

Decision (Neuro)Science in Society

Rei Akaishi
Unit Leader at RIKEN CBS

Machine Learning Tokyo
at U Tokyo

PRICE \$8.99

THE

NEW YORKER

OCT. 23, 2017

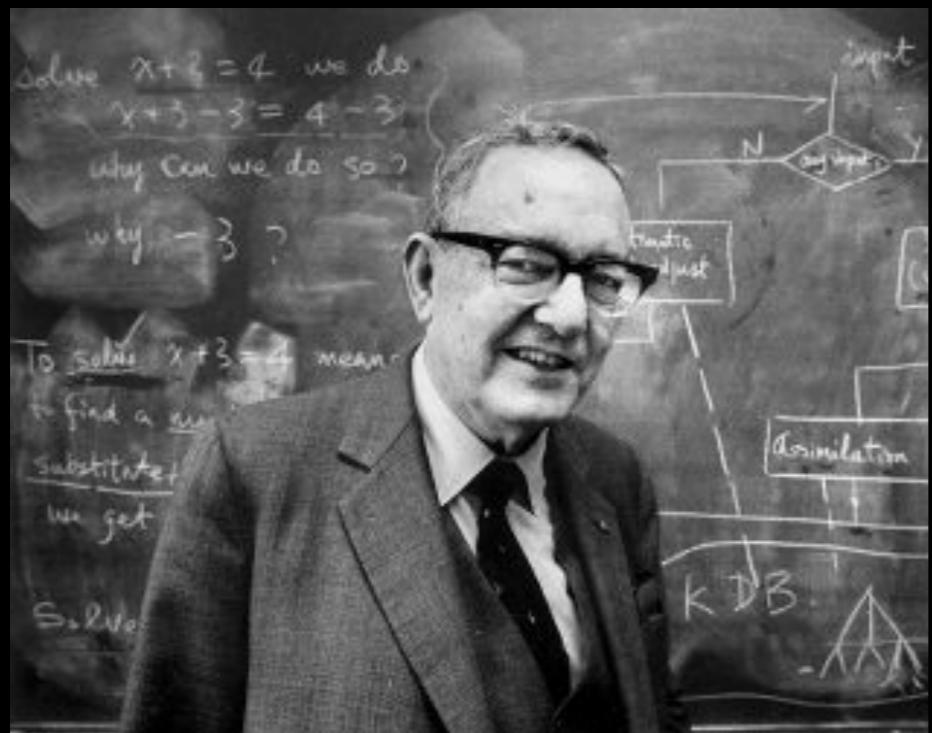




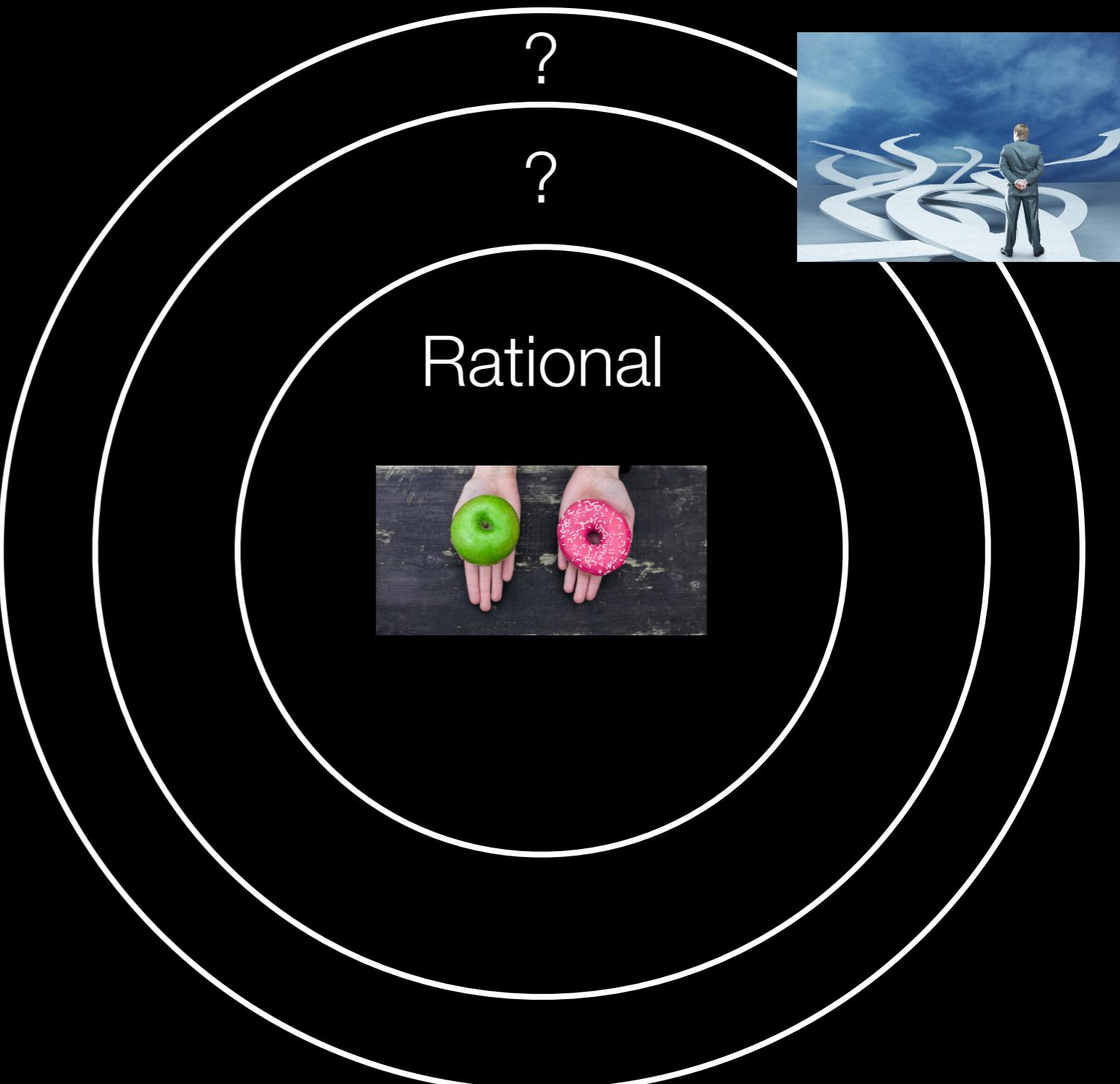


Bounded Rationality

Herbert Simon



<http://jewishcurrents.org/herbert-simon-and-artificial-intelligence/>



Satisficing (Suffice + Satisfactory)

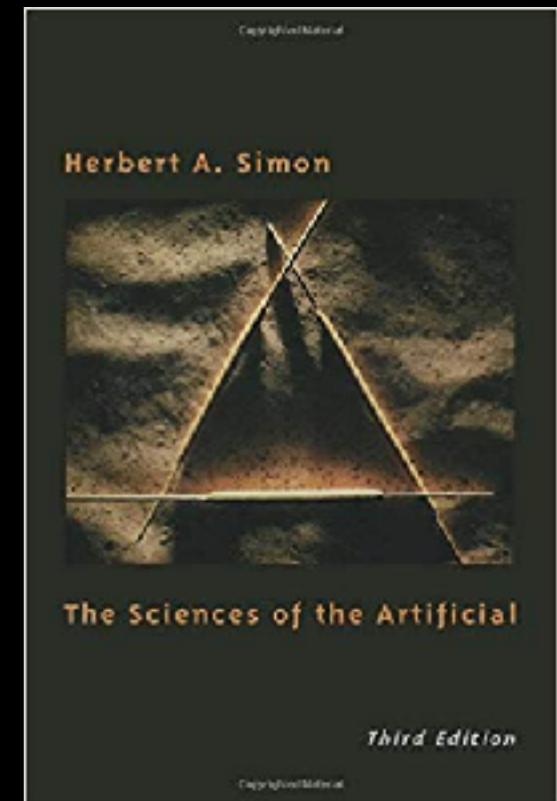
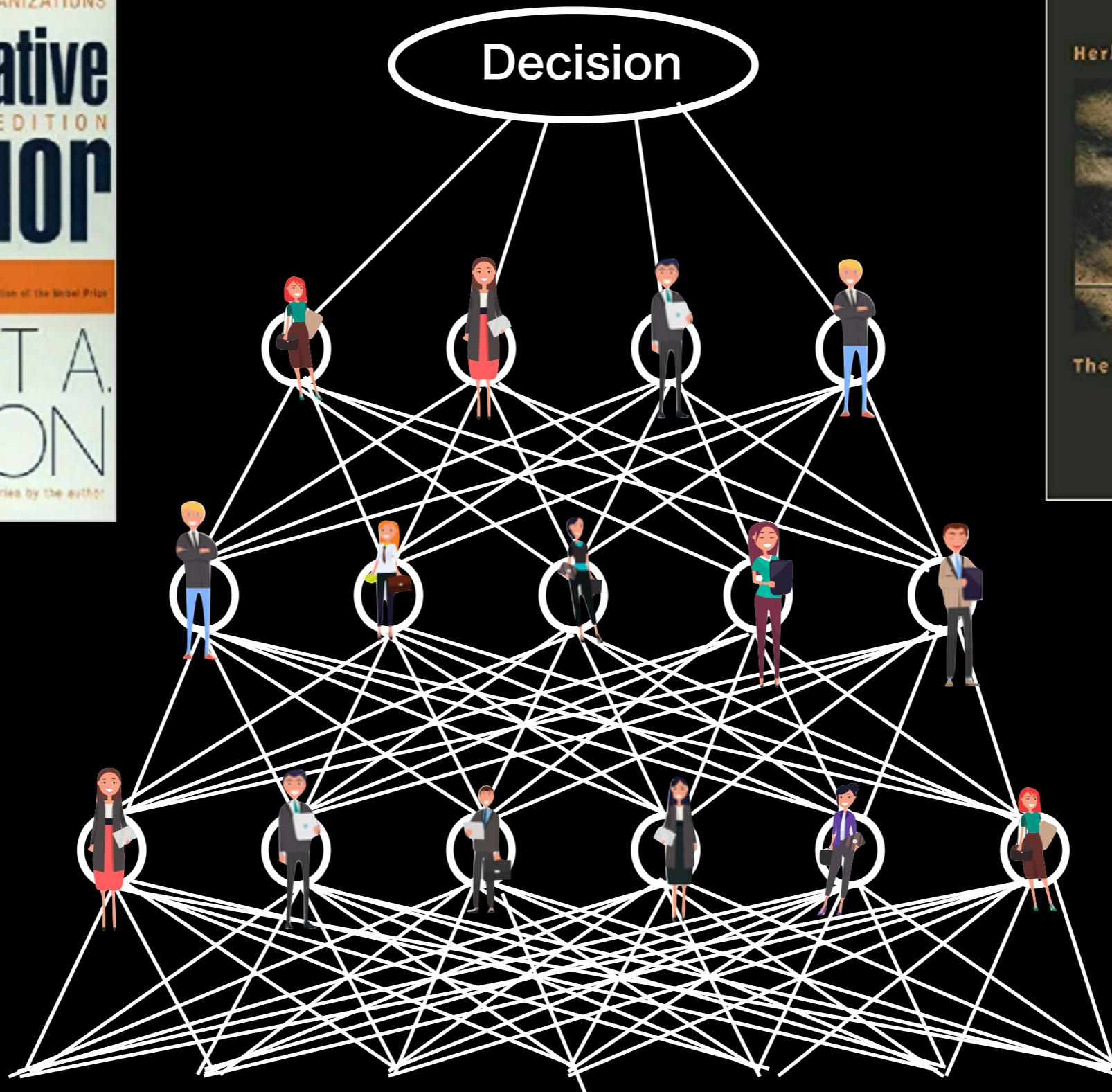
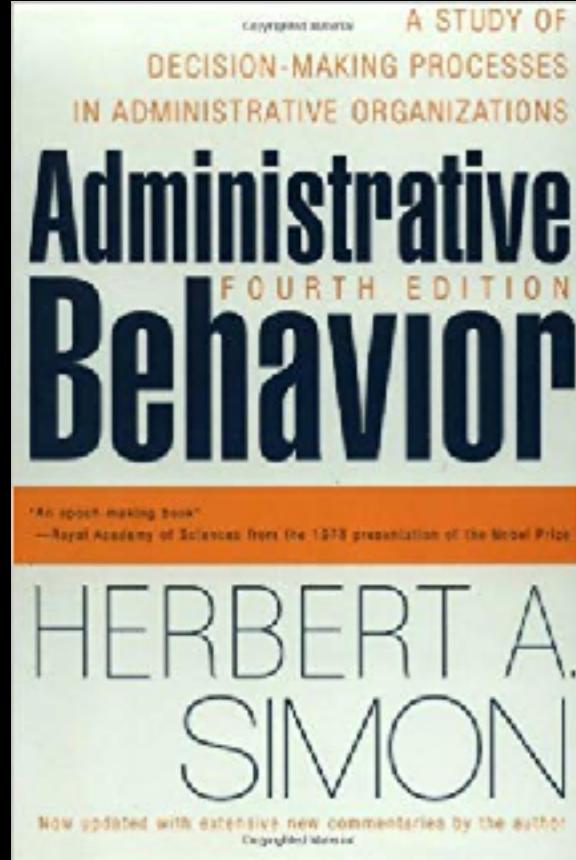


"decision makers can satisfice either by finding optimum solutions for a simplified world, or by finding satisfactory solutions for a more realistic world.

Neither approach, in general, dominates the other, and both have continued to co-exist in the world of management science."

https://www.wikiberal.org/wiki/Herbert_A._Simon

Simon, 1979





AI・MLの仕事は経営の意思決定の仕事
Jobs of AI/ML are decision making in management.

Kazuo Yano, Hitachi



Data are beautiful, but it's decisions that are important.
It's through our decisions — our actions — that we affect the world around us.

<https://towardsdatascience.com/introduction-to-decision-intelligence-5d147ddab767>

Cassie Kozyrkov, Google

Agree or Disagree?



Who are we?



Homo Economicus

- Rational
- Unbounded Capacity
- No Cognitive Bias
- Only Self Interest
- No Interest in Others



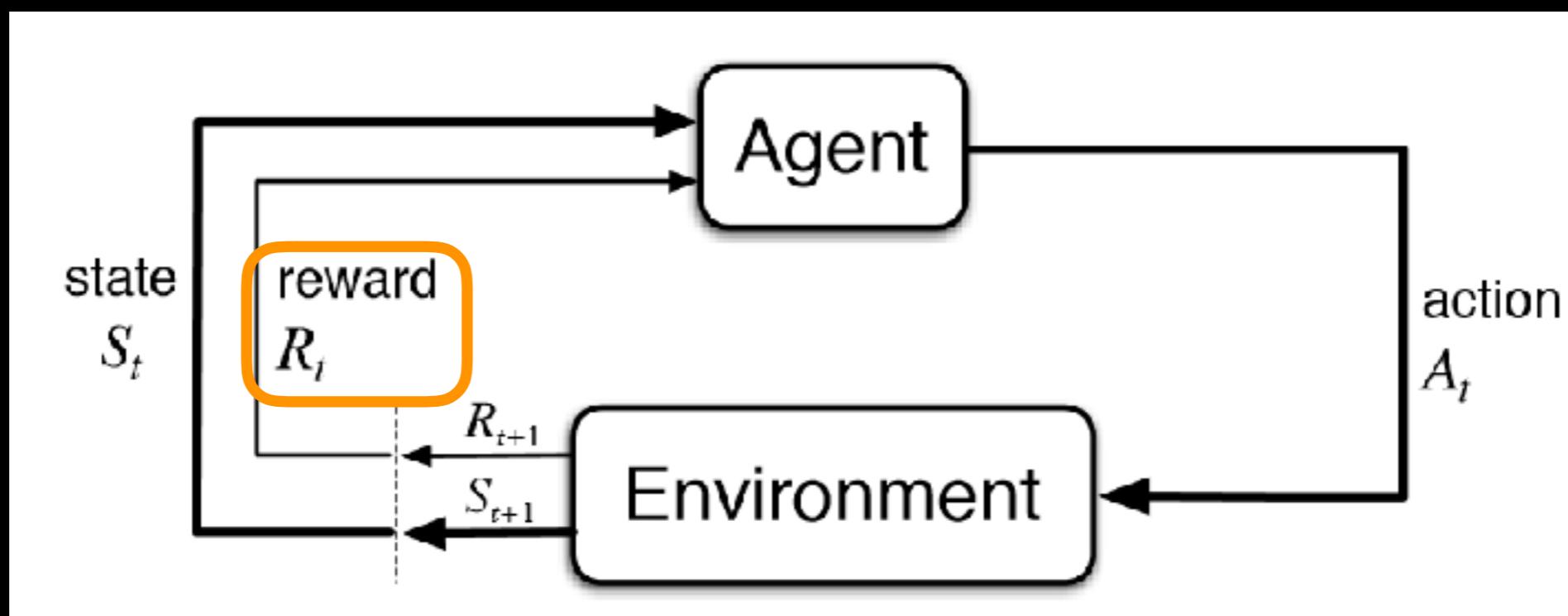
<https://mises.org/blog/homo-economicus-straw-man>

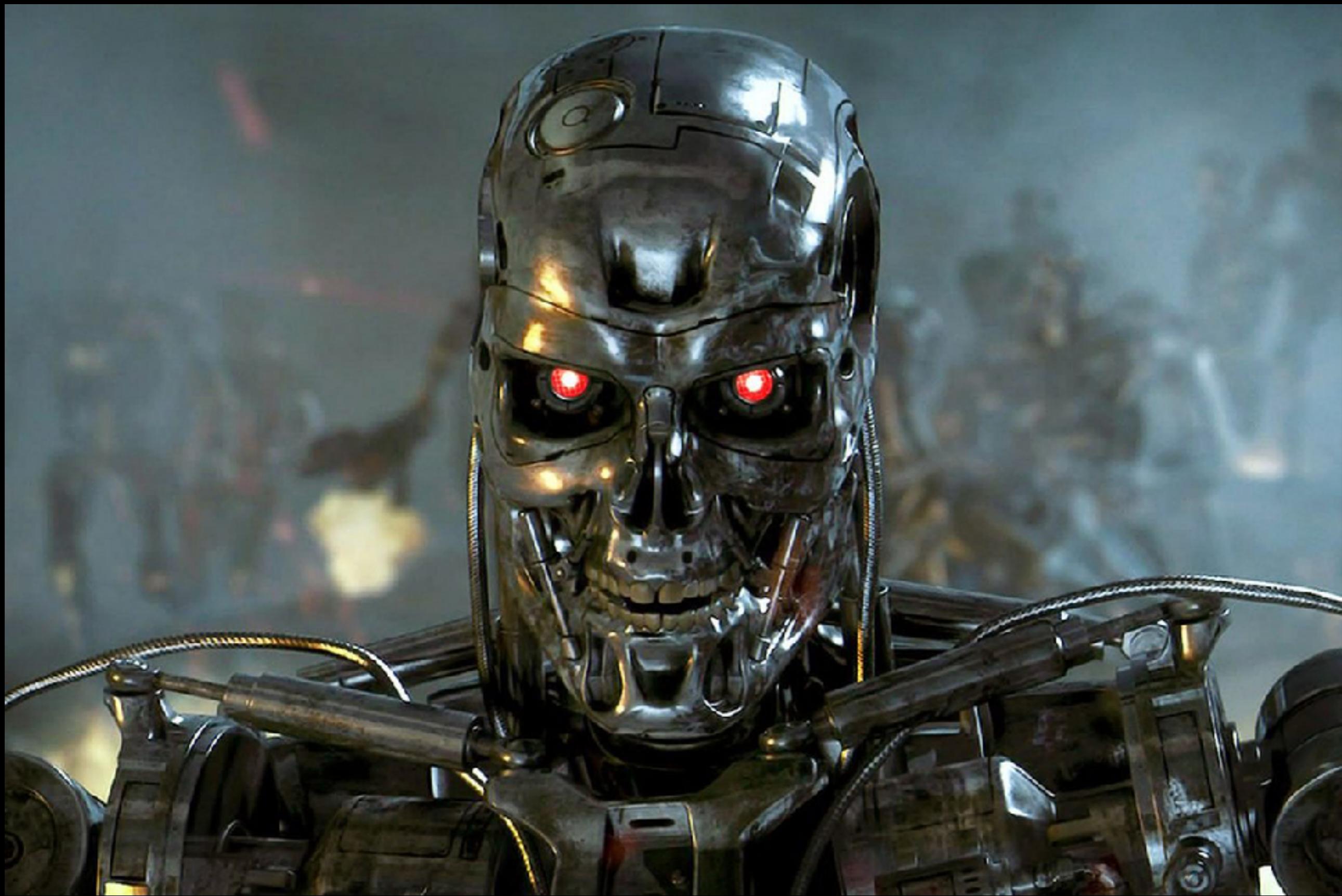
Rationality & Goal

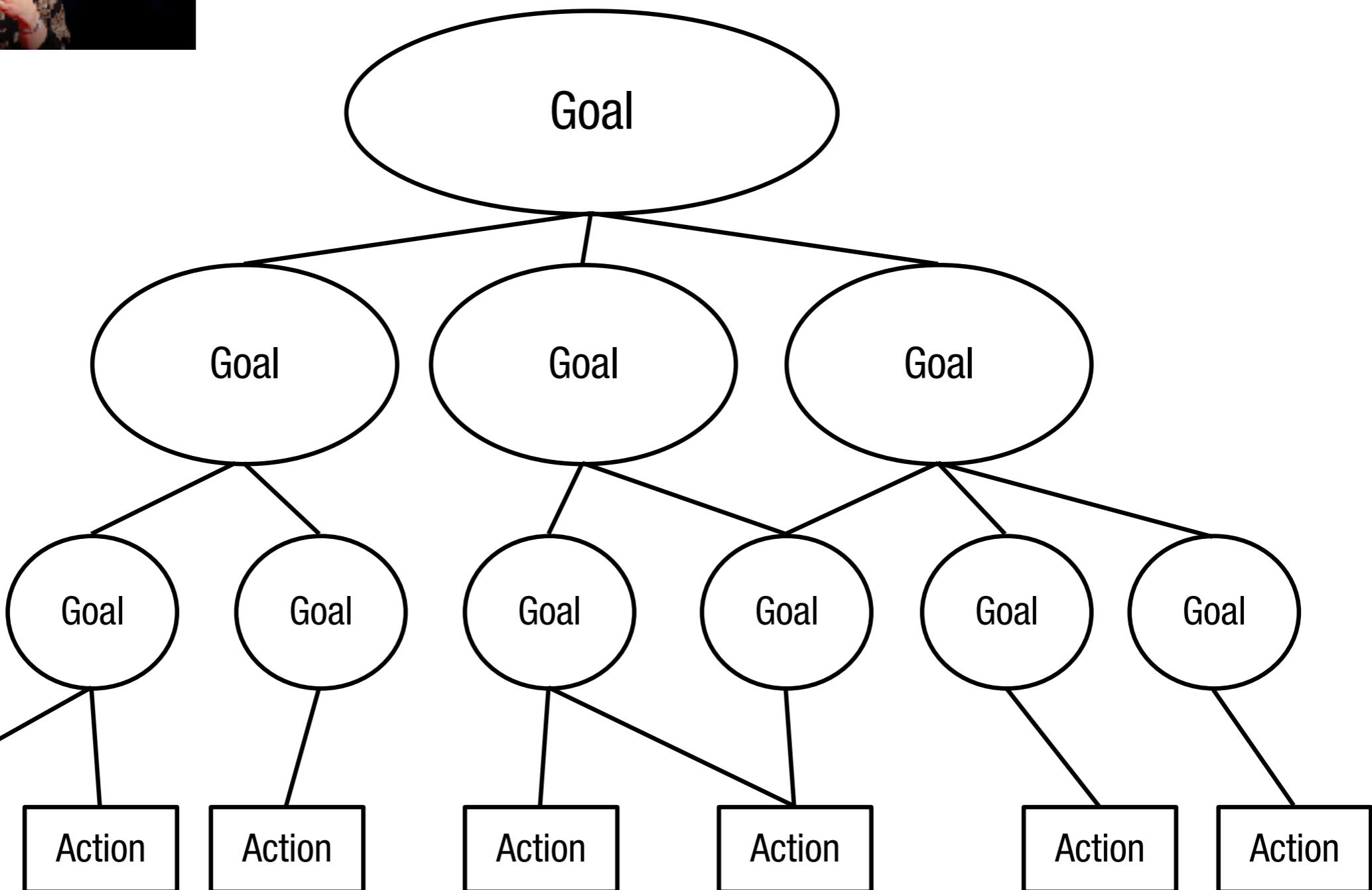
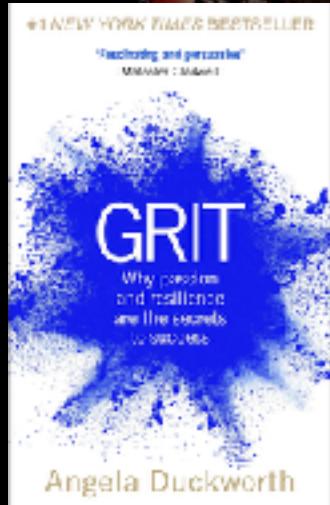
Rational, Optimal & Adaptive

- Rational
 - optimal for a purpose of achieving a certain specific goal.
- Optimal
 - maximally efficient for achieving a certain specific goal
- Adaptive
 - compatible and effective (to a certain extent) for a purpose of achieving a certain specific goal.









Duckworth & Gross, 2014



Photo: AP



Summary

- Goals are important for any types of decision making.
- Without goal, rationality, optimality, and adaptiveness cannot exist.
- It is important to set right set of goals for both biological and artificial systems.
- Humans are good at setting (hierarchical) goals.

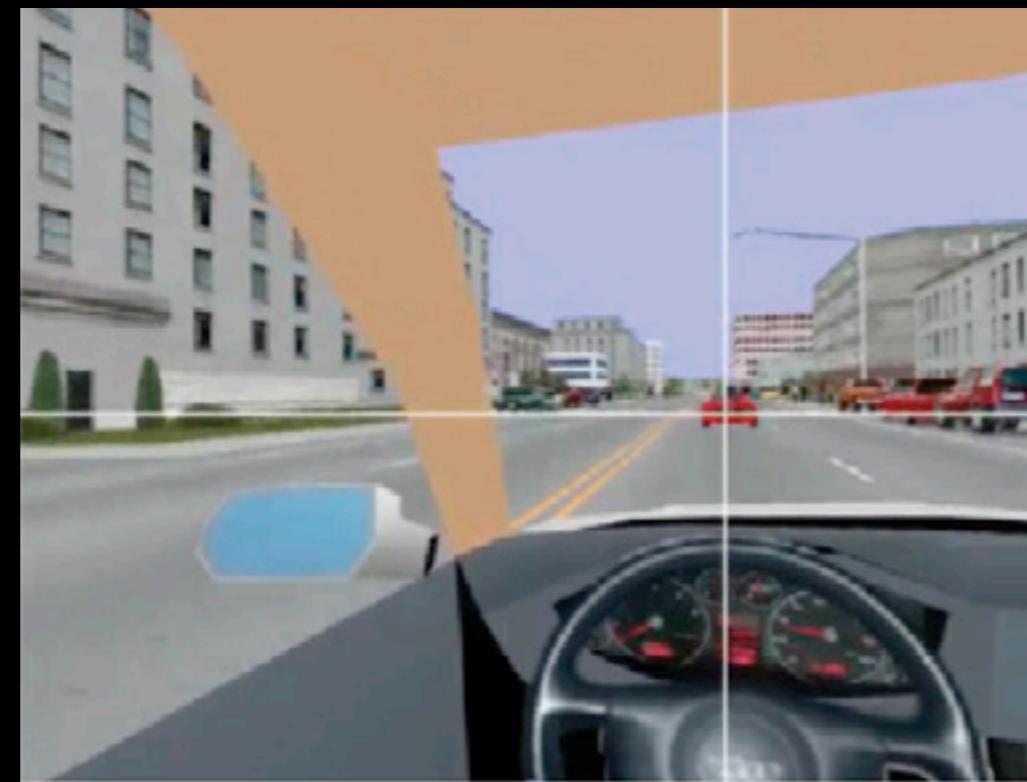
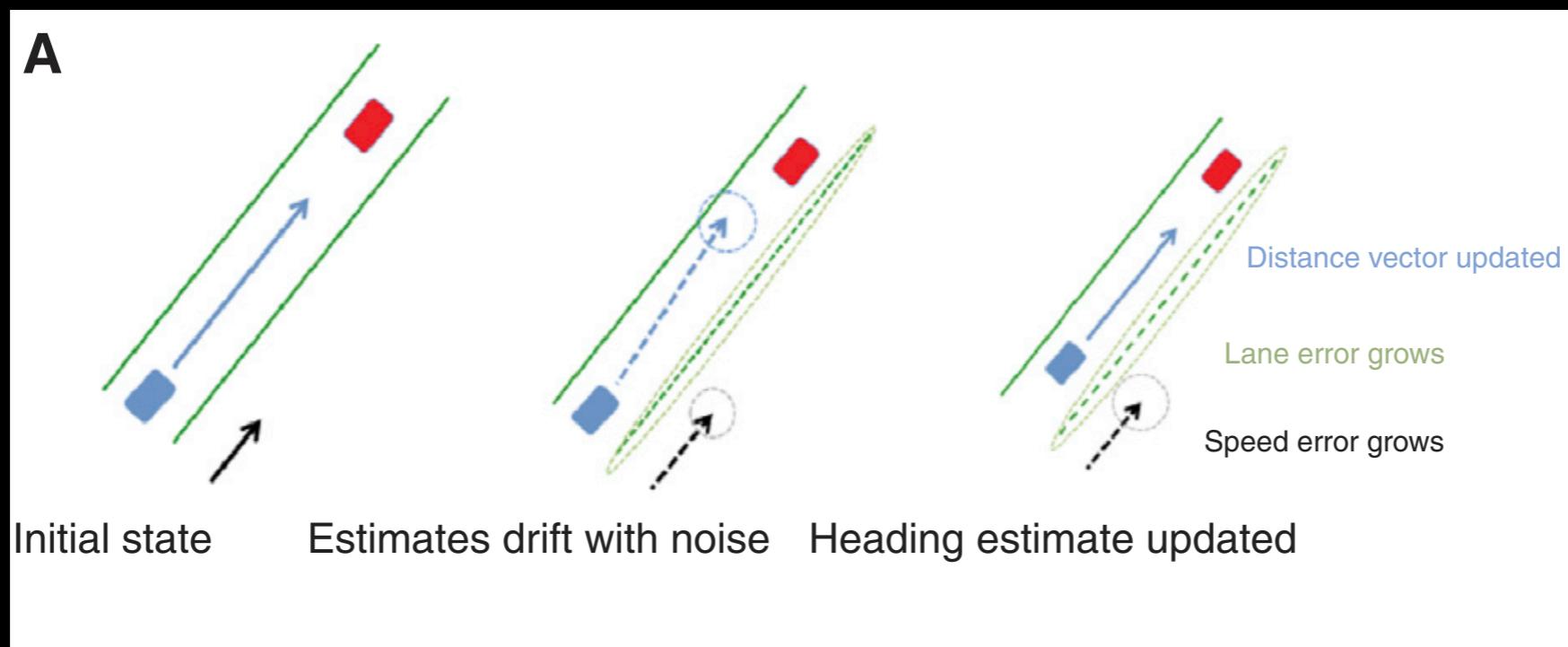
Behavioral Hierarchy

<https://www.youtube.com/watch?v=Yw84byATxw>



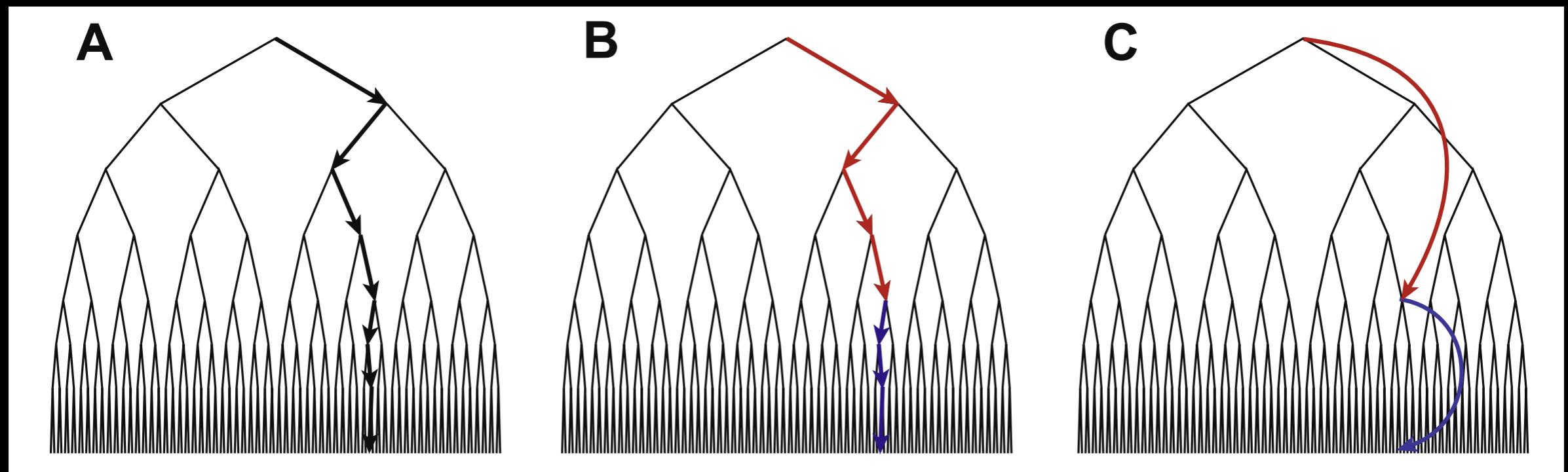


Skill, Habit and Control

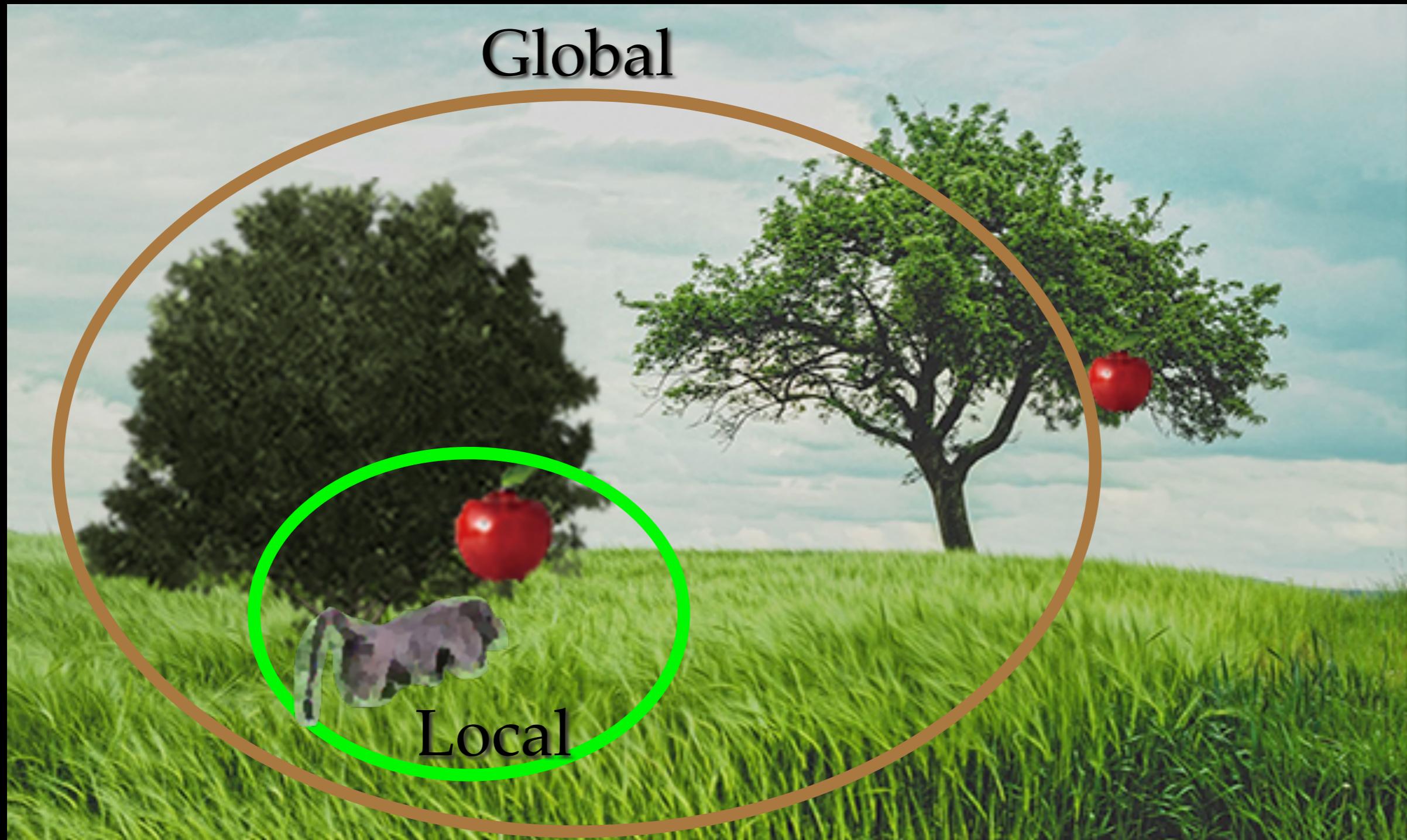


Hayhoe & Ballard, 2014

Hierarchical Reinforcement Learning



Foraging Decision



Value and
opportunity cost in a
current environment

Value and opportunity
cost in another
environment



Kolling et al., Science, 2012

Hayden et al., Nature Neuroscience, 2011

Kolling et al., Neuron, 2014

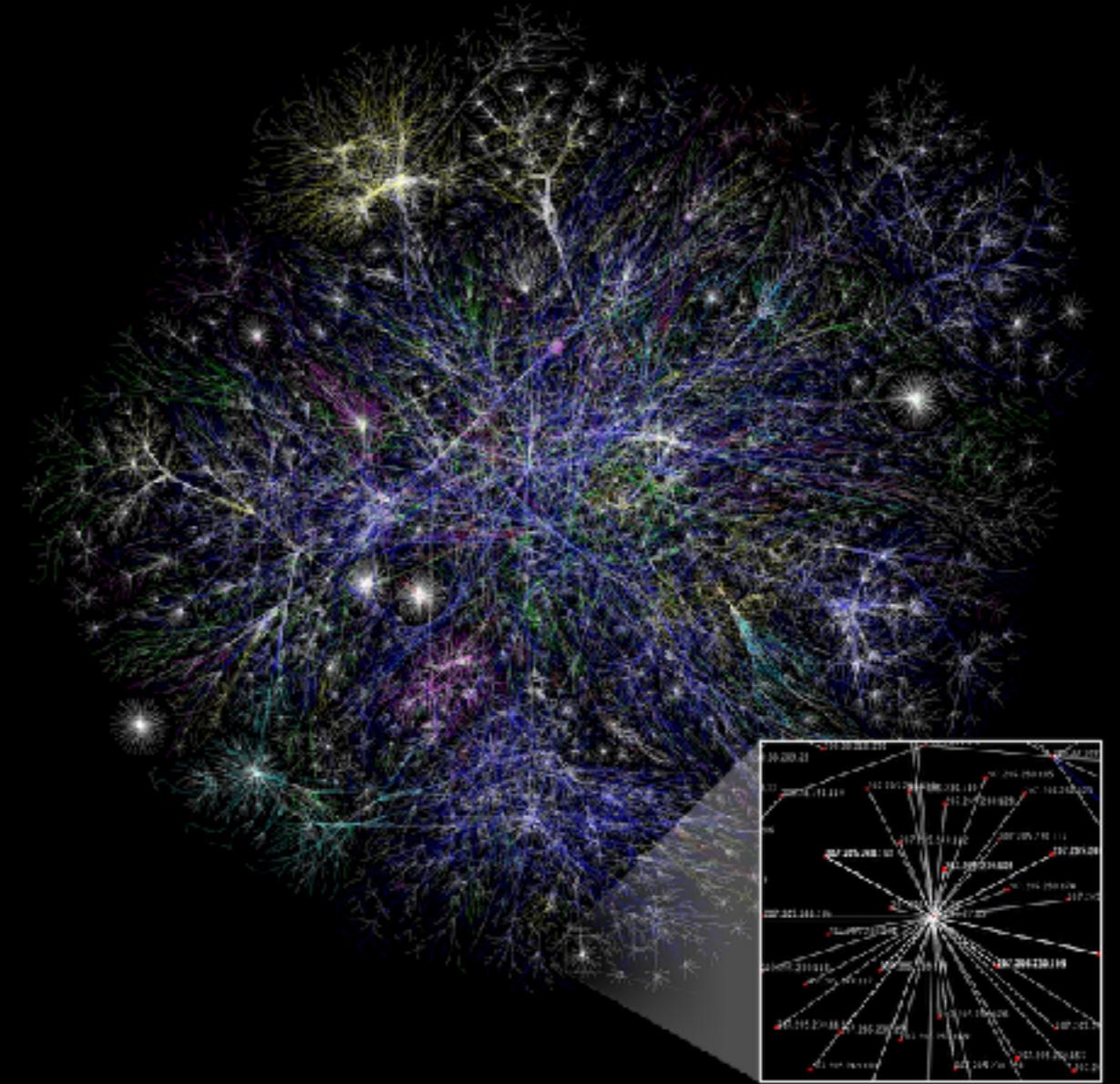
Wittmann, Kolling, Akaishi et al., Nature Communications, 2016



Summary

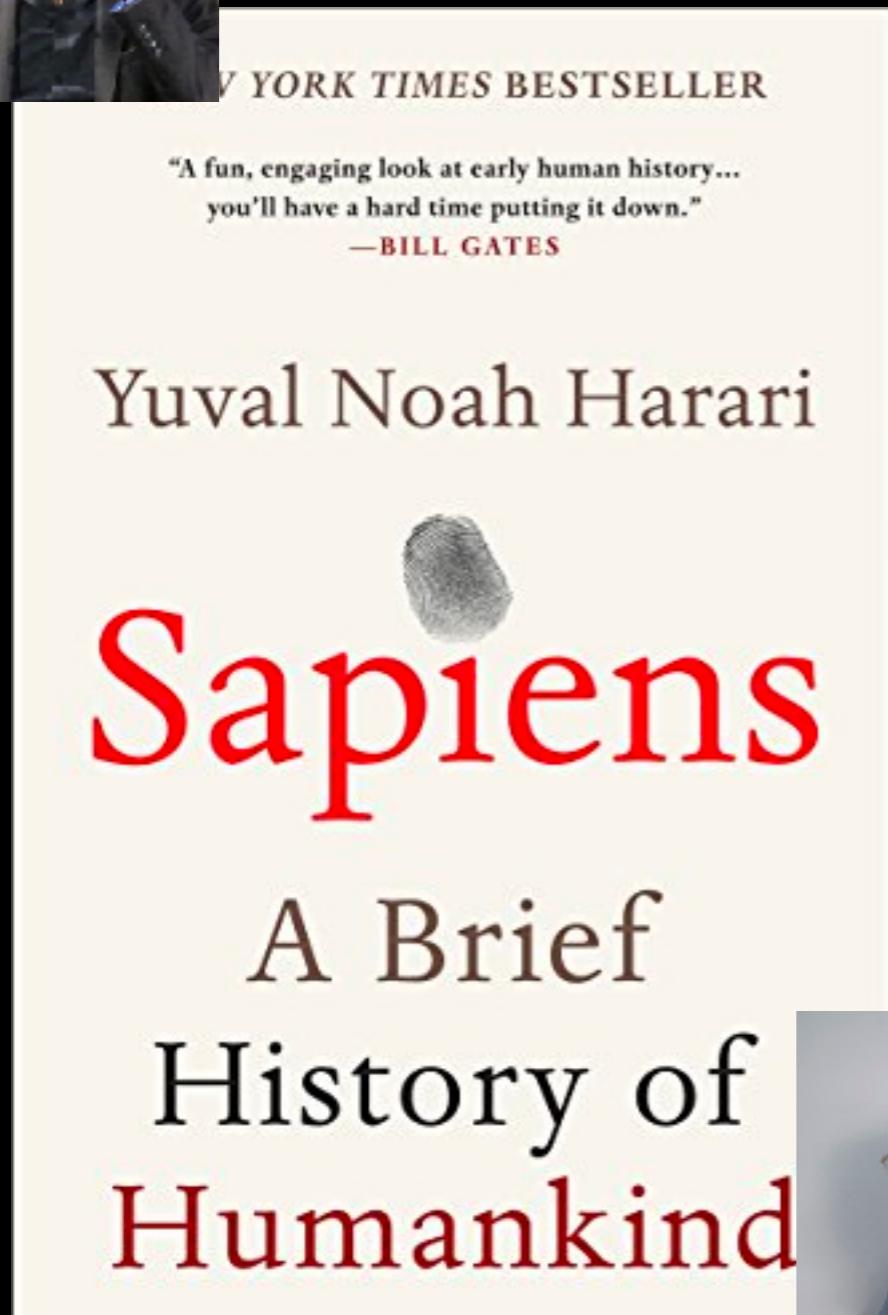
- Everyday behaviors like driving a car consist of individual actions and a “chunk” of these individual actions.
- The behavioral hierarchy is critical to organize our actions.
- Recent developments in decision neuroscience, hierarchical reinforcement learning and foraging decision, capture this hierarchical organization of human behavior.

Decision in Society





Harari



Dunbar

- Dunbar number suggests that a single person can have 100-200 people of personal connections in her/his social network.
- Yet, our society consists of much larger number of people.
- There has to be something in human cognition that can overcome the limitation of Dunbar number.



- The ideal decision makers, Homo Economicus, creates the situation ‘Tragedy of Commons’.
- If this is true for real human beings, a human community cannot survive by sharing common resources.

Hardin



- But actual human beings and their community (at least for those who have actually survived) can share goals and run organizations.

Ostrom



- Cooperative relationships and social norms can be created by the human beings living in groups through the means of punishment and establishing trust.

Yamagishi (山岸)



George Mason

They (western states) will have the same pride, and other passions, which we (eastern states) have; and will either not unite with, or will speedily revolt from, the Union, if they are not in all respects placed on an equal footing with their brethren.

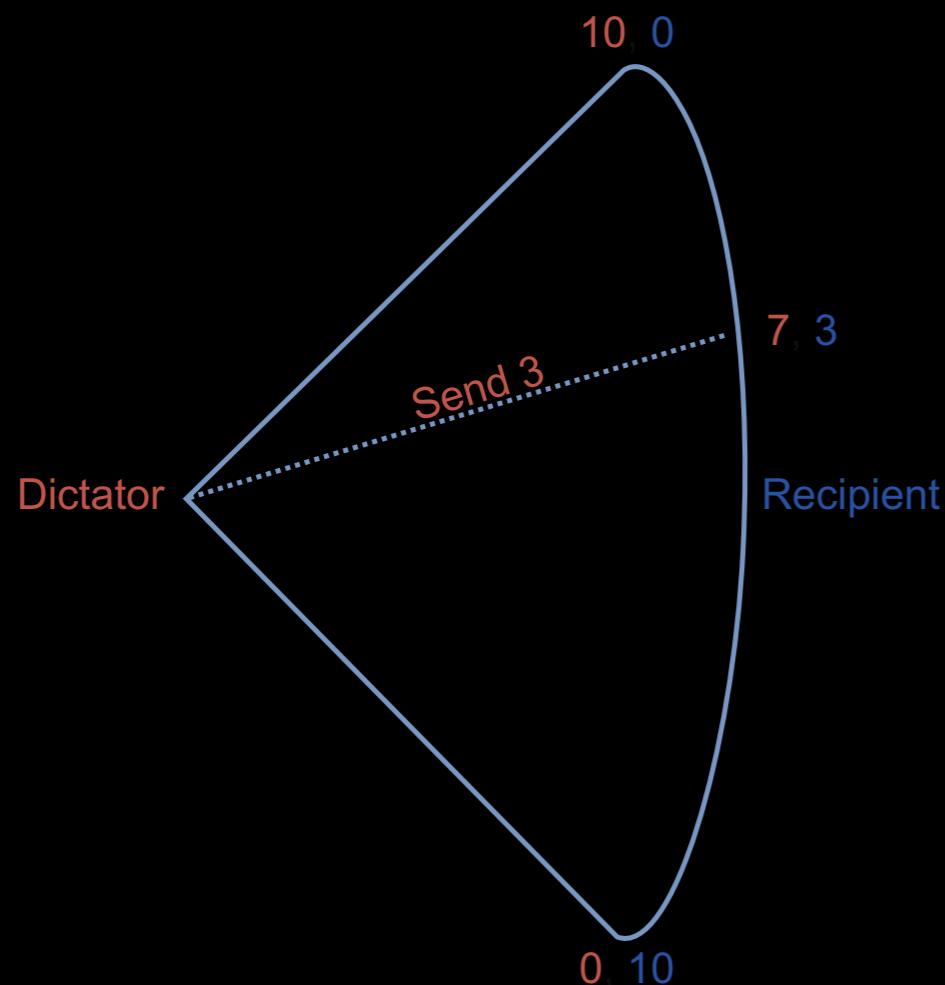
—at 1787 constitutional convention.





Fehr

Inequality Aversion



- One player, the dictator, has a sum of money which he can allocate between himself and another player, the recipient.
- The Dictator game measures a positive concern for the recipient's material payoff that is independent of the recipient's behavior, because the recipient has no actions to take.
- Dictator allocations are found to be a mixture of 50% offers and 0% offers, and a few offers in between.

$$U_i(x) = x_i - \alpha_i \frac{1}{n-1} \sum_{j \neq i} \max \{x_j - x_i, 0\} - \beta_i \frac{1}{n-1} \sum_{j \neq i} \max \{x_i - x_j, 0\}$$

Fehr & Schmidt, 1999

“Eat Like Locals” (Social Influence)

[https://www.youtube.com/
watch?v=sMZR-YGz_Gc](https://www.youtube.com/watch?v=sMZR-YGz_Gc)



[https://www.youtube.com/
watch?v=FlIObA4CdW](https://www.youtube.com/watch?v=FlIObA4CdW)

••••• T-Mobile LTE 9:35 PM 99%

Filter **Restaurants San Francisco, CA** **Map**

Up or Delivery **PokéStop Nearby** Good for Groups

Ad Sriracha Thai Cuisine **\$\$**
★ ★ ★ ★ 44 Reviews
1319 9th Ave, San Francisco
Thai

Ad Nan King Road Bistro **\$\$**
★ ★ ★ ★ 524 Reviews
1360 9th Ave, San Francisco
Chinese, Asian Fusion, Thai

1. Fresca **\$\$**
★ ★ ★ ★ 843 Reviews
24 W Portal Ave, West Portal
Latin American, Tapas Bars, Peruvian
[Reserve My Table](#)

2. Mel's Drive-In **\$\$**
★ ★ ★ ★ 606 Reviews
3355 Geary Blvd, Laurel Heights
Diners

3. Burma Superstar **\$\$**
★ ★ ★ ★ 1440 Reviews
1345 Park St, Alameda
Burmese

4. Homeroom **\$\$**
★ ★ ★ ★ 3611 Reviews
400 40th St, Temescal

Nearby **Search** **Activity** **More**

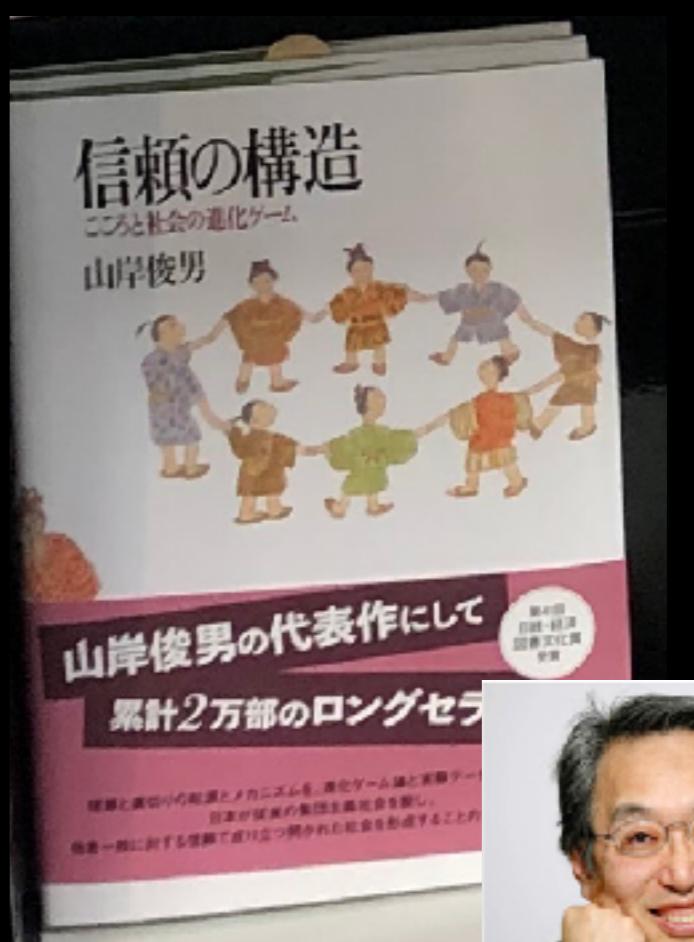
Envy & Schadenfreude

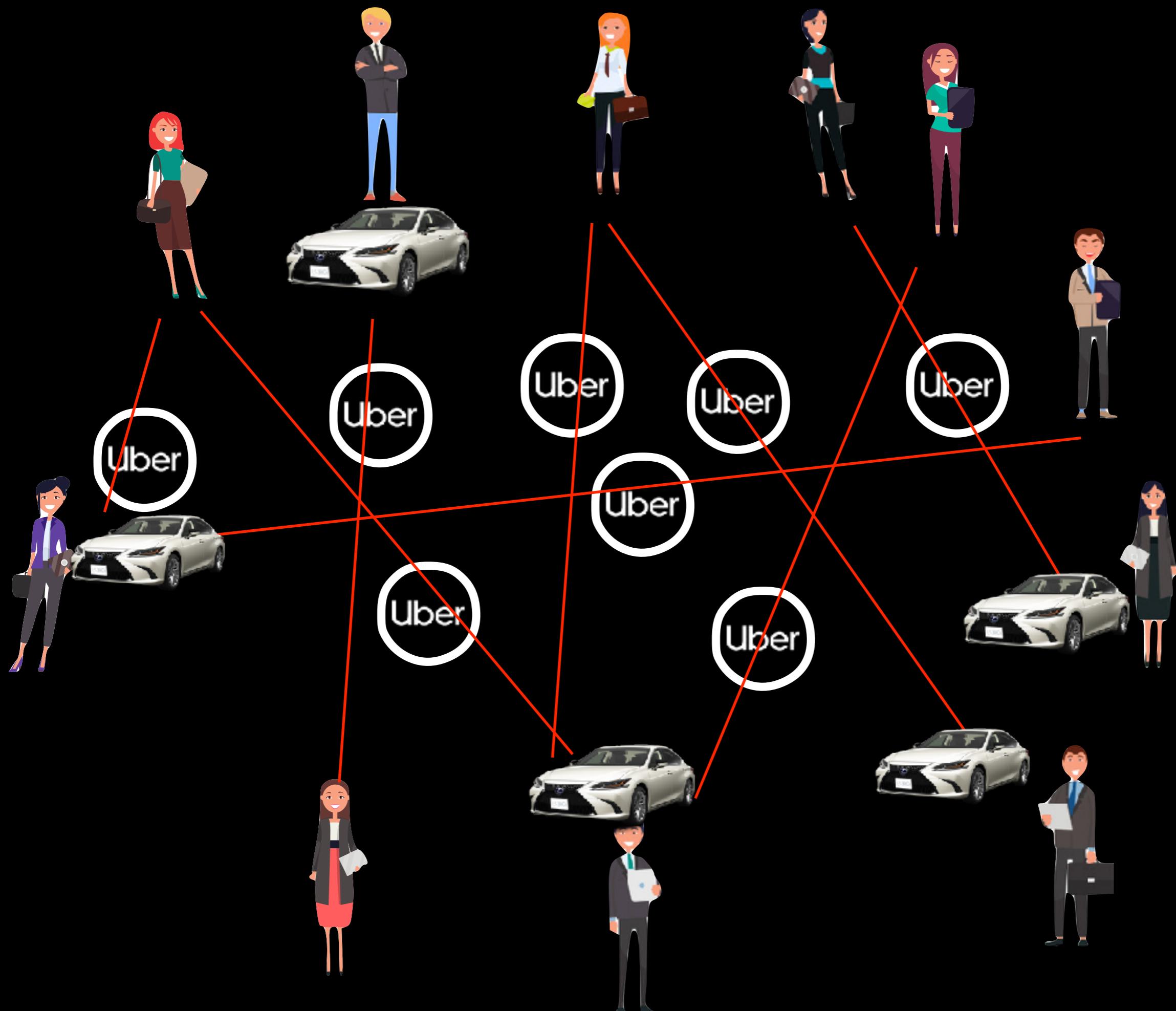
- Schadenfreude: a positive emotional state in the face of someone else's misfortune
- Envy: a negative emotional state in the face of another's fortune



Trust

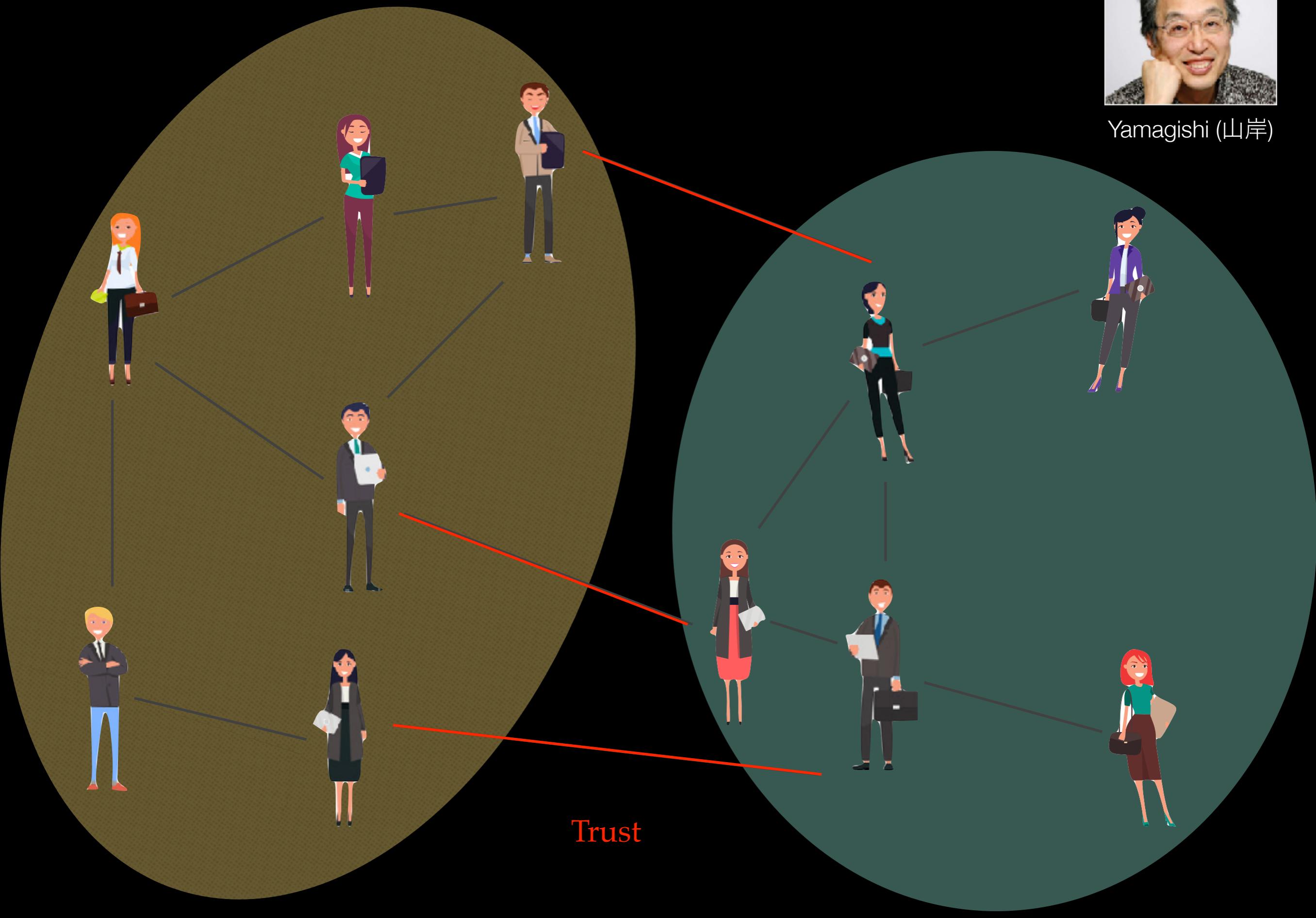


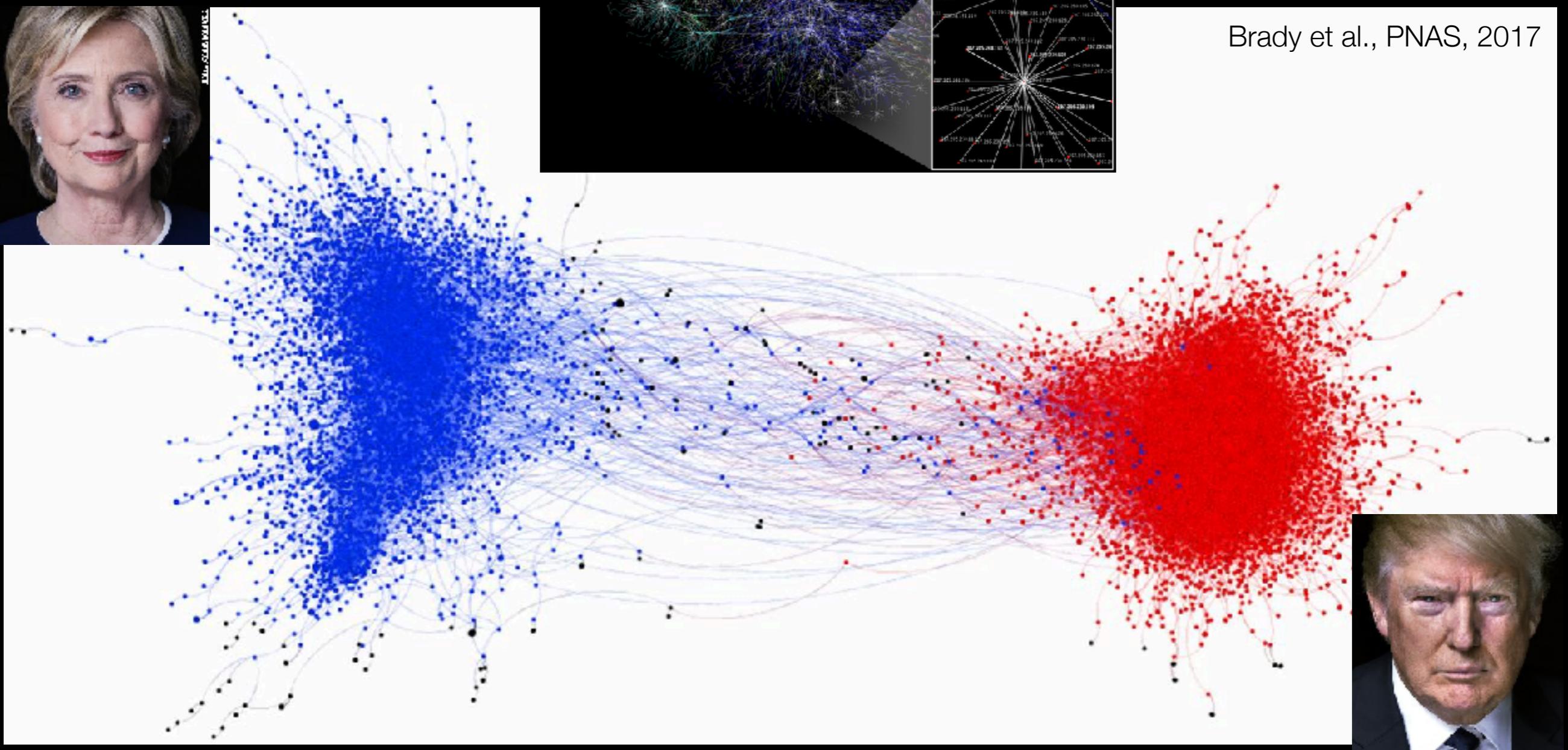






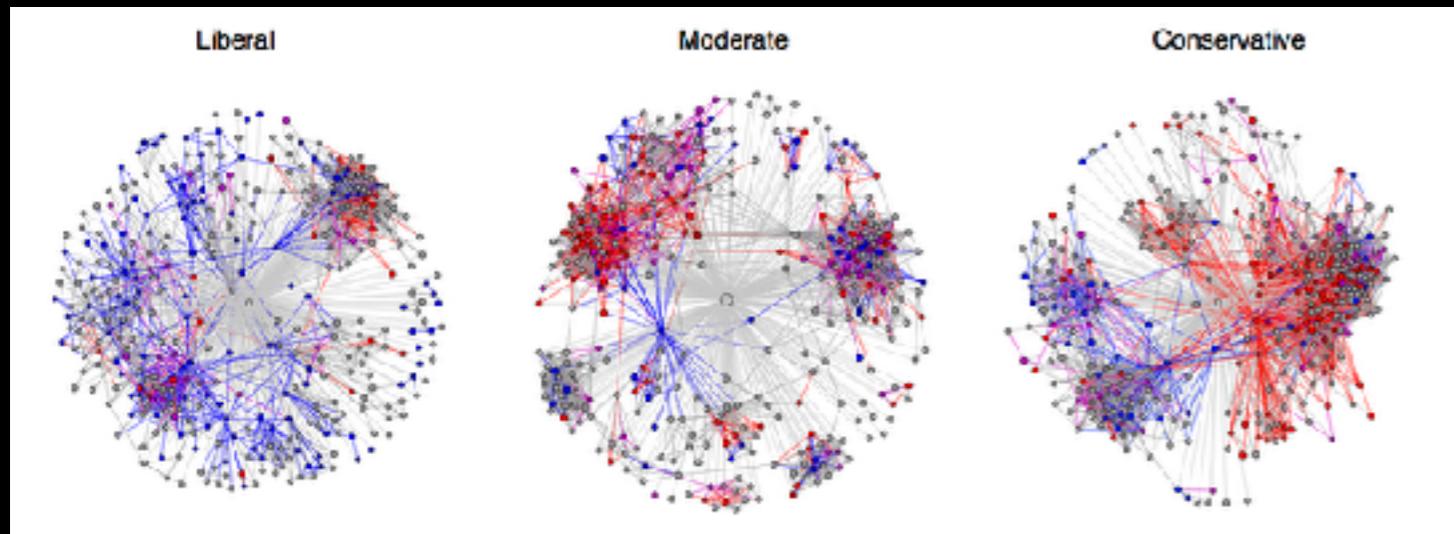
Yamagishi (山岸)





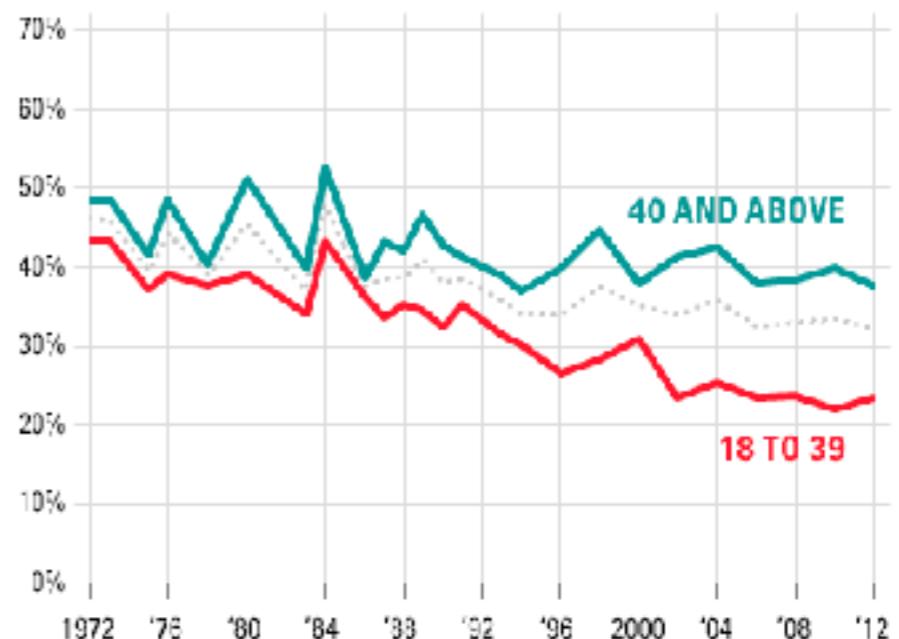
Brady et al., PNAS, 2017

Echo Chamber



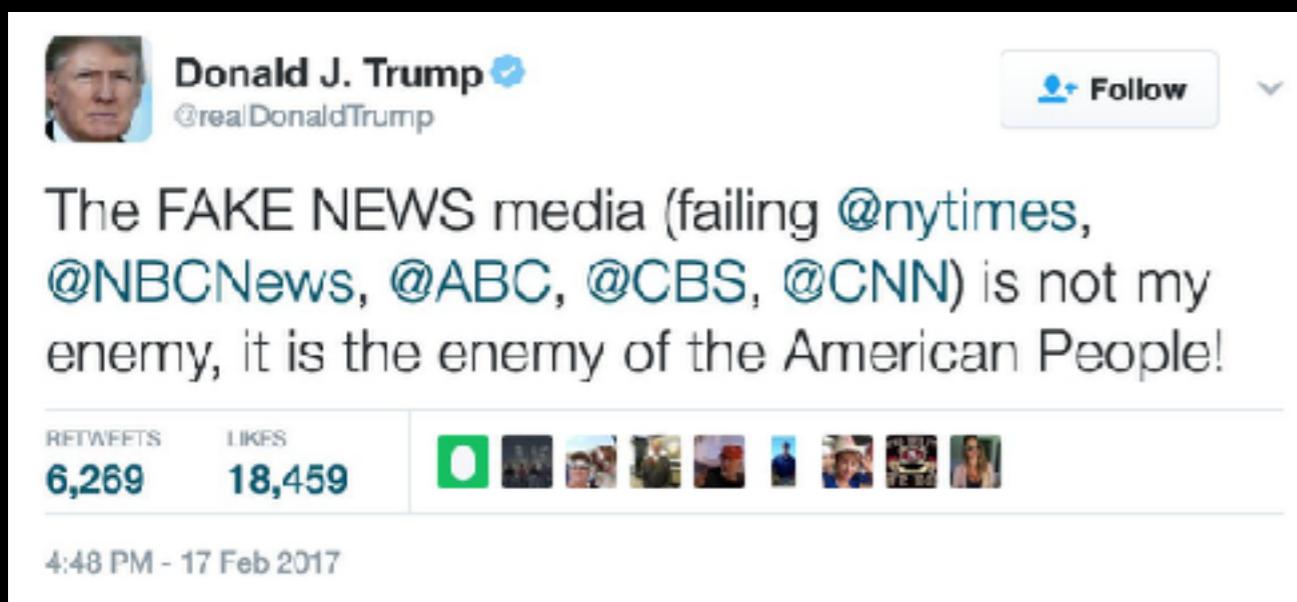
<https://www.informationweek.com/software/social/facebook-echo-chamber-is-real-but-its-your-fault/d/d-id/1320342>

Americans, By Age in Years, Who Said "Most People Can Be Trusted," 1972–2012



Source: General Social Survey, 1972–2012

Fake News



Donald J. Trump 
@realDonaldTrump

Follow

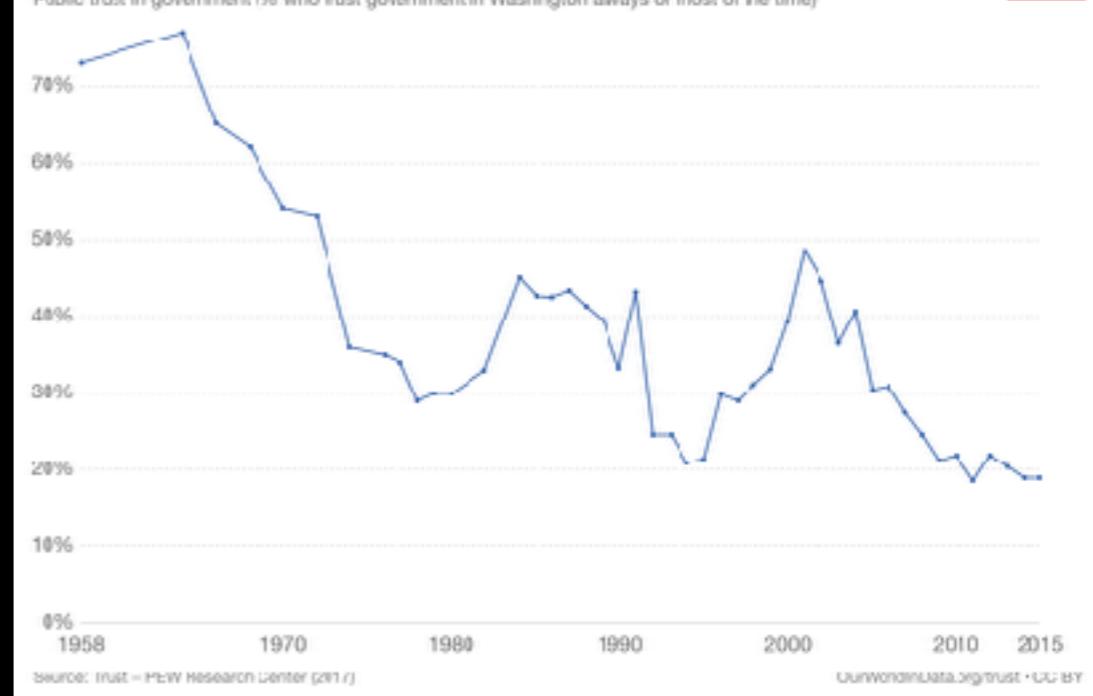
The FAKE NEWS media (failing @nytimes, @NBCNews, @ABC, @CBS, @CNN) is not my enemy, it is the enemy of the American People!

RETWEETS 6,269 LIKES 18,459

4:48 PM - 17 Feb 2017

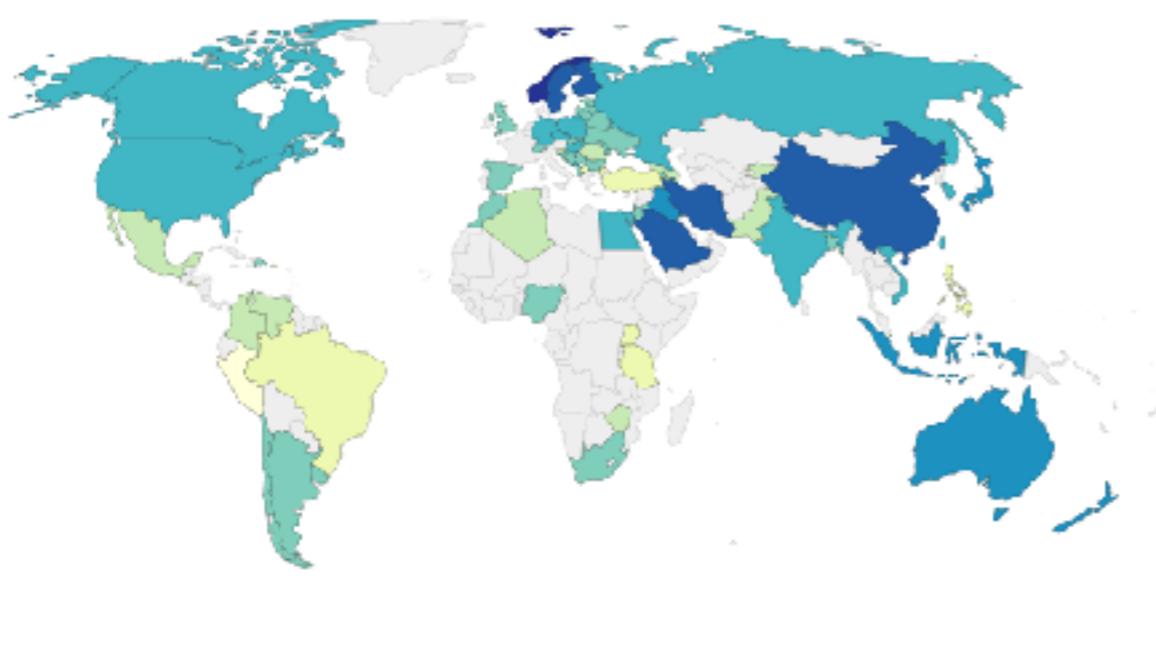
<https://twitter.com/realDonaldTrump/status/1057059603605831680>

Public trust in government, United States
Public trust in government (% who trust government in Washington always or most of the time)



Interpersonal trust attitudes, 1984

Share of people agreeing with the statement "most people can be trusted" (World Value Survey).



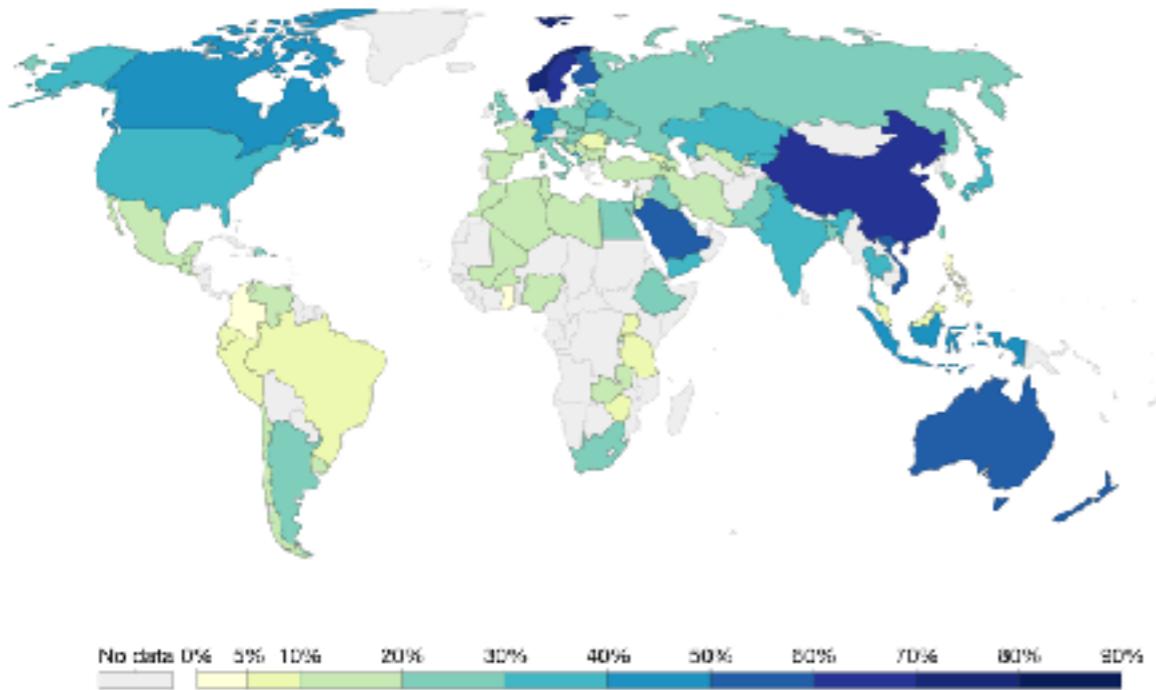
Source: Trust (World Values Survey 2014)

Note: See source for further details regarding specific survey question.

OurWorldInData.org/kunst · CC BY

Interpersonal trust attitudes, 2014

Shares of people agreeing with the statement "most people can be trusted" (World Value Survey).



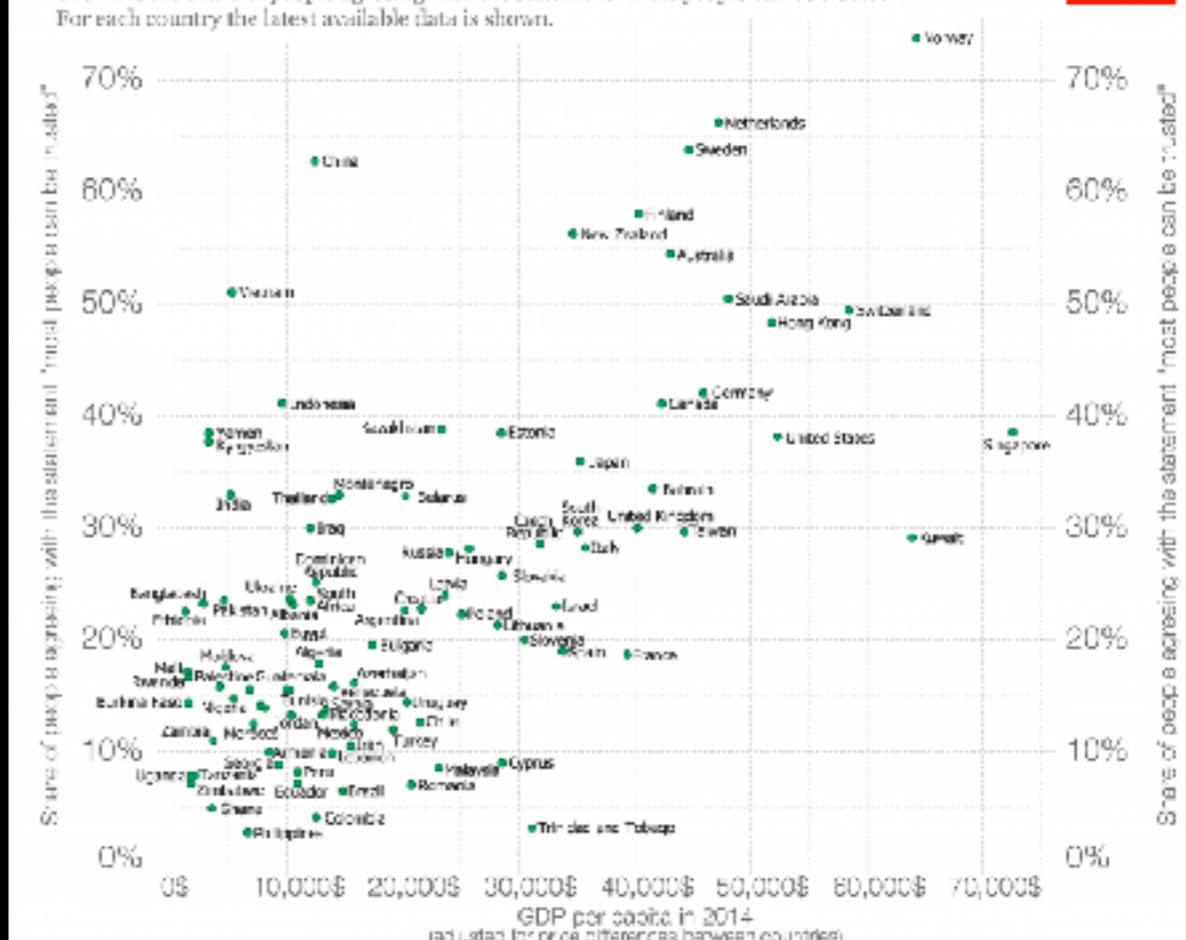
Source: Trust (World Values Survey [2014])

Note: See source for further details regarding specific survey question.

OurWorldInData.org/trust - CC BY

Country by country: Trust vs. GDP per capita

Shawn is the share of people agreeing with the statement "most people can be trusted". For each country the latest available data is shown.



Data source: World Values Survey for daily air travel and Penn World Table for data on GNP per capita.

This visualization is available at OurWorldInData.org. There you find the raw data and more visualizations on this topic.

Licensed under CC-BY-SA by the author Max Roser

Summary

- There are increasing demands for understanding humans in the context of social networks.
- Humans usually do not like inequality. Successful civilizations have considered this value systems of humans well.
- Trust is the major issue in both industries and societies globally.
- But the nature of the issues regarding trust may differ across different cultures and countries.

Thanks for your attention!

