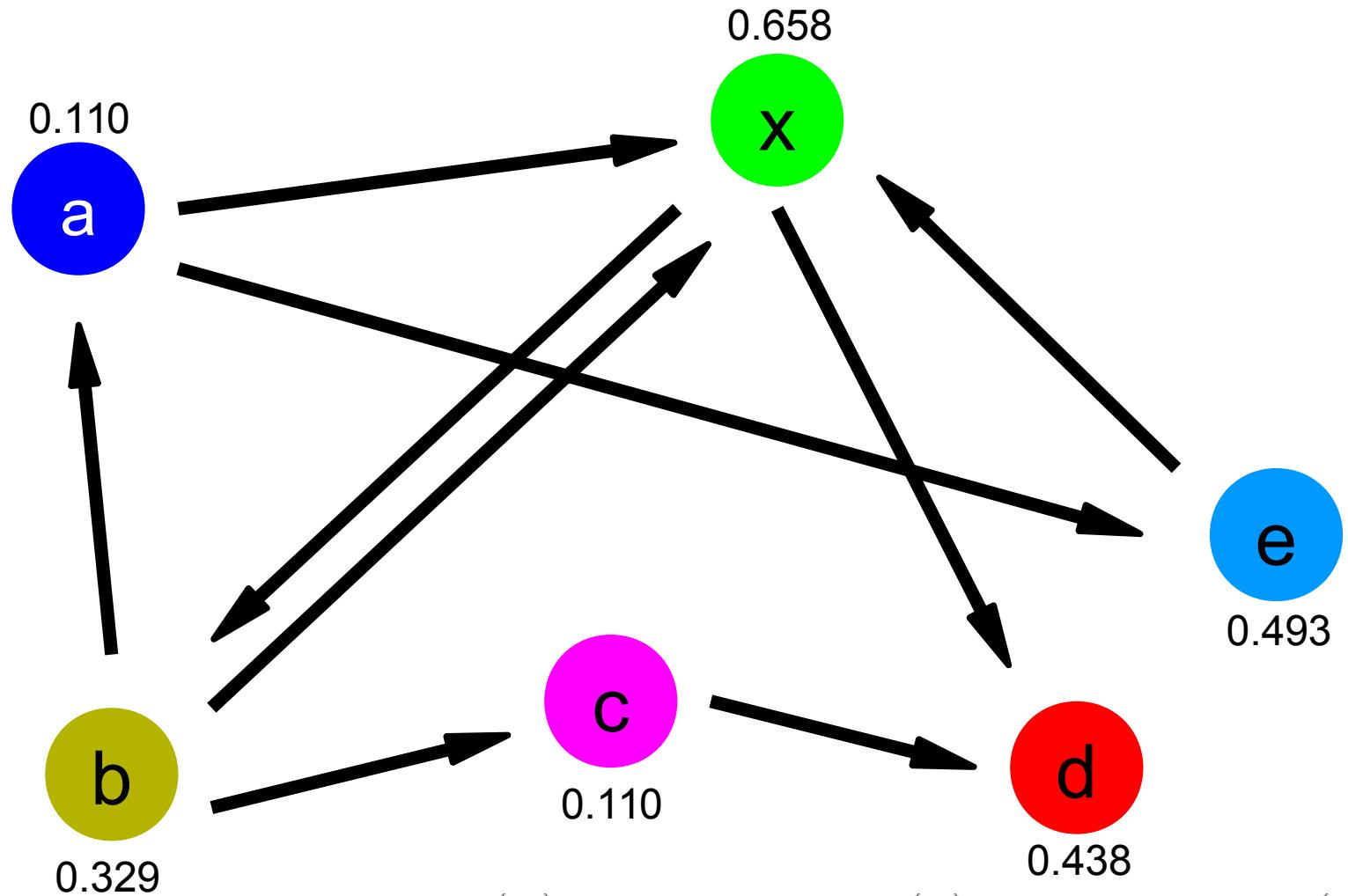
Trustfulness
Diversity
Conflict

Analysis Method 1: Trustfulness: Who Is Most Trusted?



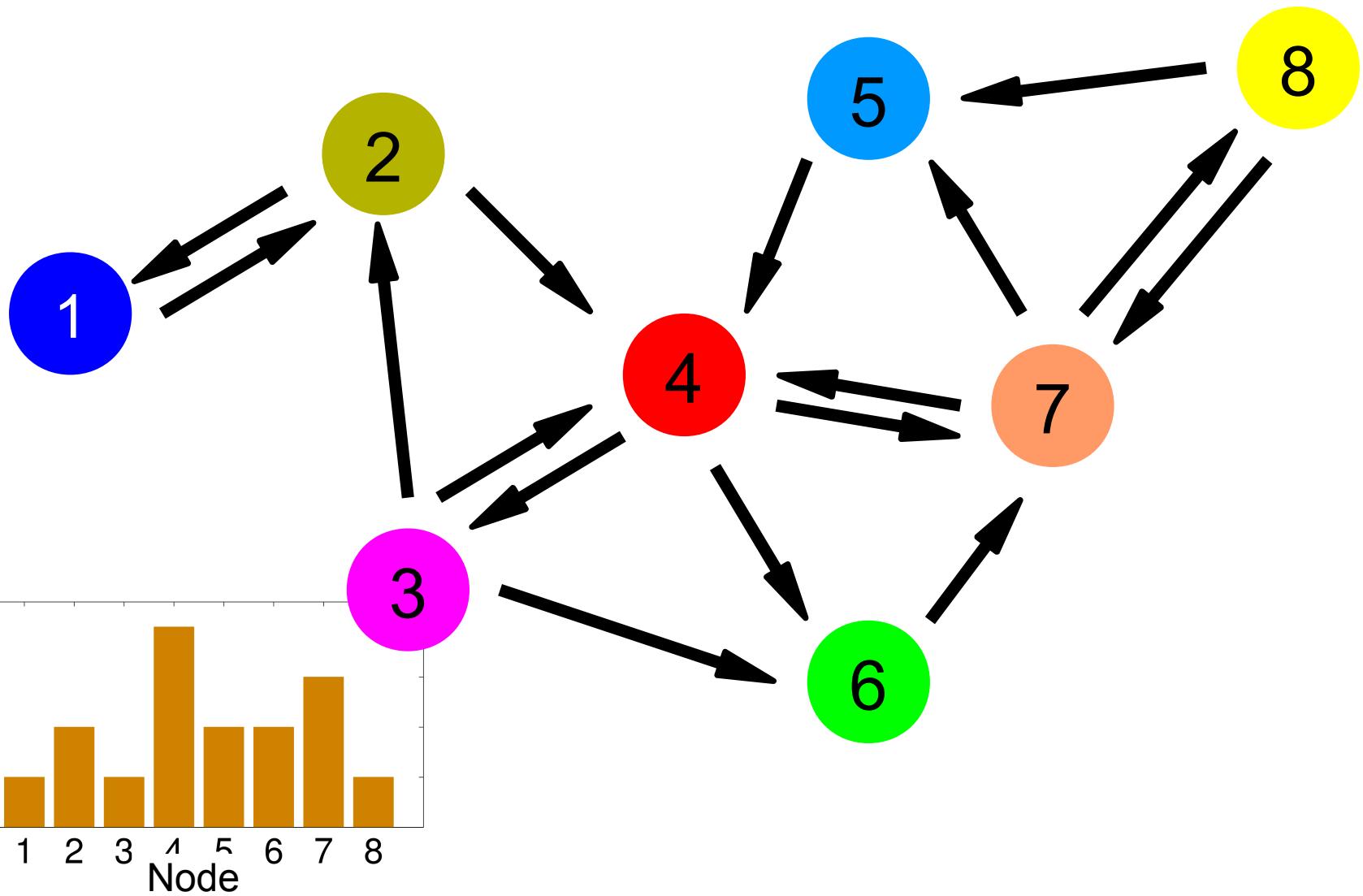
$$\text{PageRank}(x) = \frac{\text{PageRank}(a)}{2} + \frac{\text{PageRank}(b)}{3} + \frac{\text{PageRank}(e)}{1}$$

Analysis Method 1: Trustfulness: Results

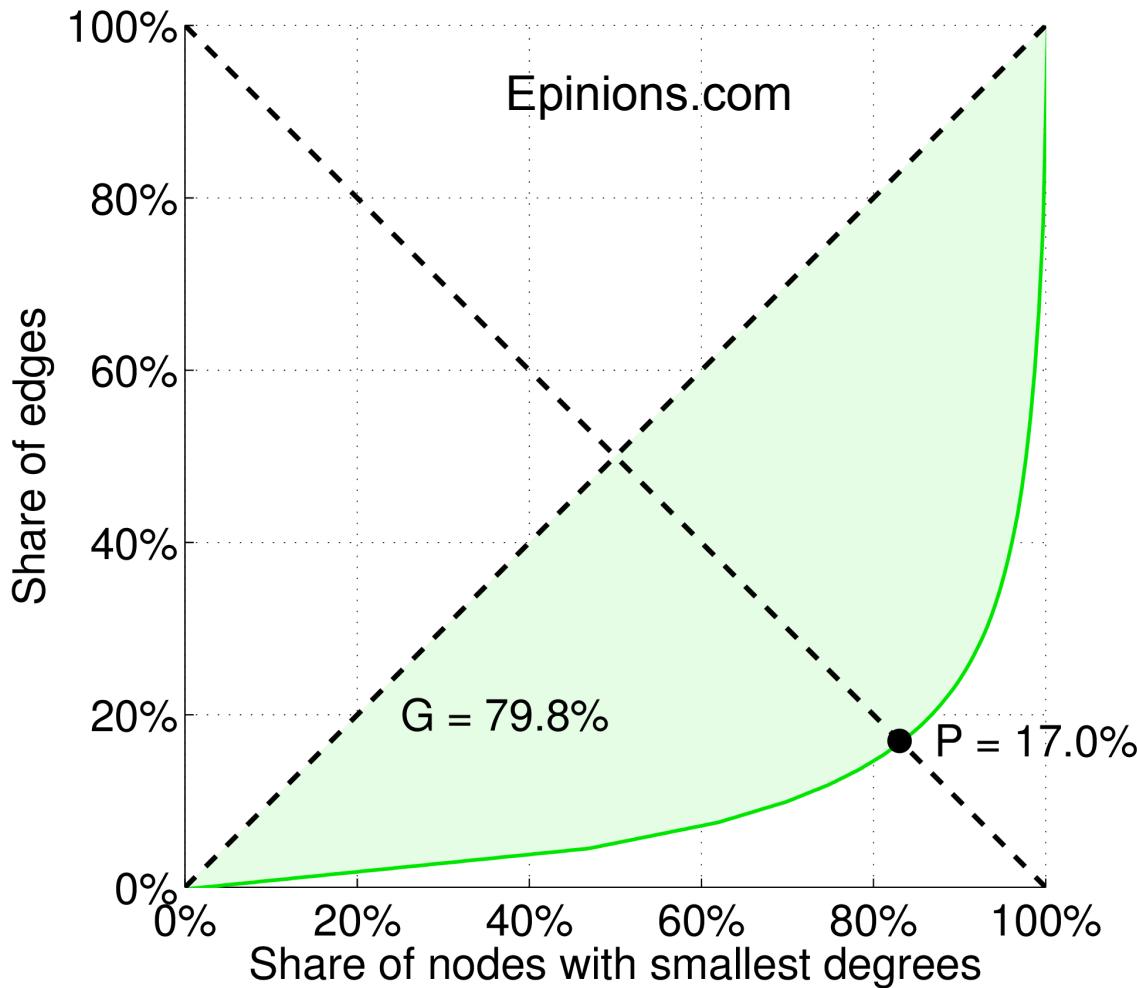


$$\text{PageRank}(x) = \frac{\text{PageRank}(a)}{2} + \frac{\text{PageRank}(b)}{3} + \frac{\text{PageRank}(e)}{1}$$

Analysis Method 2: Diversity: How Diverse Is Trust?

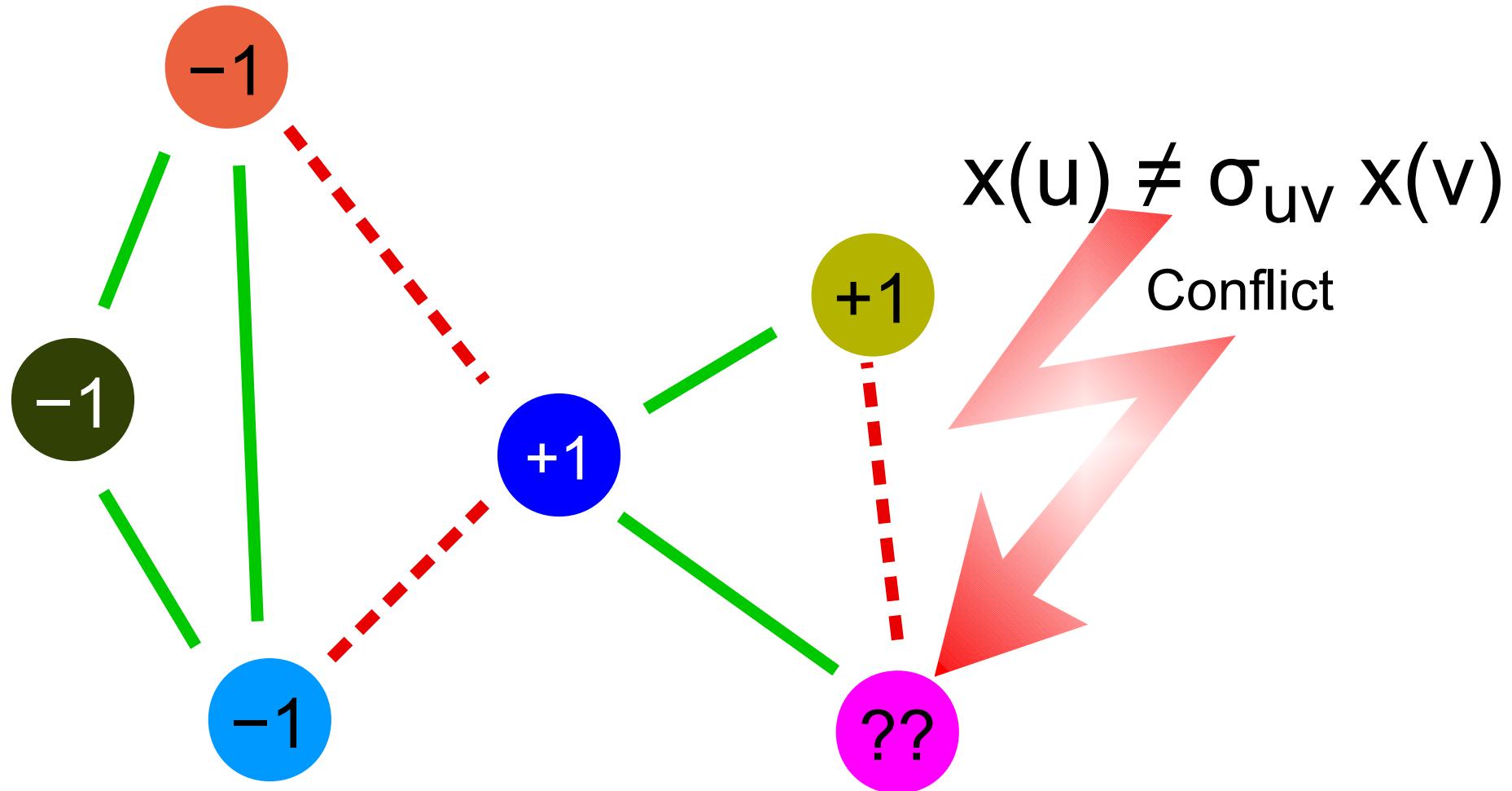


Analysis Method 2: Diversity: Lorenz Curve (Kunegis & Preusse 2012)



“17% of users are trusted by 83% of users.”

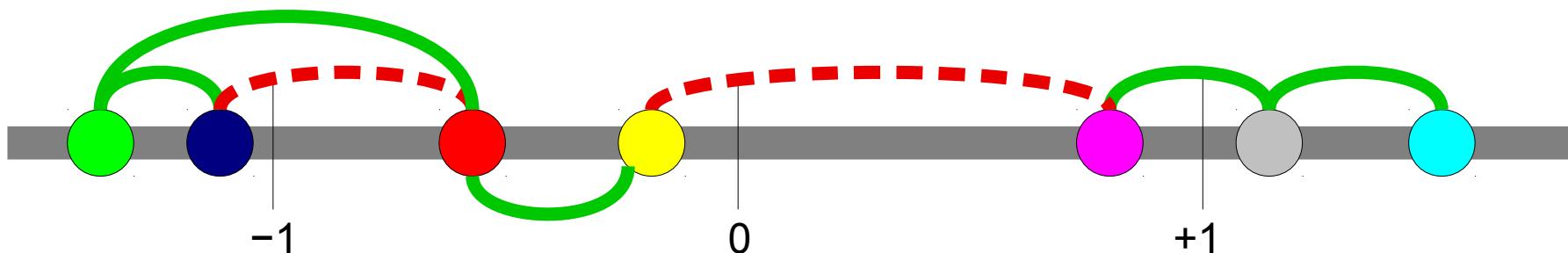
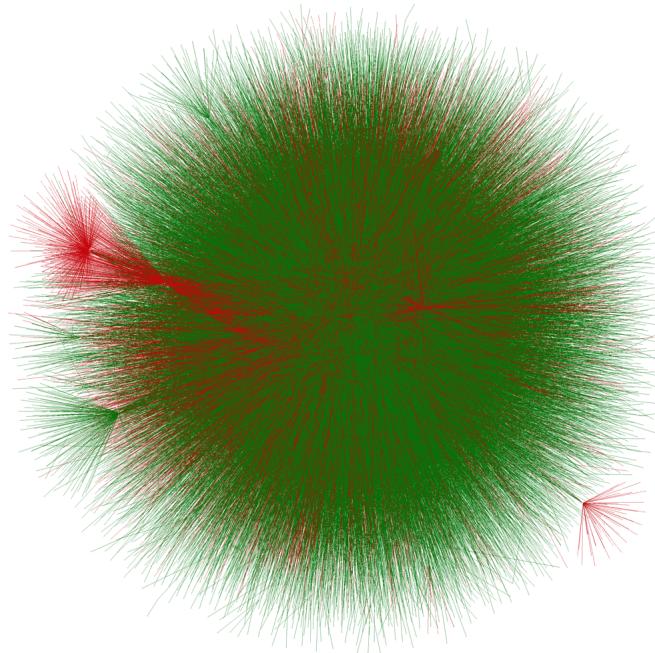
Analysis Method 3: Conflict in Networks with Trust and Distrust



$x(u)$ = sign of node (+1 or -1)

σ_{uv} = sign of edge (+1 or -1)

Analysis Method 3: Algebraic Conflict (Kunegis 2011)



Find number x for each node such that

$$\xi = E[(x(u) - \sigma_{uv} x(v))^2]$$

is minimal, and

$$E[x(u)^2] = 1.$$

Slashdot.org: $\xi_{\min} = 0.000730$



Thank you!

References

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