

Advanced Social and Information Networks

We Can
CHANGE
THE World

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no laptops /
smartphone usage
please!

such usage negatively impacts your peers

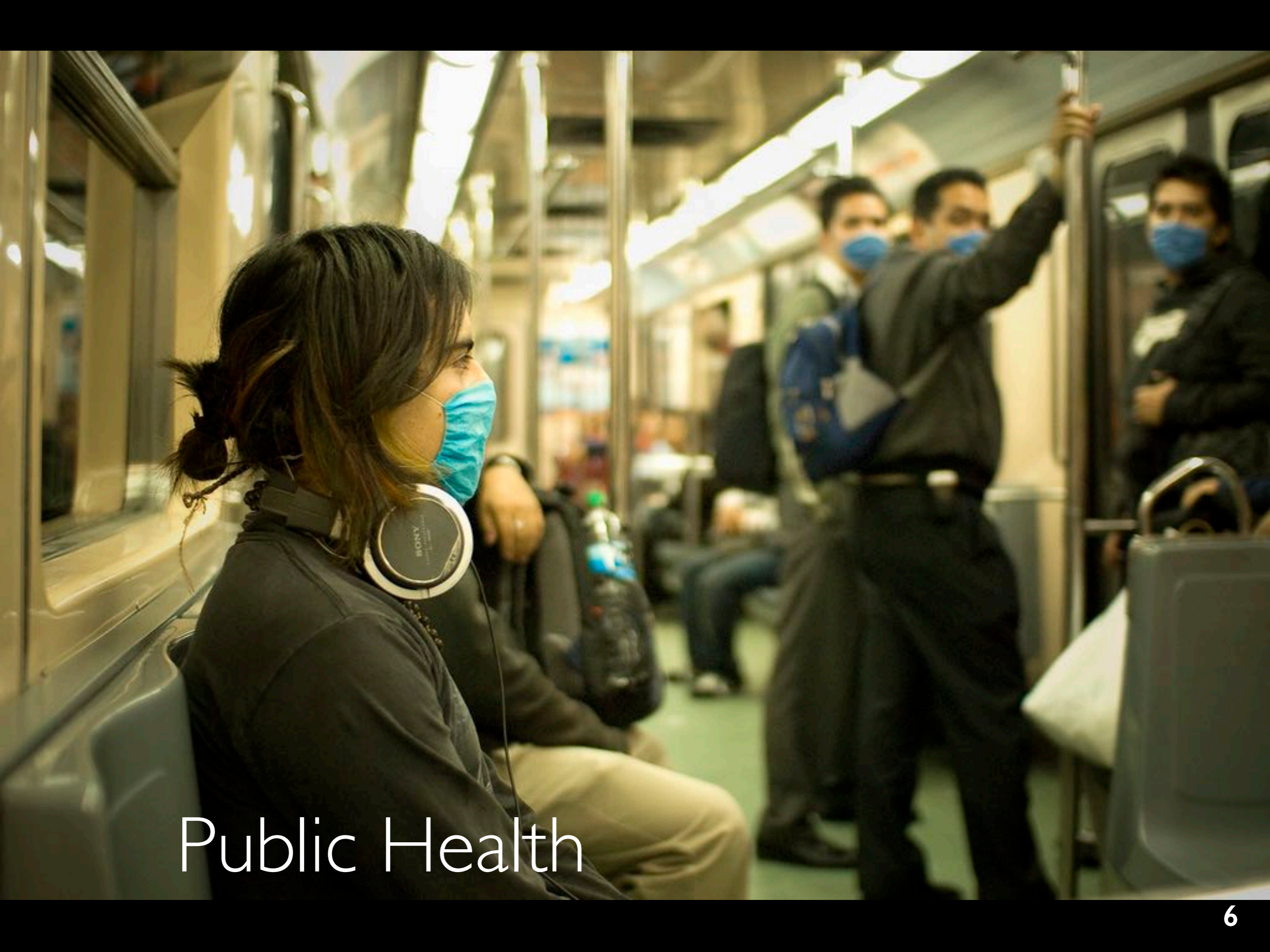
Faria Sana, Tina Weston, Nicholas J. Cepeda, **Laptop multitasking hinders classroom learning for both users and nearby peers**, Computers & Education, Volume 62, 2013, Pages 24-31,

This class will focus on
**strategic interaction on
networks**, where actors are
resource constrained

Examples of large-scale
strategic behavior
problems include

Sustainability





Public Health



congestion

A confluence of ideas from
**game theory, behavioral
economics, advertising and
computer science** will play
a key role in addressing
these challenges

class **mechanics**

misbehaving

background

mechanisms

social signals

social choice

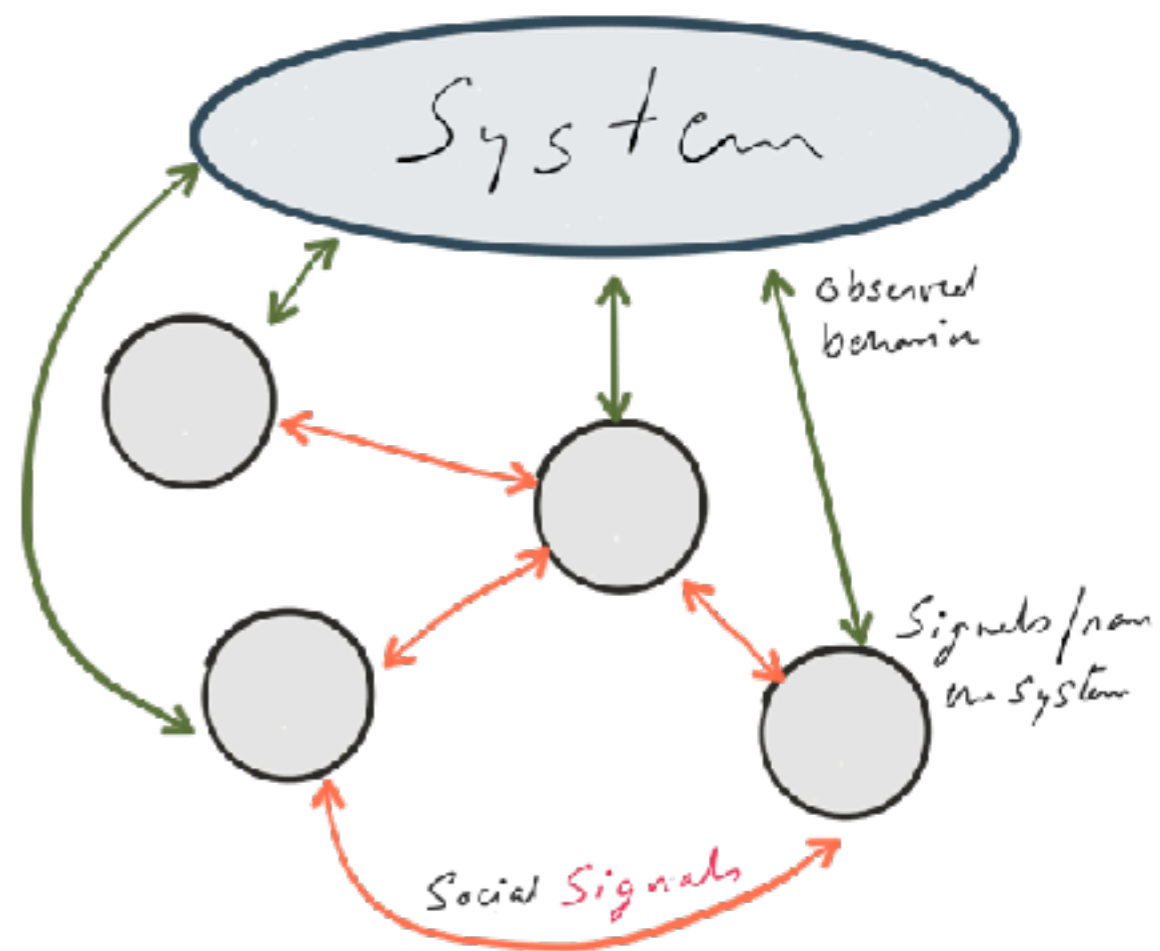
surveillance

macroscopic behavior

capitalism

CS598 CLASS MECHANICS

*Everything you wanted to
know*



class website:

<https://courses.grainger.illinois.edu/cs598hs/sp2020/>

Let's go over the
class schedule

paper review

| paper presentation

15%

weekly, open ended questions

1 each week (pass / fail);
can re-submit in case of
fail for 50% credit

20% (total)

project

proposal 10%

paper 30%

Final presentation 10%

best presentation (**extra credit**) 2%

participation

feedback on final
presentations

10%

class participation

5%

you can miss* two classes;
for every class beyond
two, you will lose a third
of a letter grade

i.e. A → A- (for missing three classes)

i.e. A → B+ (for missing four classes)

university related travel, medical and family emergencies are excepted

academic integrity

zero tolerance policy!

Plagiarism deserves special mention. **It is an academic violation to copy, to include text from other sources, including online sources, without proper citation.** Any student found to be violating this code will be subject to disciplinary action.

MEET THE TA



Rick

background



When do people cooperate?

What are examples
when large scale
technological networks
have facilitated collective
behavior?

Iran, 2009



Cairo, 2011



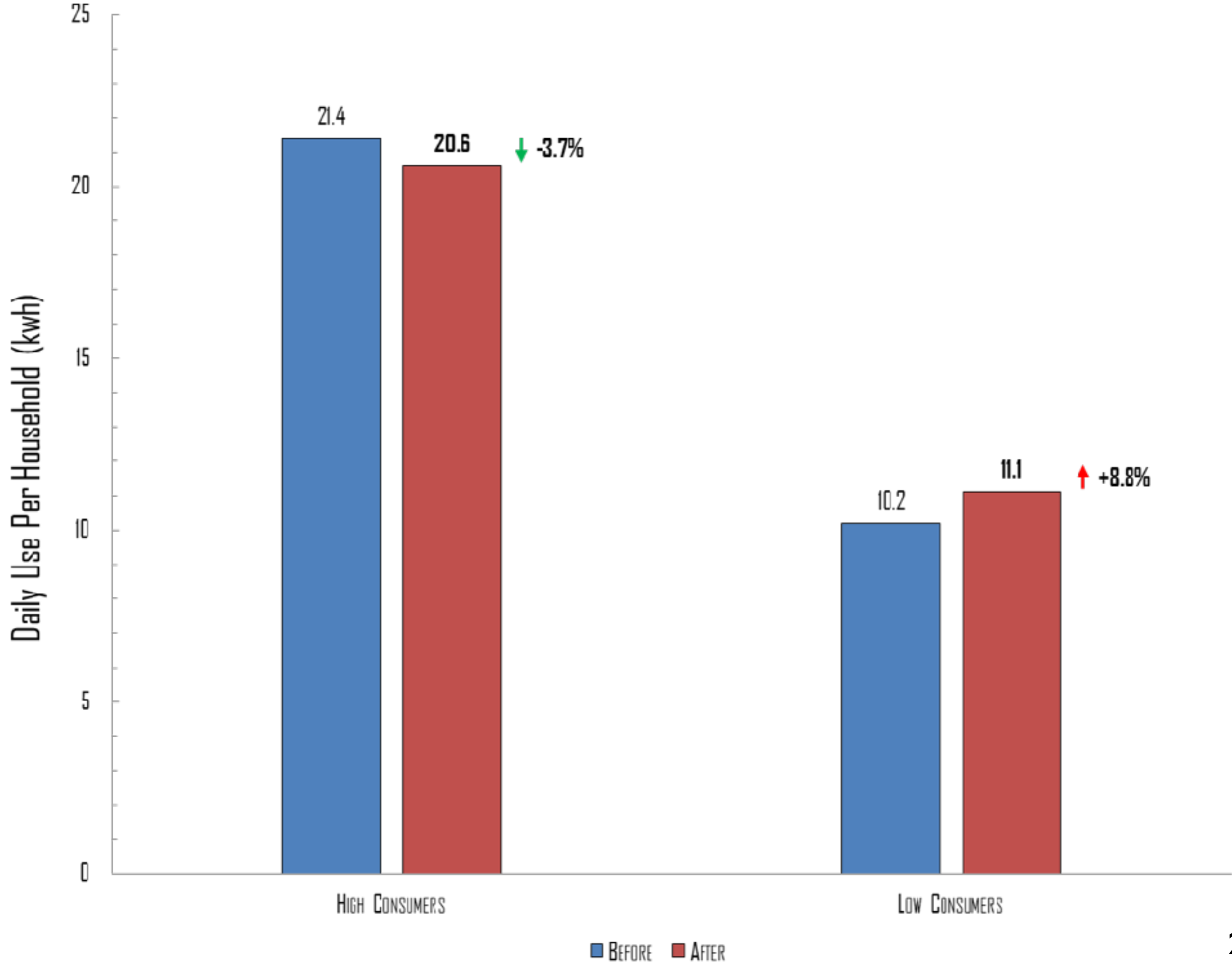
Birmingham, 2011

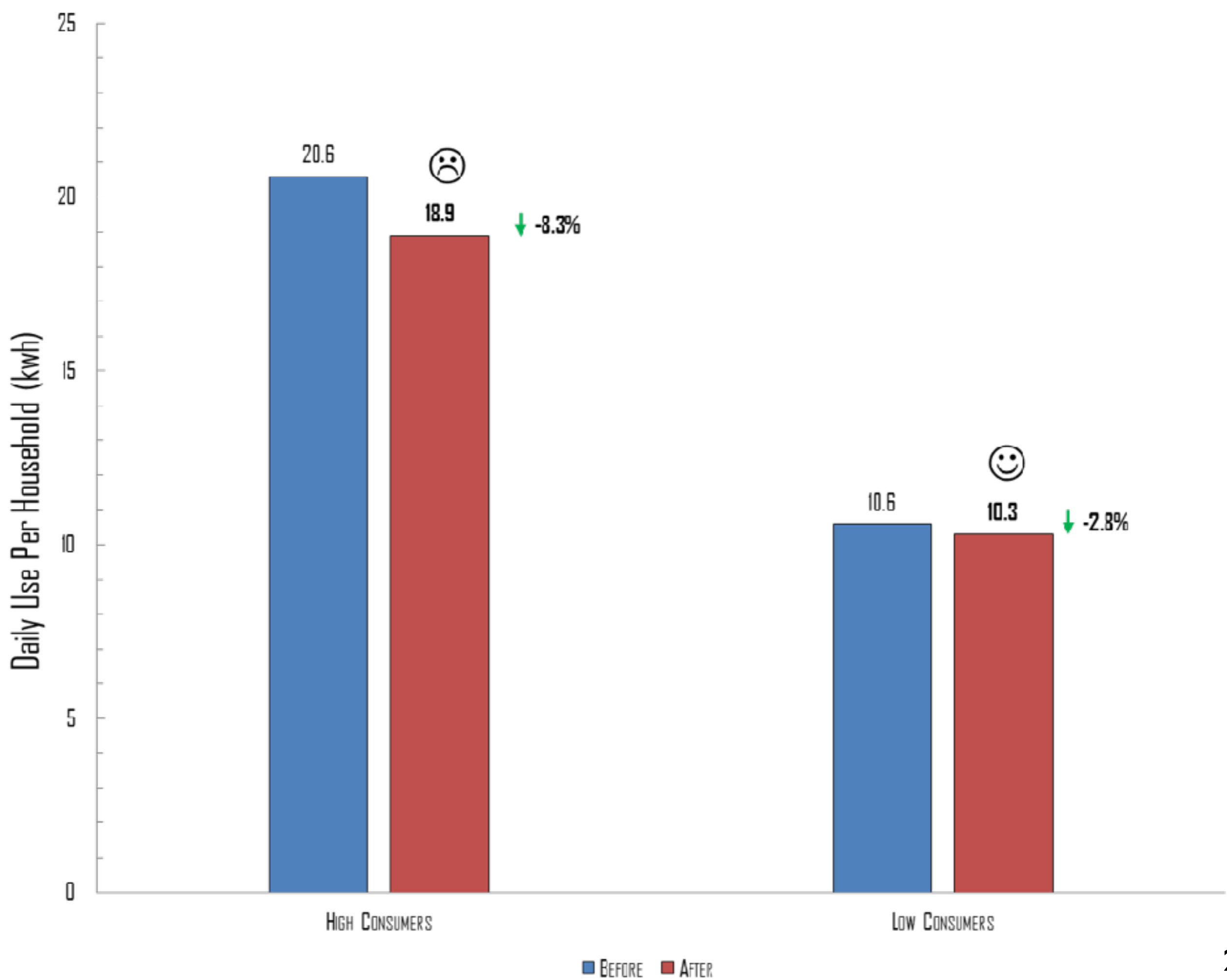




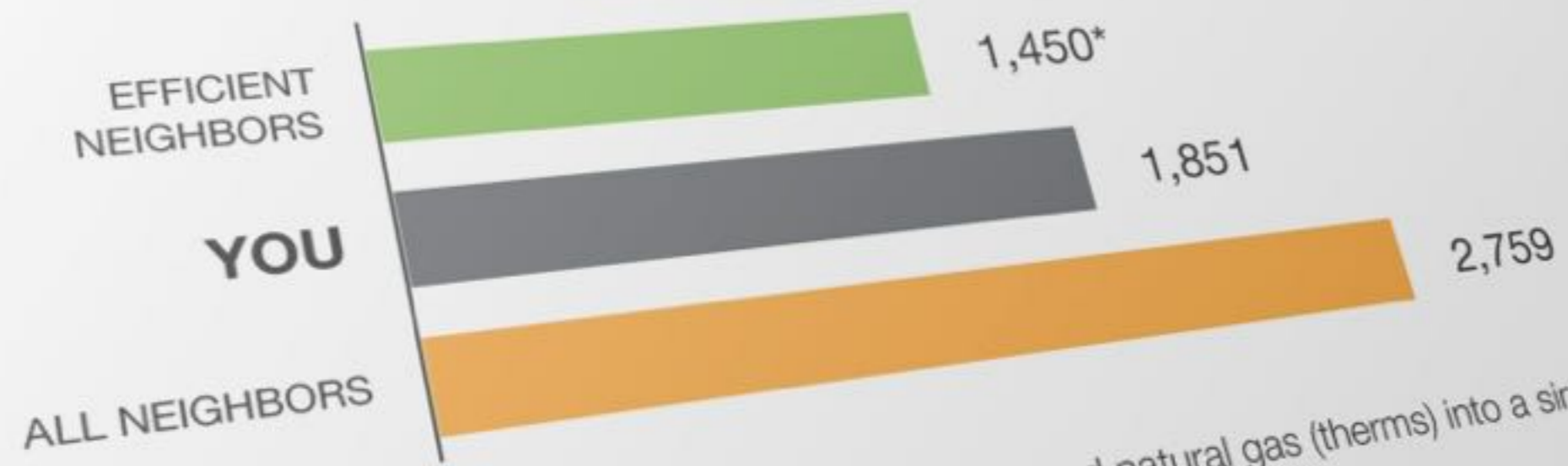
San Marcos, California

[Schultz, 2007]





November Neighbor Comparison | You used **28% MORE** energy than your efficient neighbors



HOW YOU'RE DOING

GREAT 😊😊

▶ **GOOD** 😊

MORE THAN GOOD 😊

* This energy index combines electricity (kWh) and natural gas (therms) into a single measurement.

WHO ARE YOUR "NEIGHBORS"?

■ ALL NEIGHBORS
Approximately 100 occupied nearby homes that are similar in size to yours (avg 2,023 sq ft) and have both electricity and natural gas service.

Neighbor Comparison

You used **74% MORE** energy than your neighbors.
This costs you a lot more.

people tend to cooperate
if they expect others to
do so too

people who share resources have a
selfish reason not to cooperate

[Hardin, 1968]



May 29, 1435, Valencia, Spain



Feb 1, 1483, Törbel, Switzerland



Elinor Ostrom,
Nobel
Laureate 2009

Small homogenous
groups; ability to
sanction, monitor and
resolve conflicts in a
low-cost manner

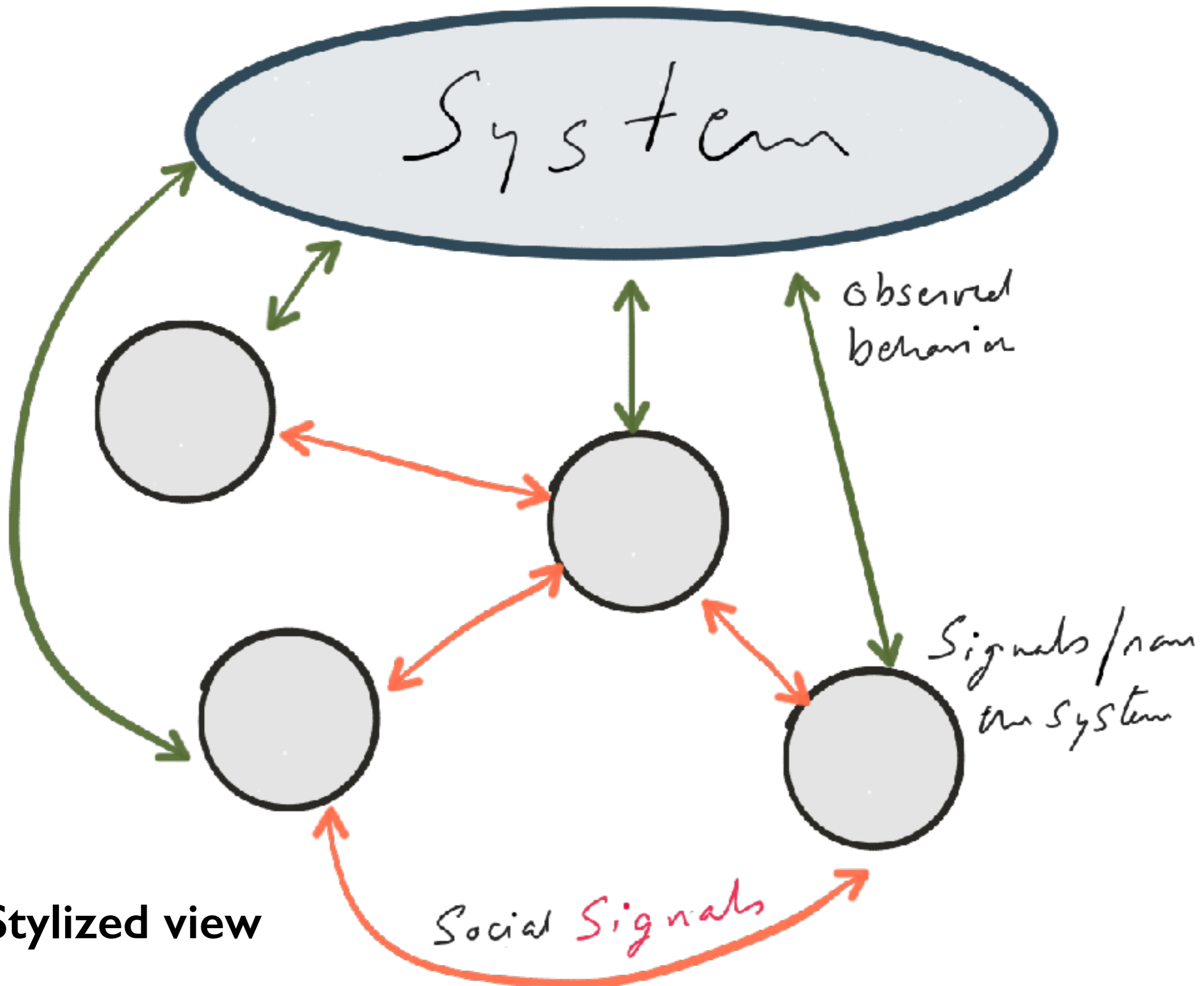


An aerial night view of a city, likely San Francisco, with a dense grid of lights and a prominent bridge. A bright star is visible in the upper right corner of the dark sky.

The CS question:

How do we scale up?

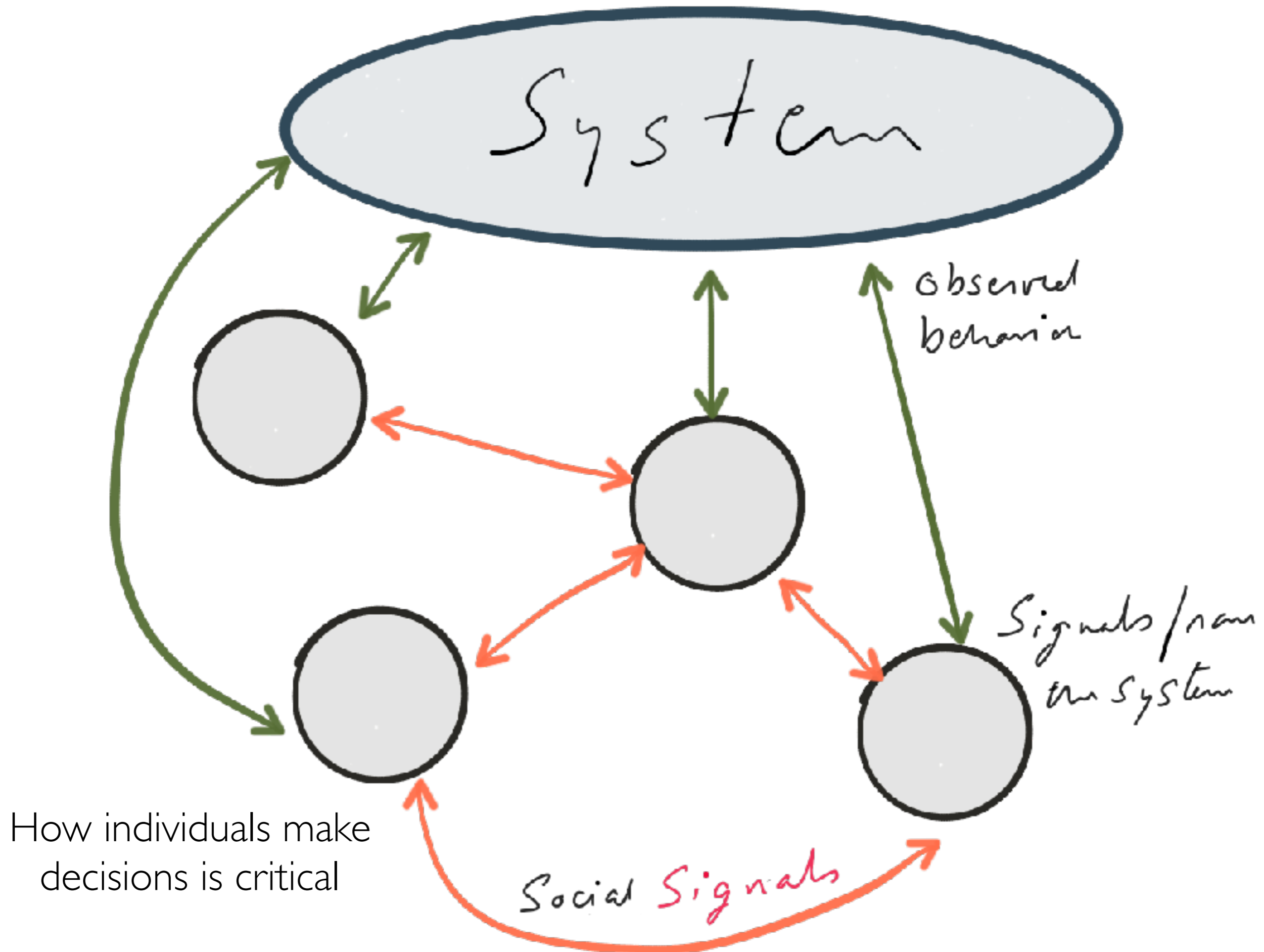
mechanisms, realistic models, interventions



A Stylized view

misbehaving

Individual decision making



How individuals make decisions is critical

In this class, we will re-examine **rational behavior**, which forms the basis of game theory and mechanism design

Stanley mows his lawn every weekend and it gives him terrible hay fever. I ask Stan why he doesn't hire a kid to mow his lawn. Stan says he doesn't want to pay the \$10. I ask Stan whether he would mow his neighbor's lawn for \$20 and Stan says no, of course not.

Thaler, Richard H.. Misbehaving: The Making of Behavioral Economics (p. 20). W. W. Norton & Company. Kindle Edition.

Linnea is shopping for a clock radio. She finds a model she likes at what her research has suggested is a good price, \$45. As she is about to buy it, the clerk at the store mentions that the same radio is on sale for \$35 at new branch of the store, ten minutes away, that is holding a grand opening sale. Does she drive to the other store to make the purchase?

On a separate shopping trip, Linnea is shopping for a television set and finds one at the good price of \$495. Again the clerk informs her that the same model is on sale at another store ten minutes away for \$485.

Imperfect knowledge
Limited resources
Make sub-optimal decisions

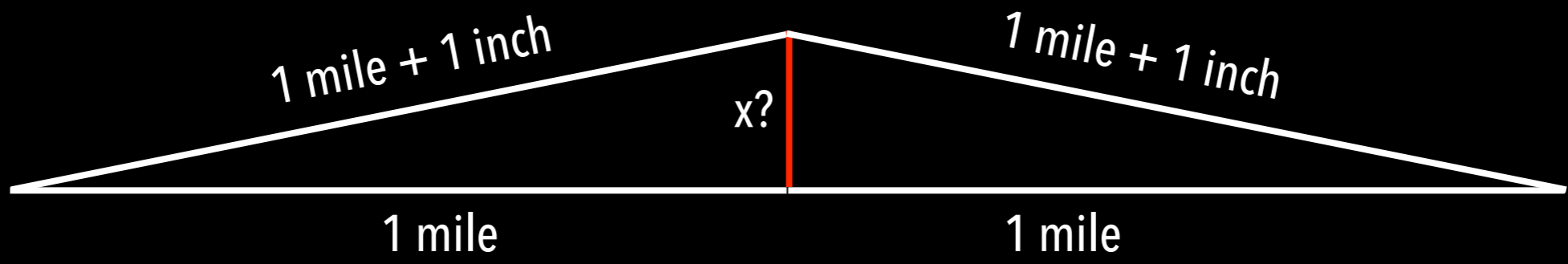


Econs **vs.** Humans

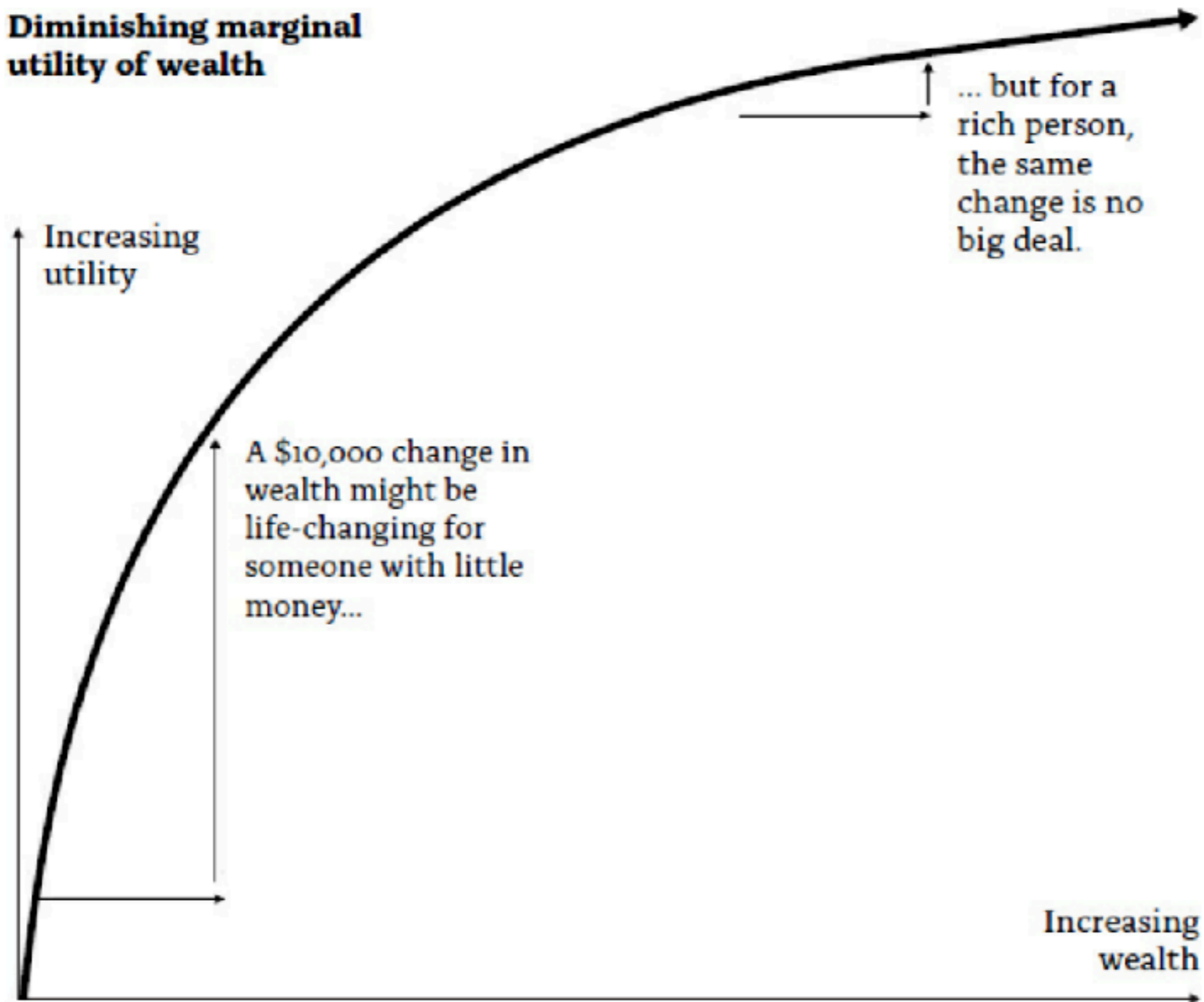


Have complete knowledge
Always possess resources to
act on decisions
Make optimal decisions

Normative v. descriptive



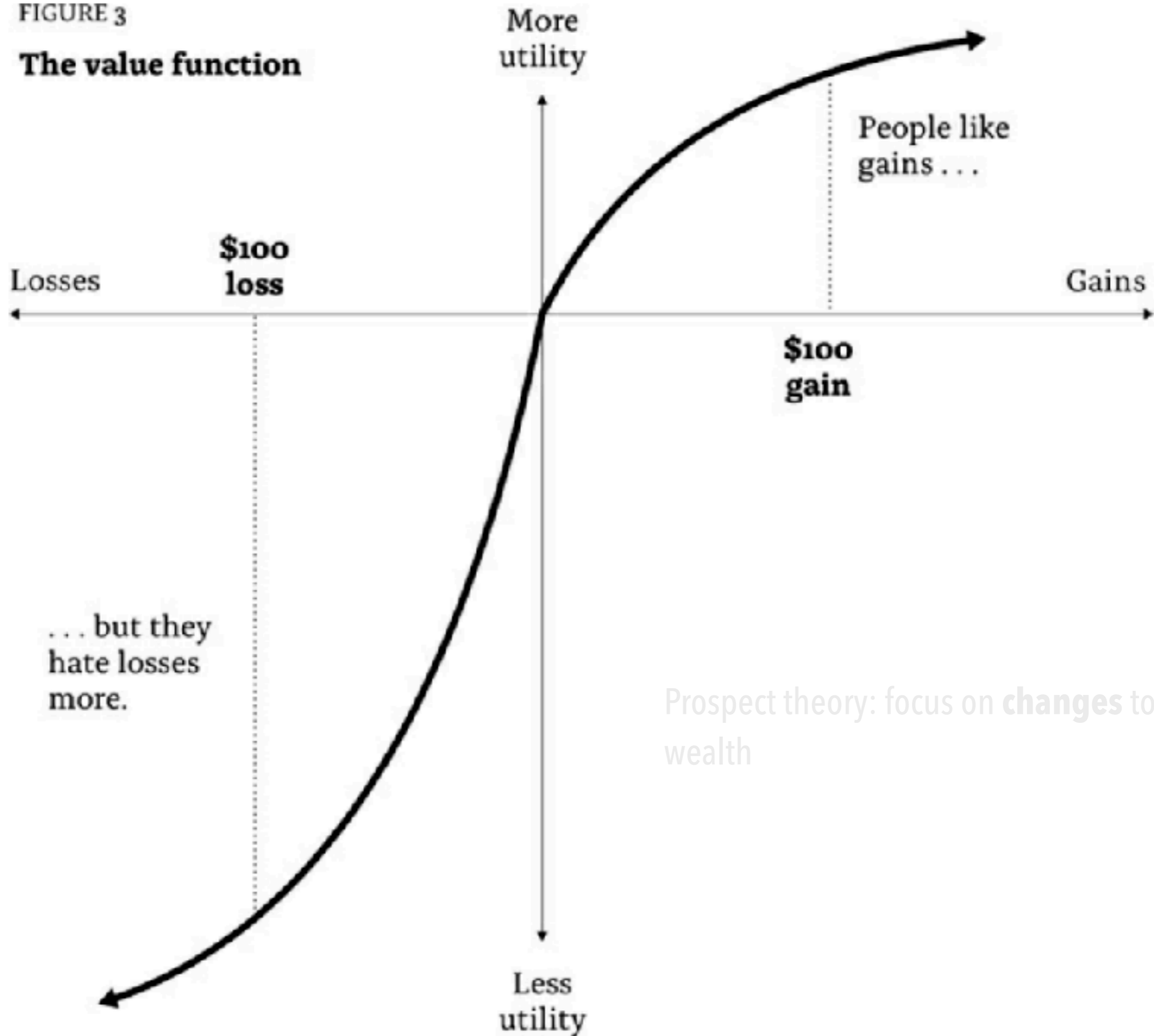
Diminishing marginal utility of wealth



Expected utility: diminishing returns; focus on **levels** of wealth

FIGURE 3

The value function



Linda is thirty-one years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in antinuclear demonstrations.

Which alternative is more probable?

- Linda is a bank teller.
- Linda is a bank teller and is active in the feminist movement.

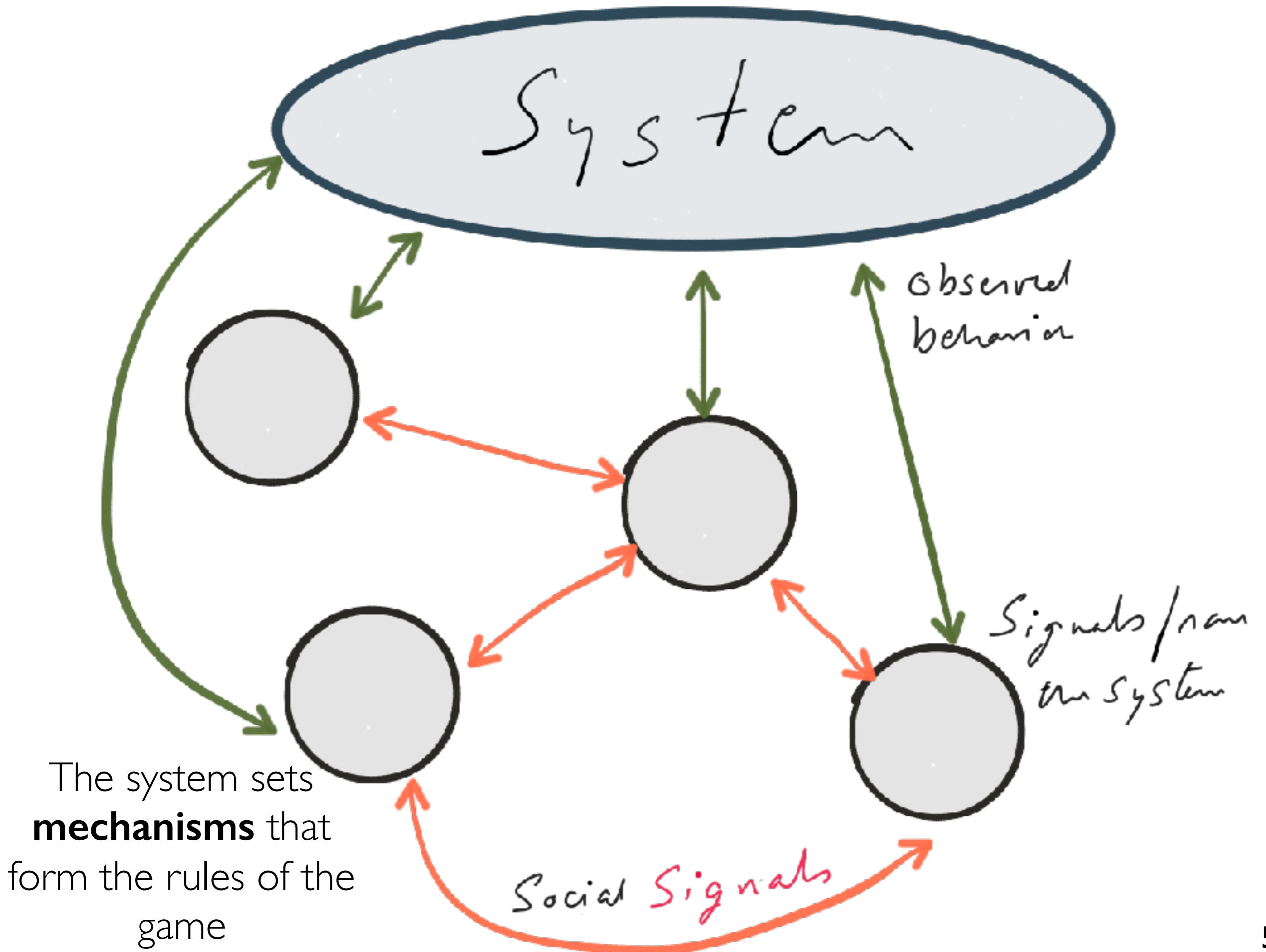
Assume that you have two choices: a nearly sure bet (97%, called 'p' bet) of winning \$10, or a 37% chance of winning \$30 (called '\$' bet)

what would you choose, p or \$?

how much will you pay
in exchange for the **p**
bet?

how much will you pay
in exchange for the \$
bet?

mechanisms





Incentive compatible

social choice (**voting**)

The riot that wasn't: How Twitter spread rumours of communal violence in Kolkata

On Monday, a road blockade was portrayed as a full-blown riot by some social media users – part of a worrying trend of misinformation being spread online.



Sreemoy Talukdar
@sreemoytalukdar



Follow

Riot in Kolkata. All Muslim-dominated areas are burning. Many injured. No deaths yet. Mamata's cops are spectators. Media blackout. Total.

RETWEETS
115

FAVORITES
15



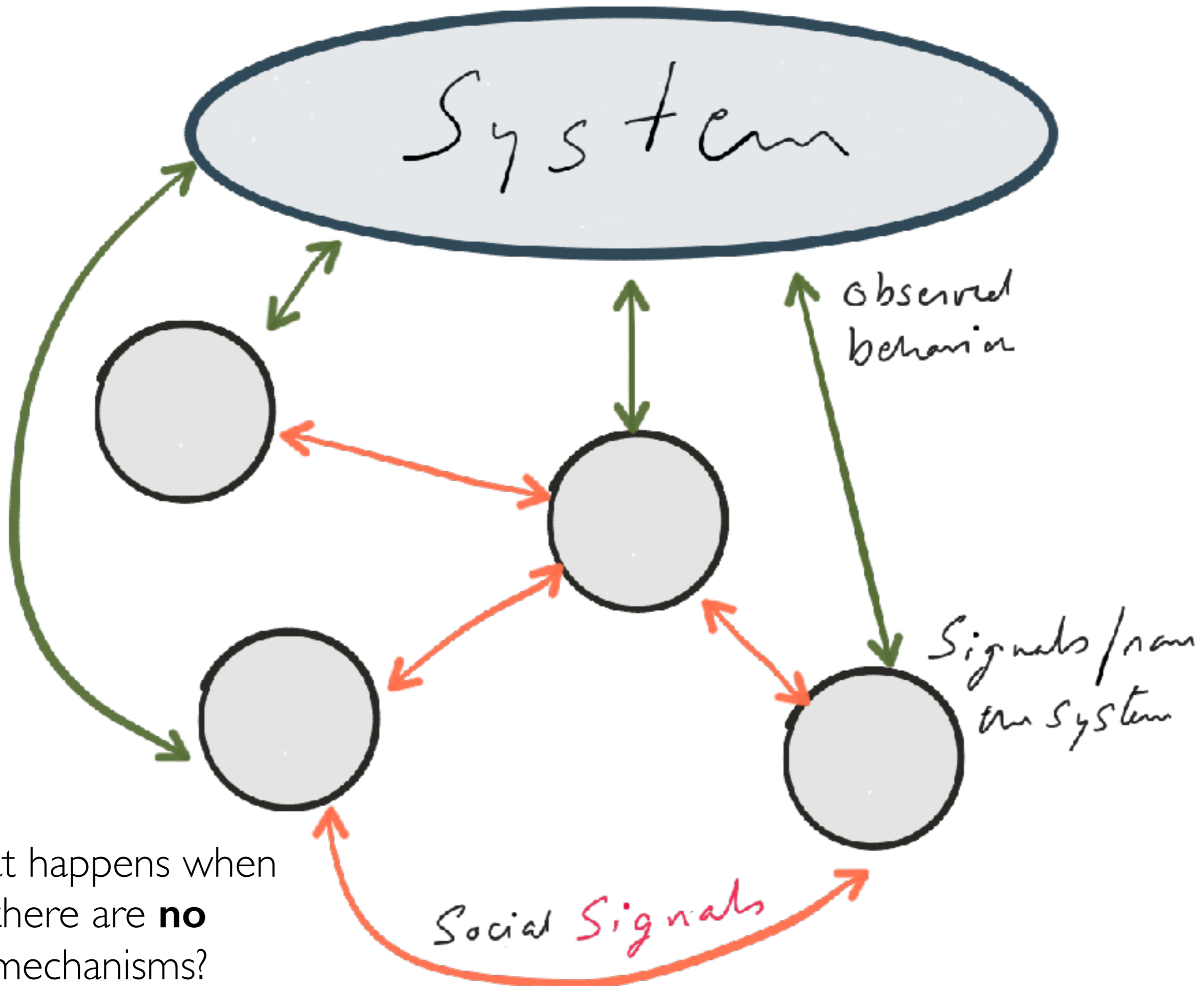
11:42 PM - 3 Aug 2015



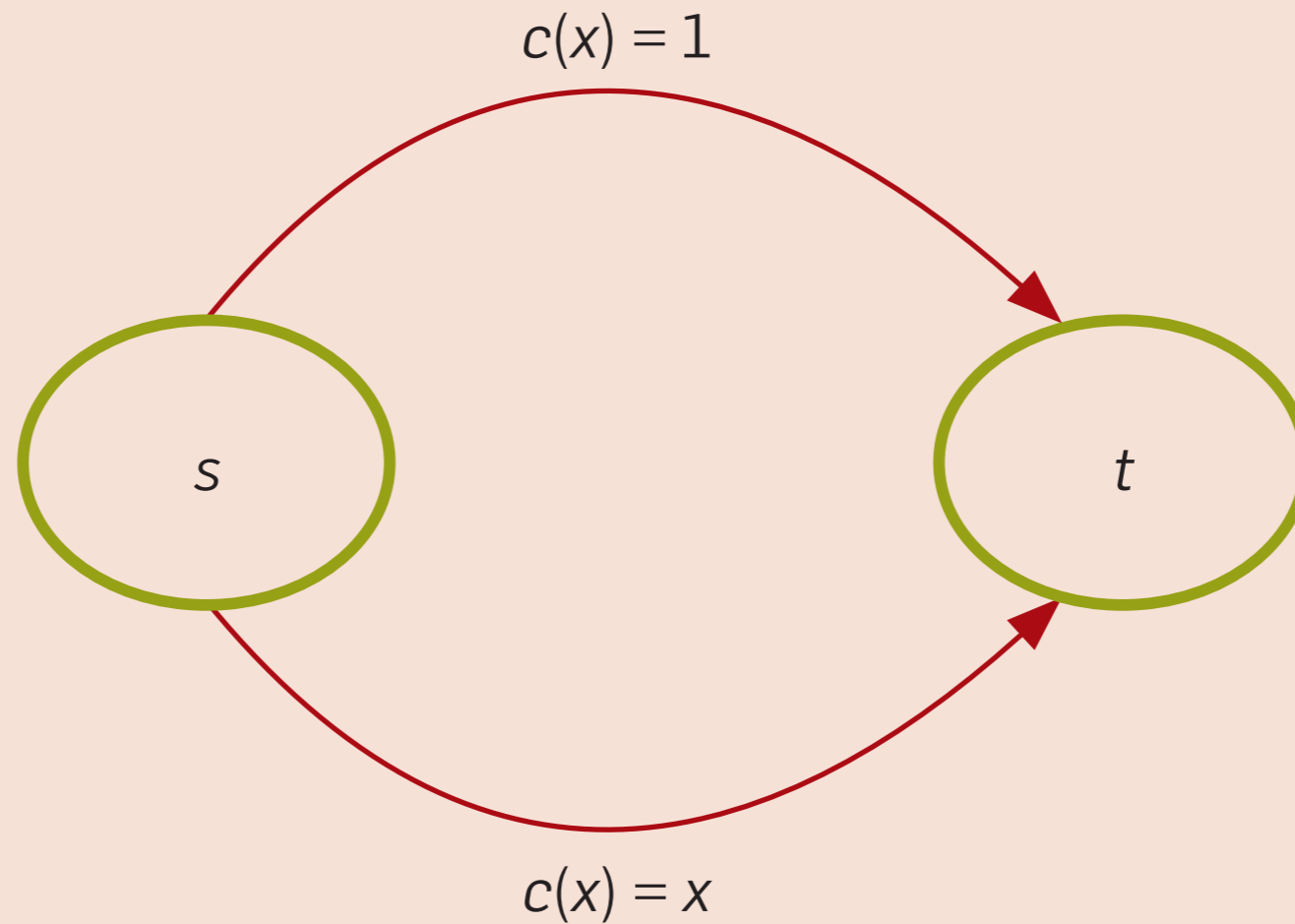
Talukdar is an editor at news website, Firstpost.

How do we create
incentive-compatible
reporting on social
networks?





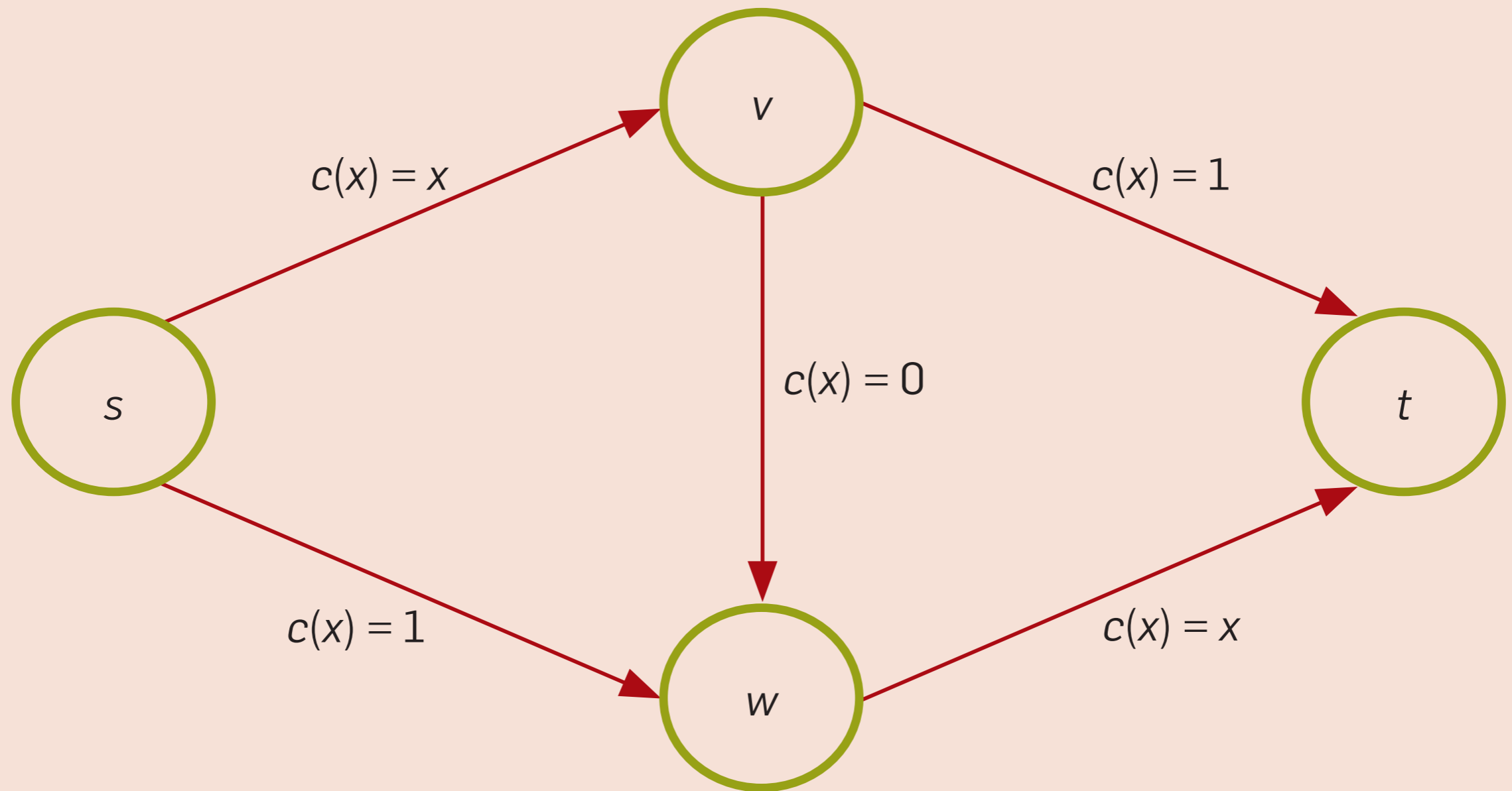
What happens when there are **no** mechanisms?



(a) Pigou's Example

What happens when there are **no** mechanisms?

The **price of anarchy** is
upper bounded by **4/3**
for **all** networks with
affine $(ax+b)$ costs



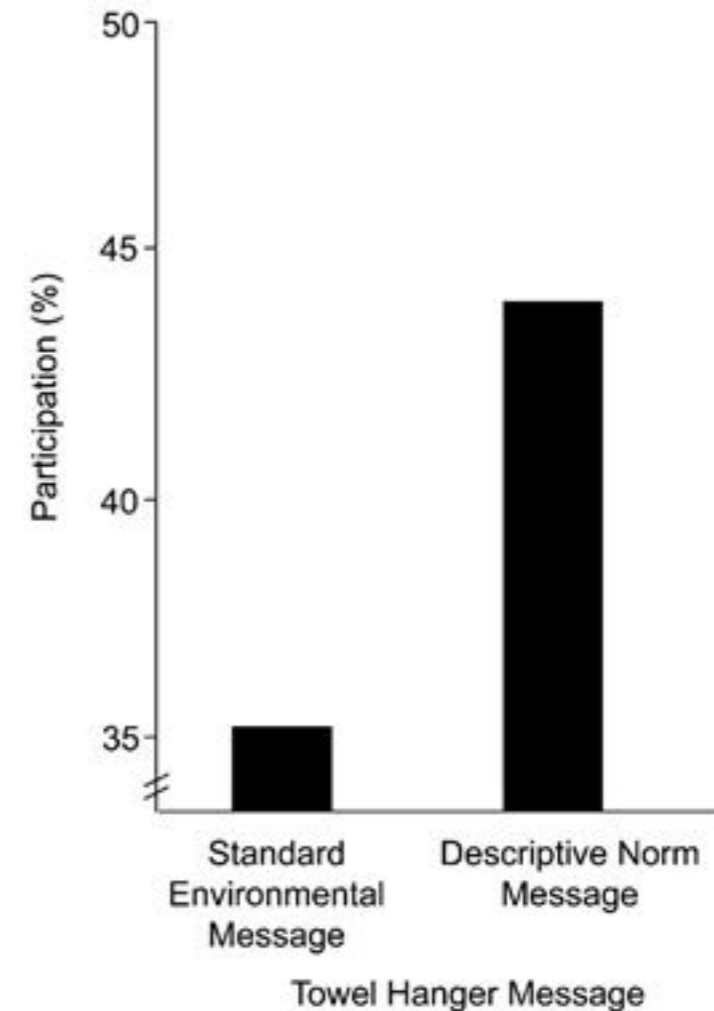
(b) Braess' Paradox

Adding edges to the network can make it **worse!**

social signals



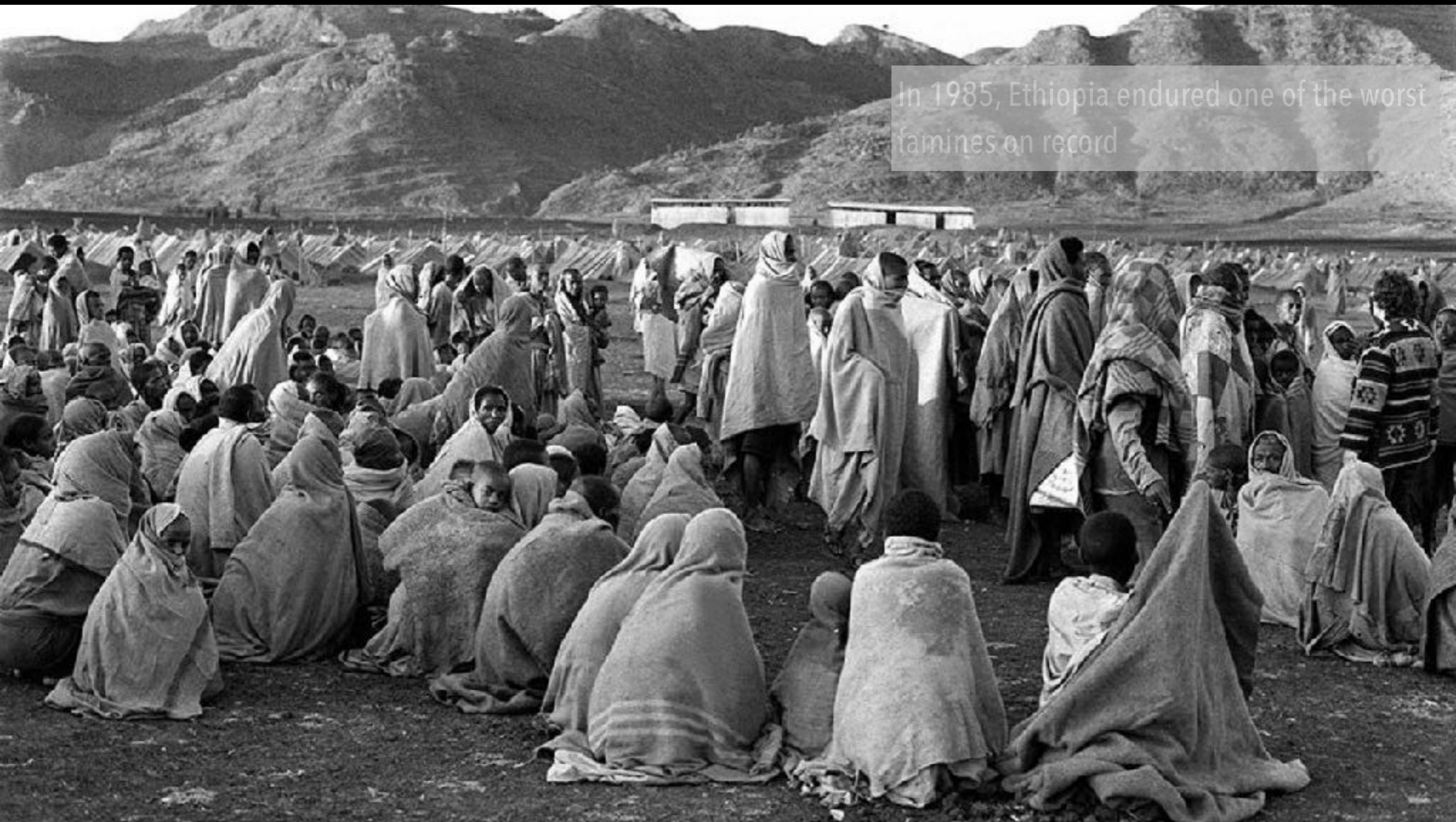
TOWEL REUSE RATES AS A FUNCTION OF SIGN IN ROOM (EXPERIMENT 1)



N. J. Goldstein, R. B. Cialdini, and V. Griskevicius. **A room with a viewpoint: Using social norms to motivate environmental conservation in hotels.** *Journal of Consumer Research*, 35(3):472 - 482, 2008.

reciprocity

In 1985, Ethiopia endured one of the worst famines on record





In 1985, Mexico City suffered a devastating earthquake

Yet, Ethiopia, then one of the poorest countries in the world, offered \$5,000 to help Mexico!

Because, in 1935, Mexico had sent aid to Ethiopia, when it was invaded by Italy.

Cialdini, Robert B.. **Influence: Science and Practice.** Pearson HE Inc.

social choice (**voting**)



Voting is complicated!

K. J. Arrow. [A difficulty in the concept of social welfare](#). Journal of Political Economy, 58(4):328-346, 1950.

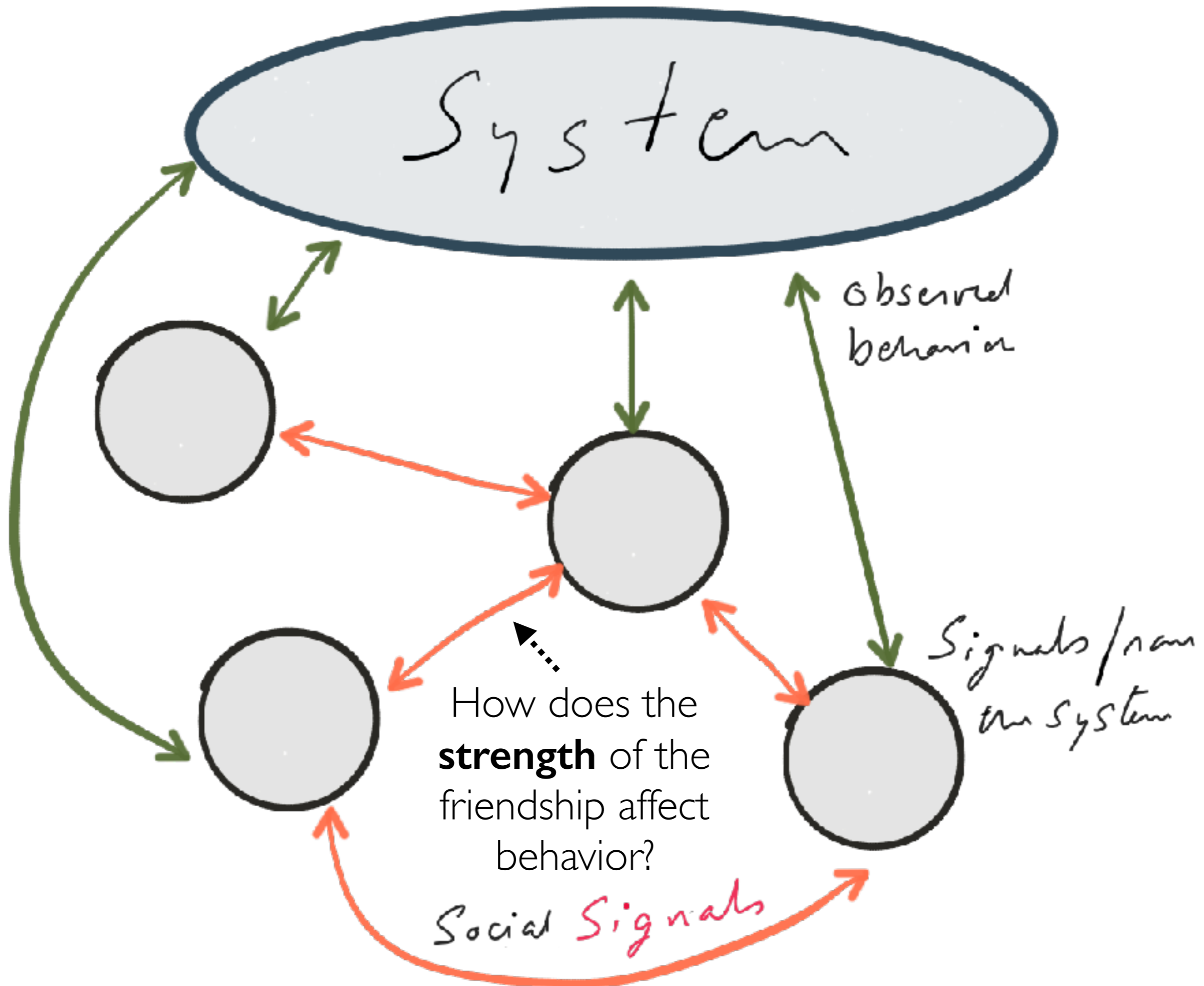
quadratic voting

knapsack voting

voting requires
independent judgements

is this true?

macroscopic **behavior**



$$\frac{\sum_{i \in N_v} \omega_i \phi(i)}{|N_v|} \geq \theta_v$$

Linear Threshold model



When did **he** decide to join?

Monday, Feb. 1st, 1960

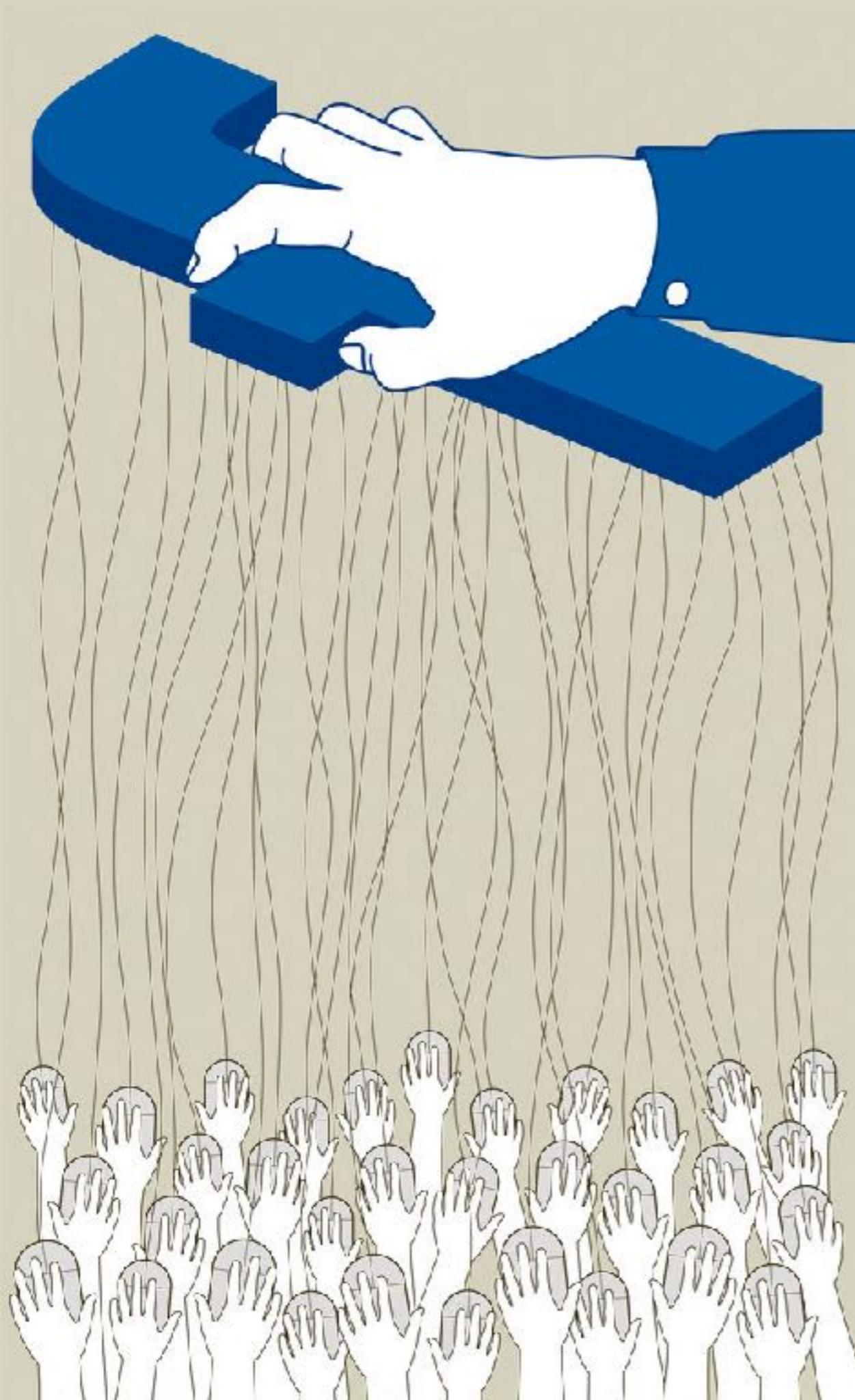


Greensboro, NC, Woolworth's sit-in

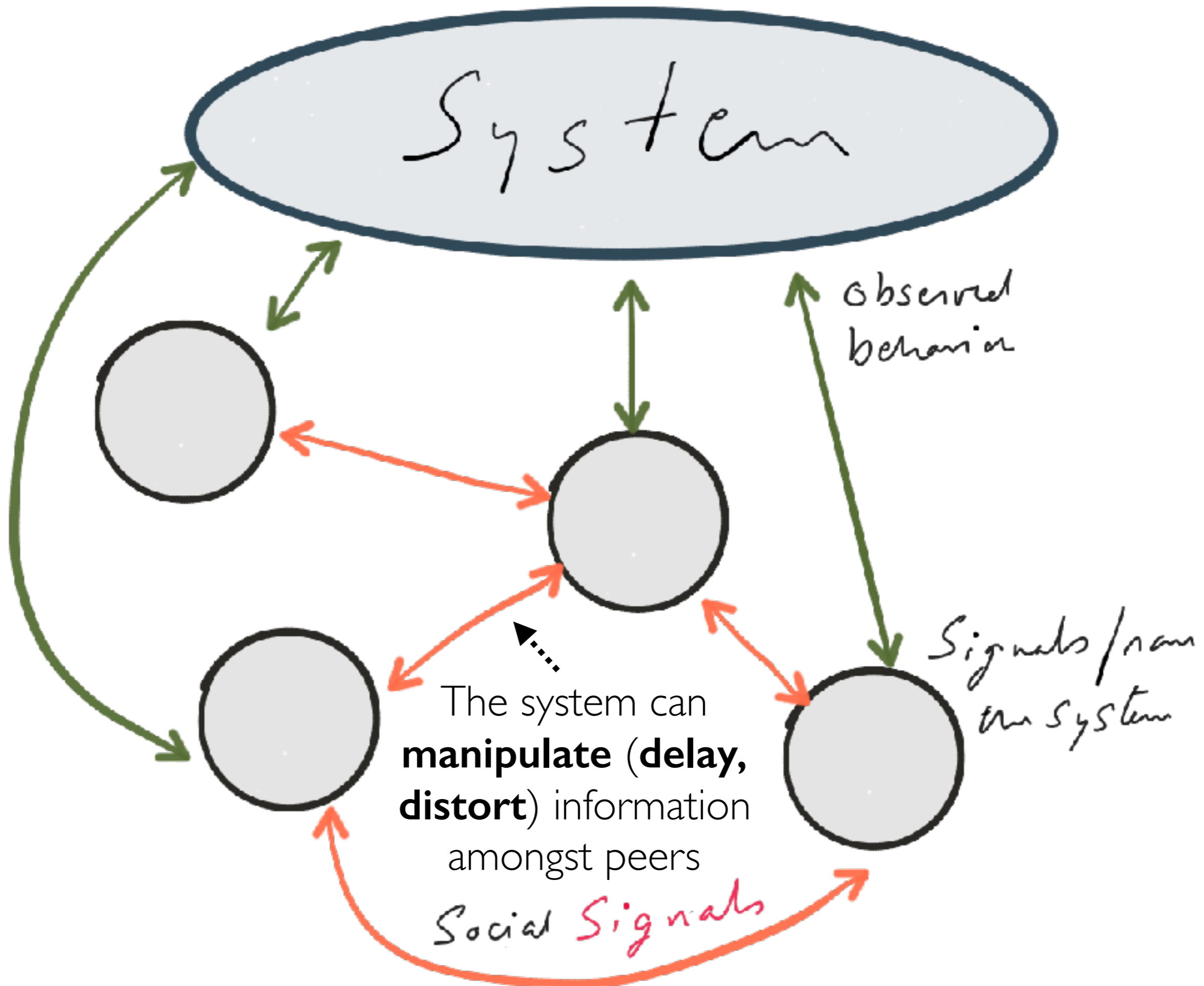
surveillance **capitalism**

much of our discussion
revolves around the
design of computational
systems for pro-social
outcomes

what if the design was
meant to **control** our
behavior?



Zuboff, S. (2019). **The age of surveillance capitalism:** The fight for a human future at the new frontier of power. Profile Books.



Can peers cooperate to
discover manipulation
in polynomial time?

We shall be discussing
several open problems
in this class, and
brainstorm over
solutions