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Private Truths, Public Lies within agent-based modeling

(NCN 2019/35/B/HS6/02530)

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Department of Theoretical Physics

Workshop on Sociophysics, Social Phenomena from a Physics Perspective

ONLINE (October 18-22, 2021)

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Imagine that …

- Your supervisor invites to the party at her home
- The home is newly renovated
- She asks you „How do you like it?”
- The look does not appeal to you
- What would you answer?

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Inspiration

- Jędrzejewski A, Marcjasz G, Nail PR, Sznajd-Weron K (2018) Think then act or act then think? PLoS ONE 13(11): e0206166
- Towards understanding of the social hysteresis: an agent-based approach, NCN 2019/35/B/HS6/02530, 2020-2024

PLOS ONE

RESEARCH ARTICLE

Think then act or act then think?

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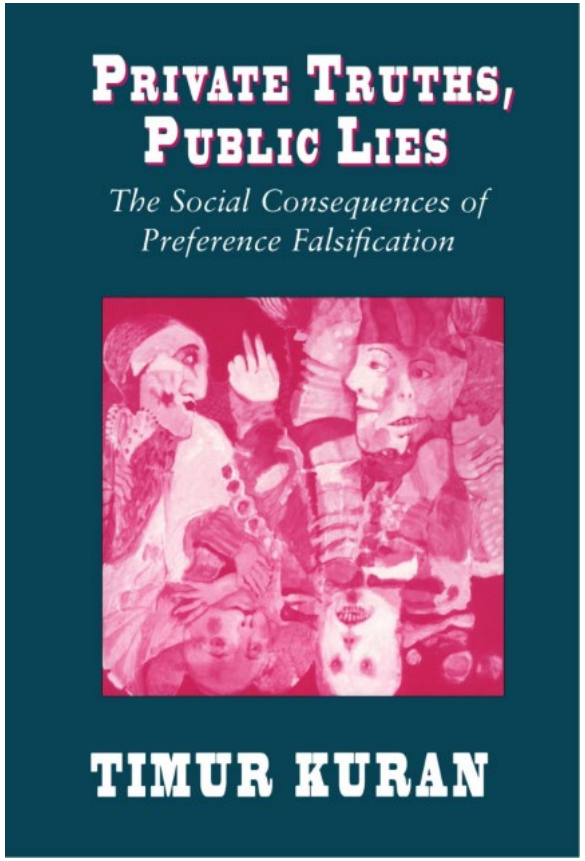
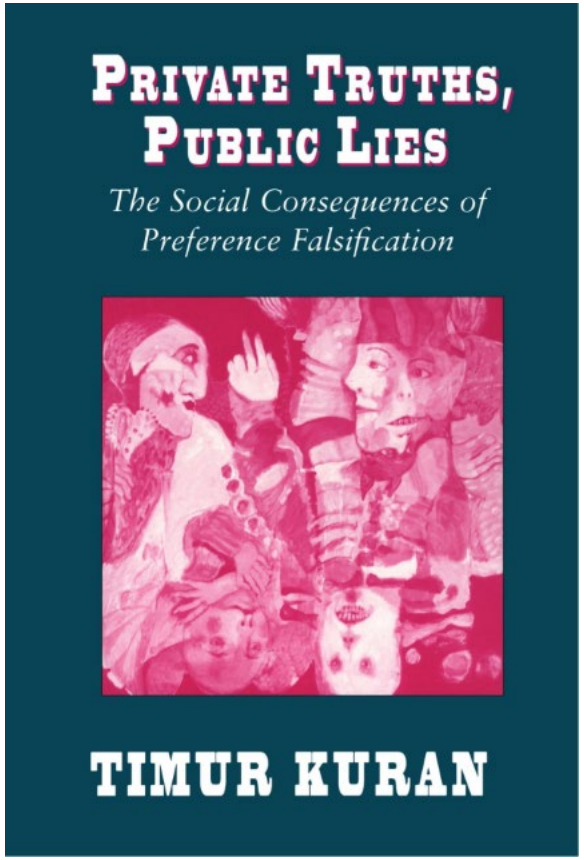


Timur Kuran,
Private Truth, Public Lies
Harvard University Press, 1995, 1997

Preference falsification

- The act of communicating a preference that differs from one's true preference
- Main reason: believe the expressed preference is more acceptable socially
- Huge social and political consequences, ex: unanticipated revolutions
- Opinion on two levels: public and private
- Not like in the CODA model:
  - André C.R. Martins, Continuous opinions and discrete actions in opinion dynamics problems, IJMPC 19 (2008)



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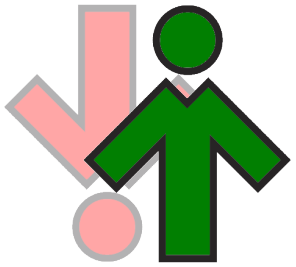
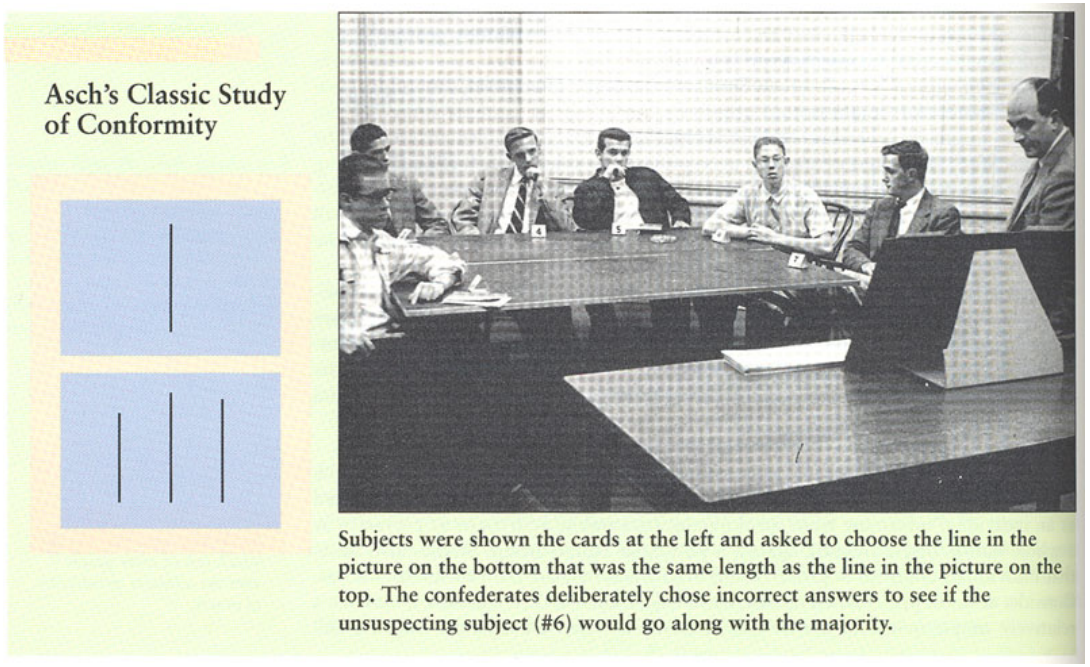
The model

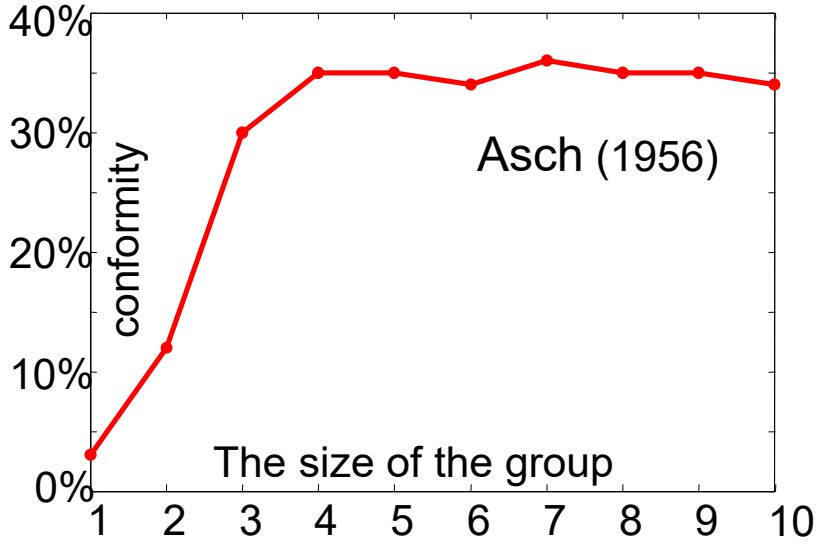
- N agents
  - Public opinion $S_i(t) = \pm 1$
  - Private opinion $\sigma_i(t) = \pm 1$
- Only $S_i(t)$ is seen by others
- Two types of social responses
  - Independence with p
  - Conformity with $1 - p$
- Conformity
  - compliance (unanimous q-panel)
  - disinhibitory contagion

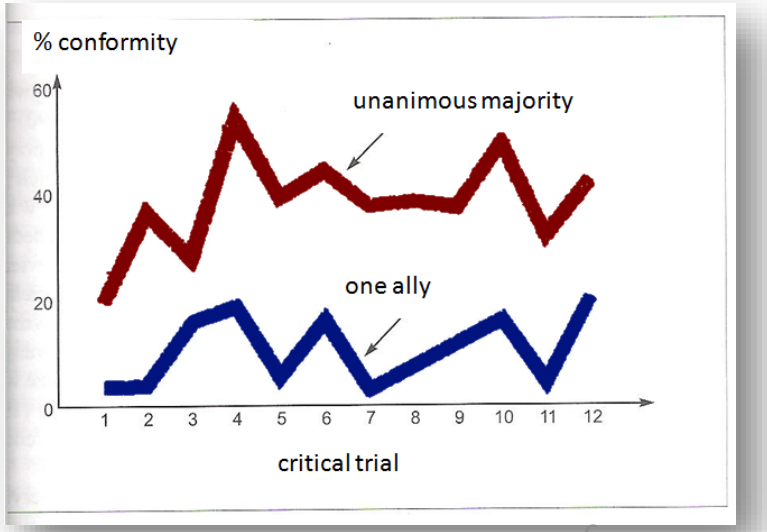
PUBLIC (EXTERNAL)	PRIVATE (INTERNAL) $\sigma_i(t) = +1$	PRIVATE (INTERNAL) $\sigma_i(t) = -1$
$S_i(t) = +1$		
$S_i(t) = -1$		

Two types of conformity

- Compliance: public conformity without private acceptance
  - Asch experiment
  - Increases with the size of the group
  - Unanimity is crucial







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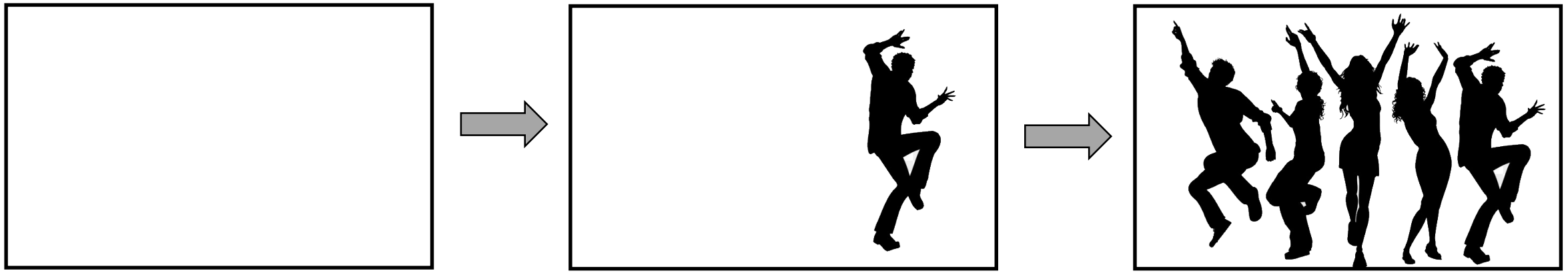
Two types of conformity

- Disinhibitory contagion
  - Appears in the case of the internal intra-psychic conflict
  - Single person can influence
  - Example by Paul Nail in „Think then act … „ PloS One 13 (2018)



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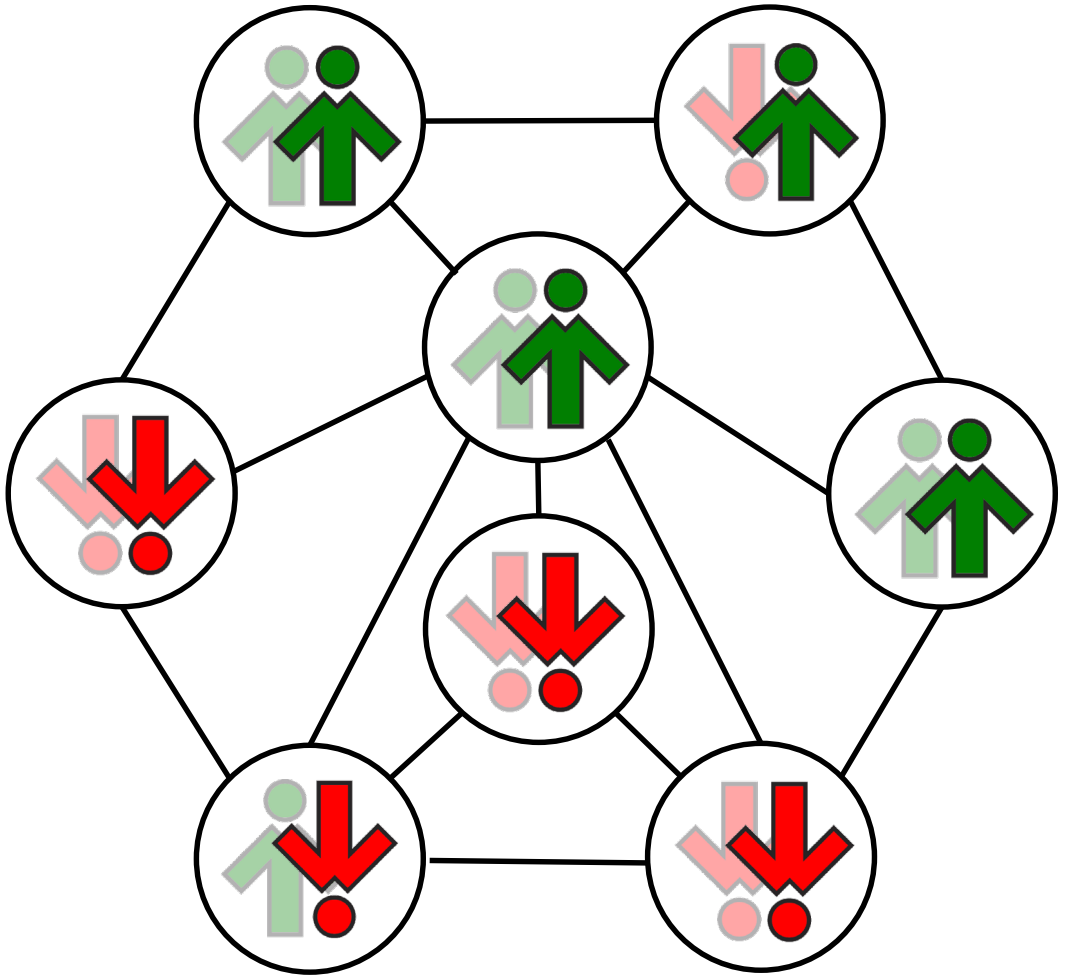
Act then Think (AT) model

- choose one voter at random, located at site i



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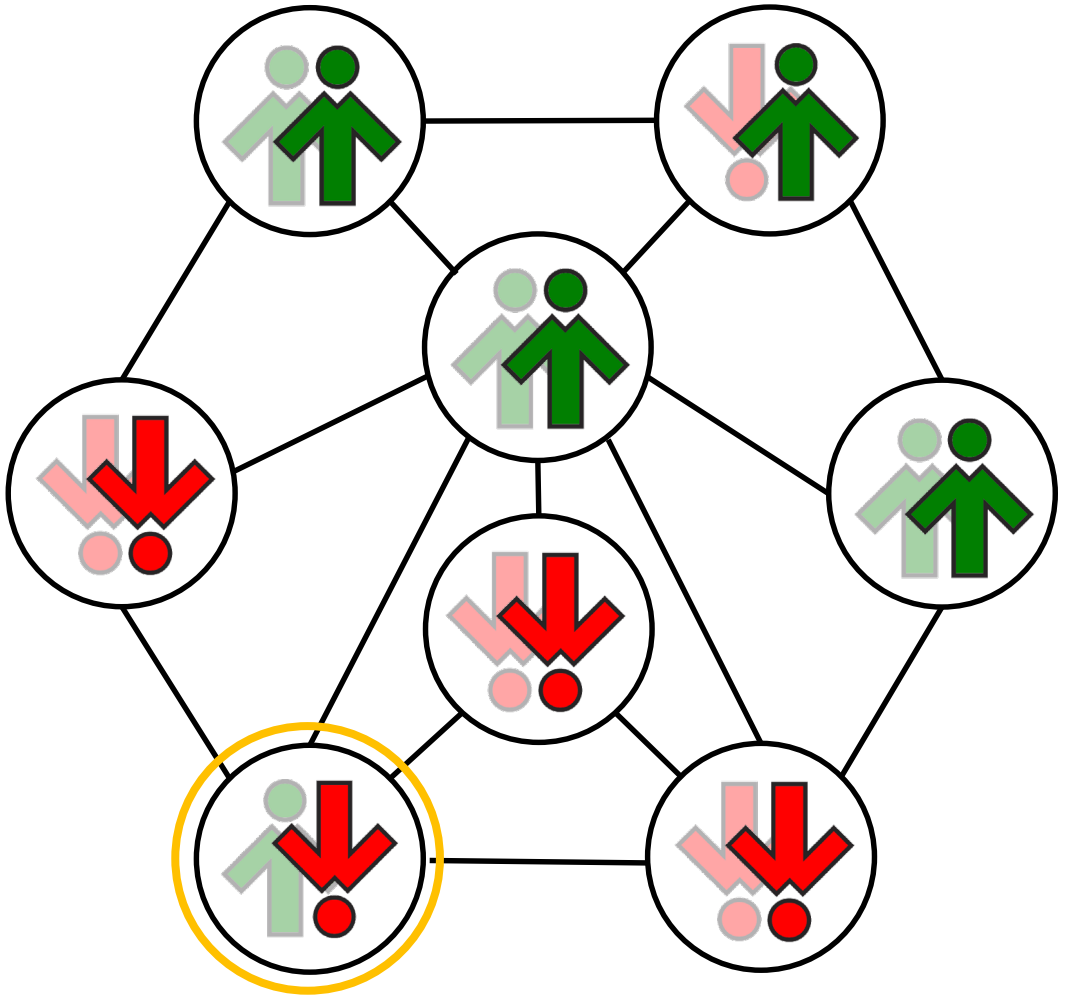
Act then Think (AT) model

- choose one voter at random, located at site i
- Act: update the **public** opinion S_i
  - **Independence with prob p**: replace public opinion by the private one

$$S_i \to \sigma_i$$



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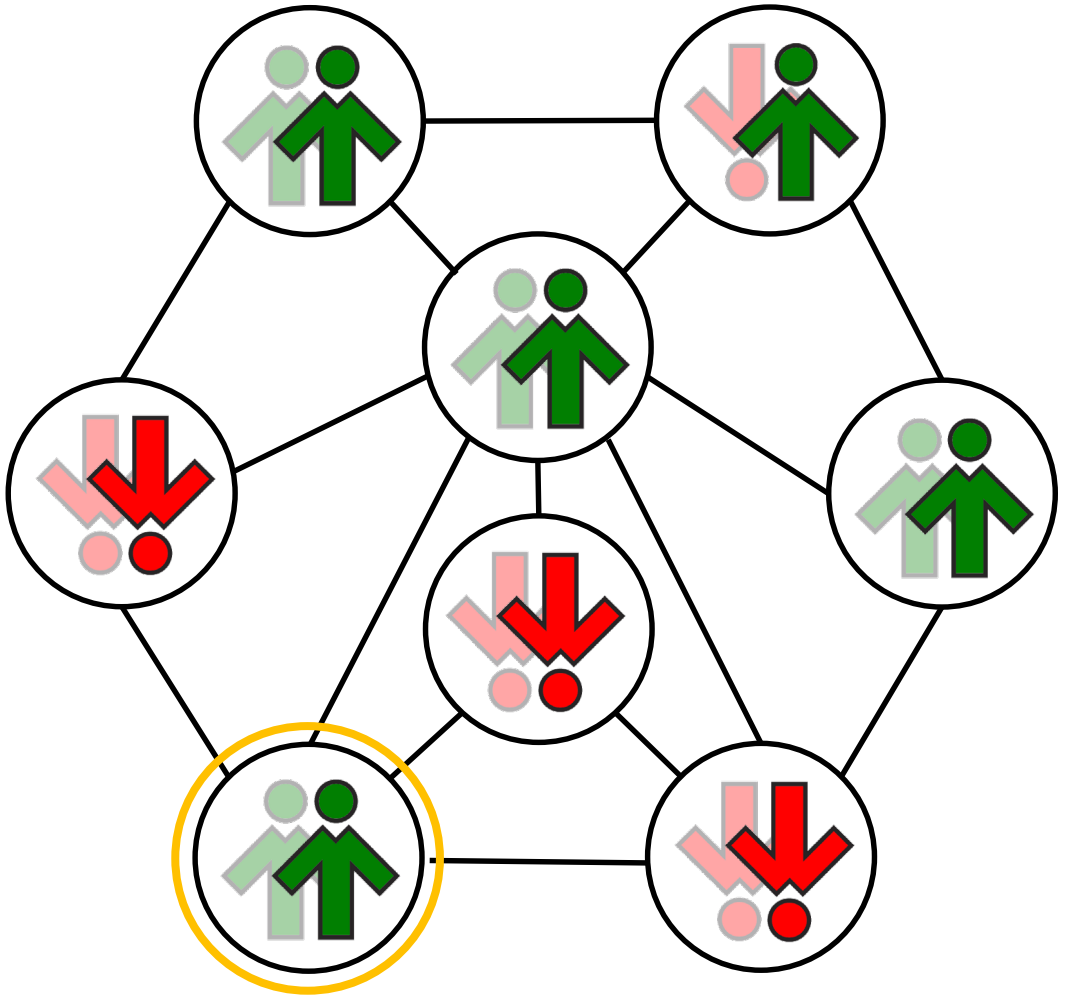

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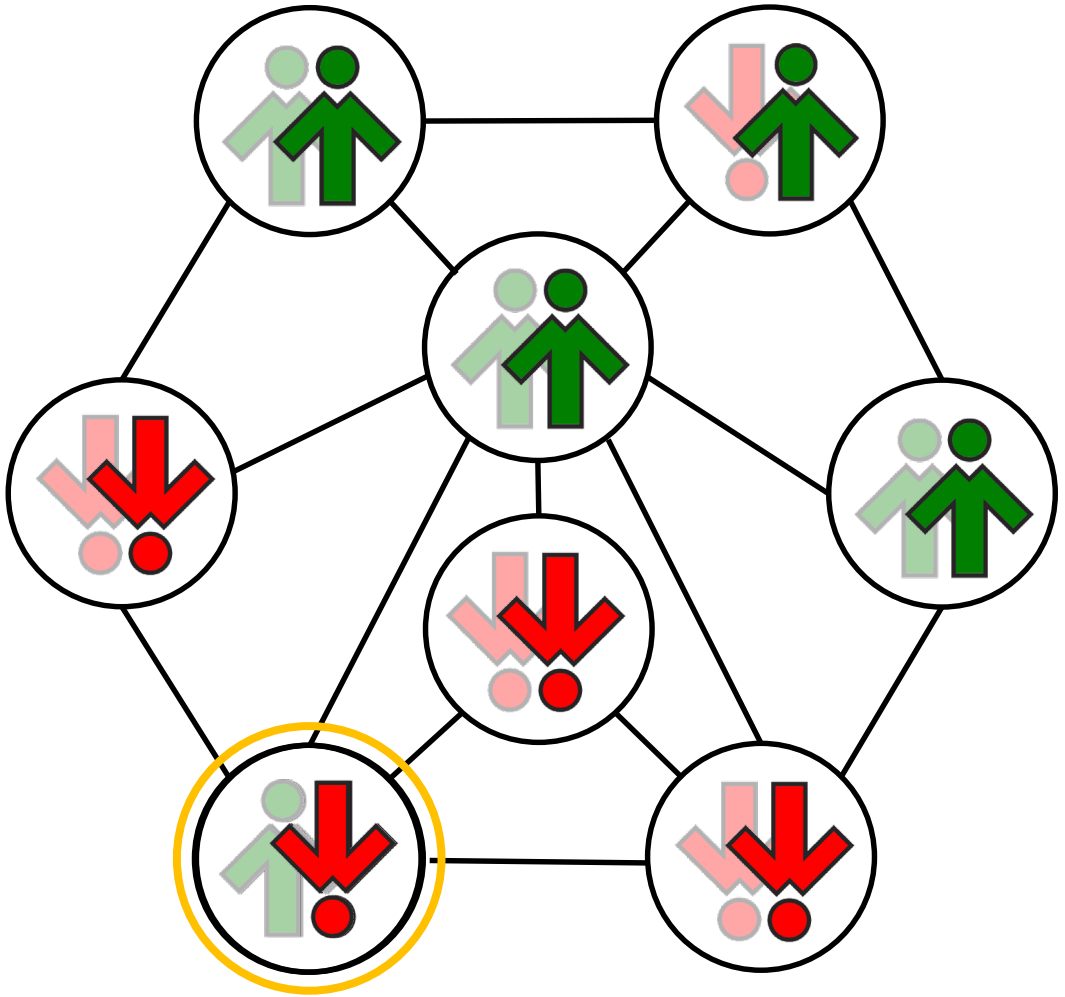
$$S_i \rightarrow \sigma_i$$

  - **Conformity with prob $1-p$**:
    1) pick randomly q neighbours without repetition



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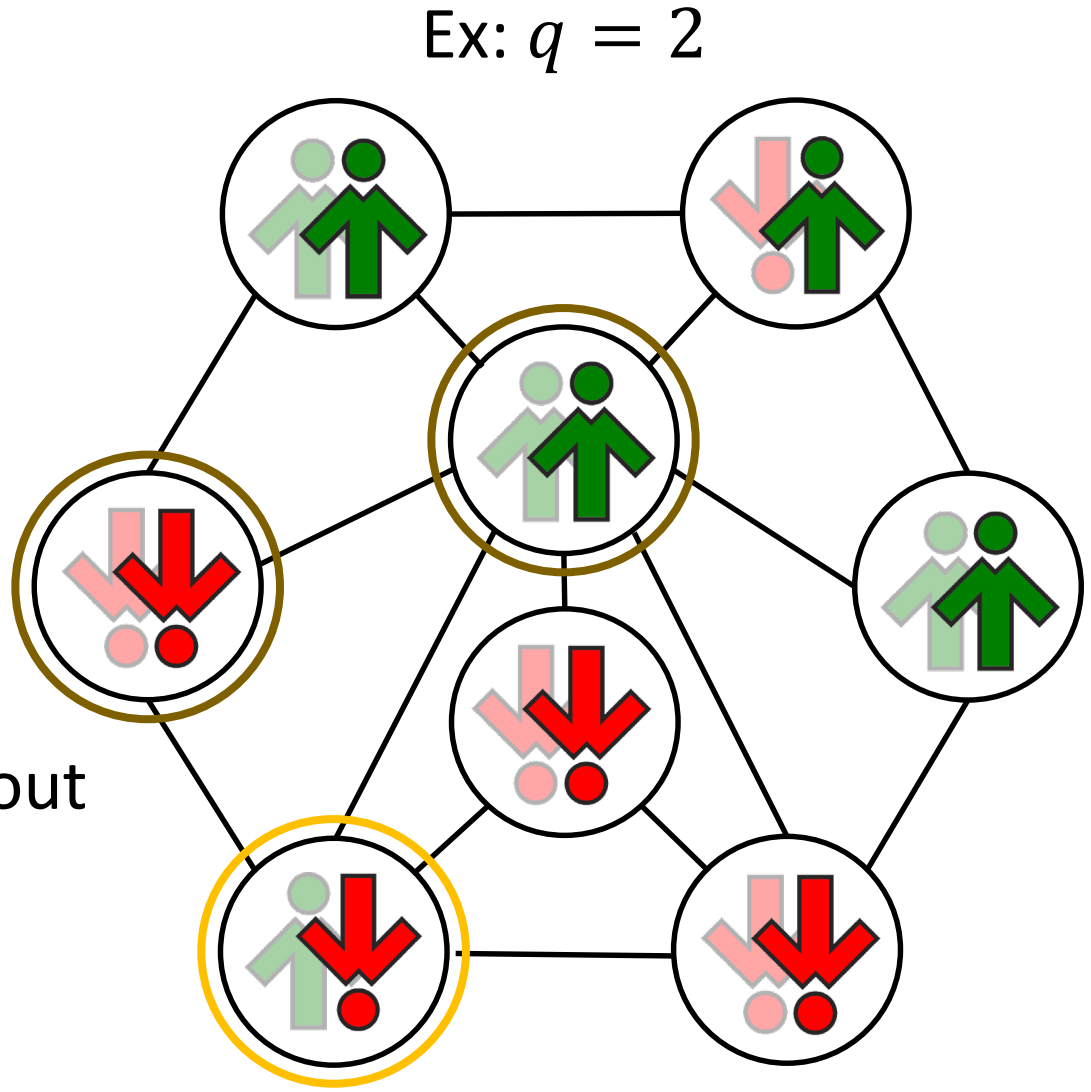
$$S_i \to \sigma_i$$

  - **Conformity with prob $1-p$**:
    1) pick randomly q neighbours without repetition
    2) $S_i = \sigma_i$? NO: disinhibitory contagion $S_i \to \sigma_i$ if one $S_{ix} = \sigma_i$



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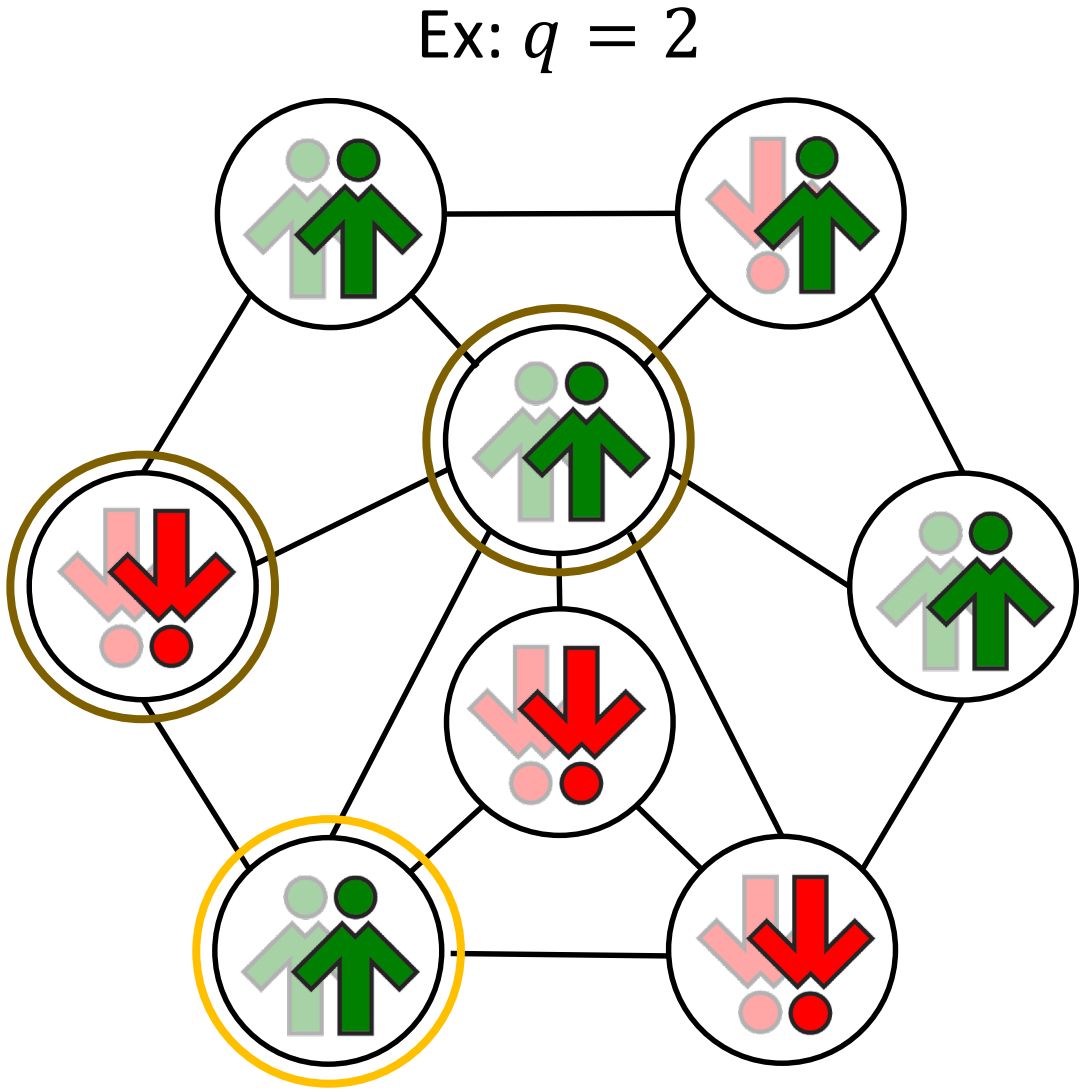

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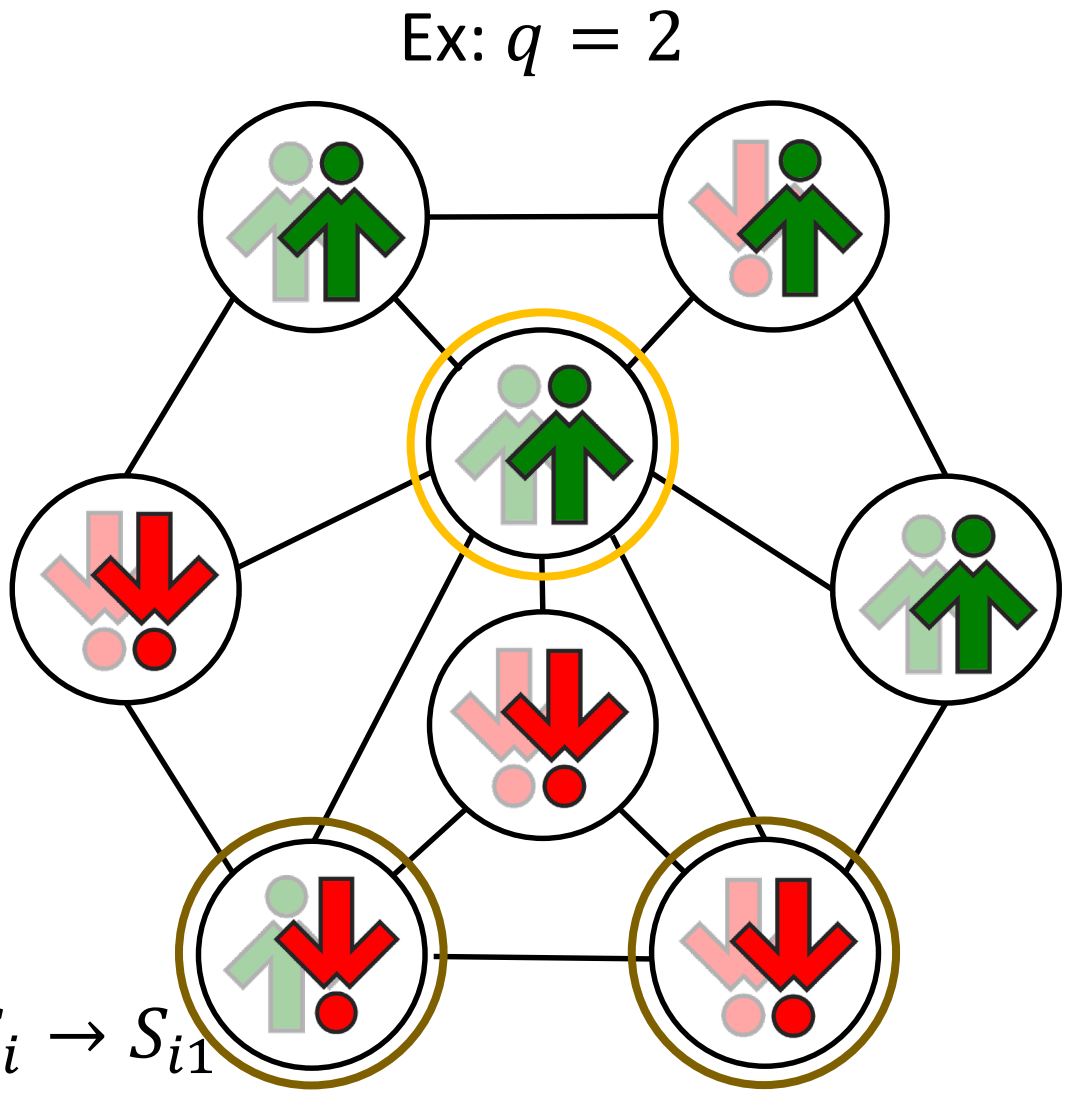
Act then Think (AT) model

- choose one voter at random, located at site i
- Act: update the **public** opinion S_i
  - **Independence with prob p**: replace public opinion by the private one

$$S_i \to \sigma_i$$

  - **Conformity with prob $1-p$**:
    1) pick randomly q neighbours without repetition
    2) $S_i = \sigma_i$? YES
    3) unanimous: $S_{i1} = \ldots = S_{iq}$? YES: $S_i \to S_{i1}$



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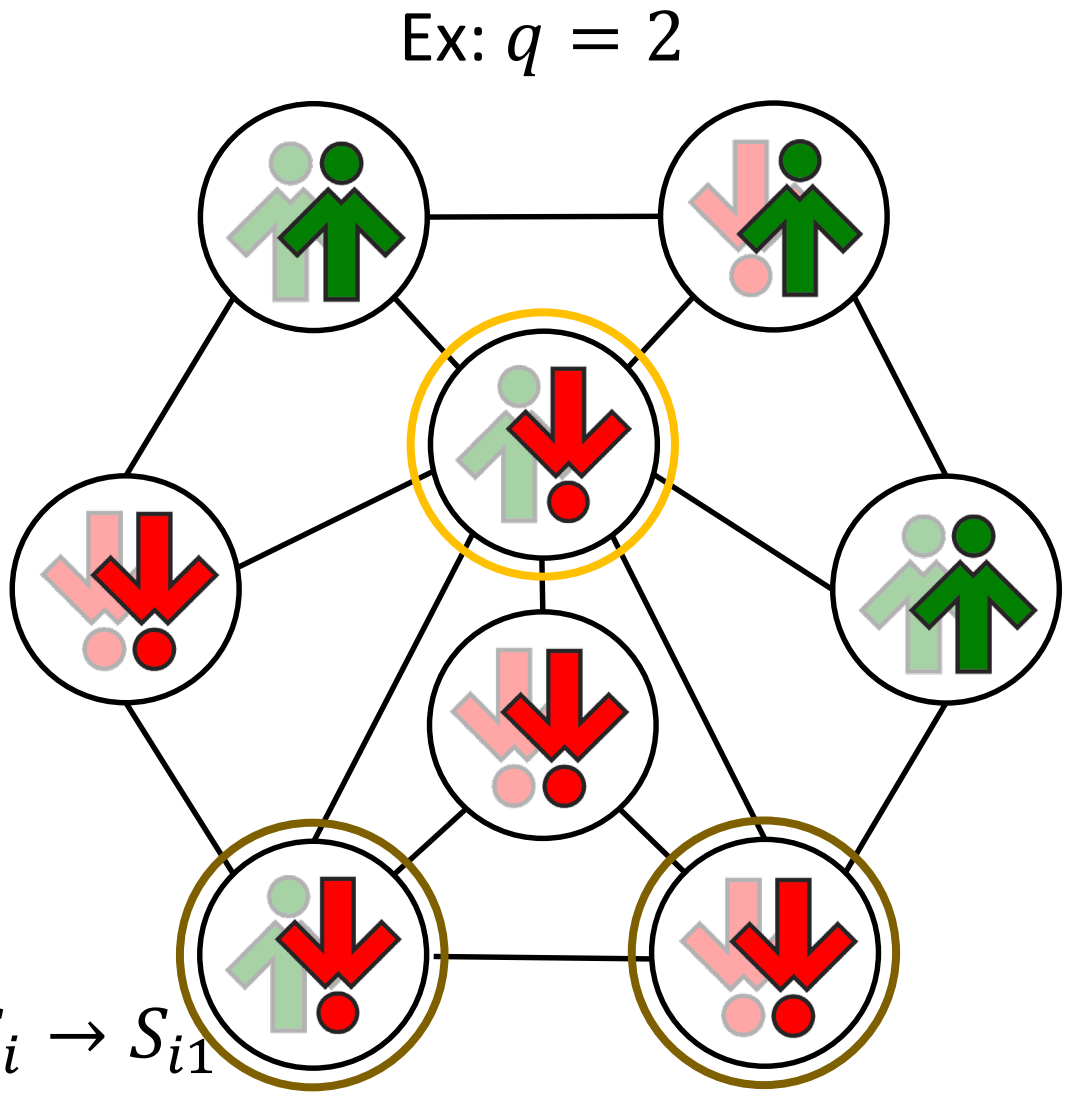

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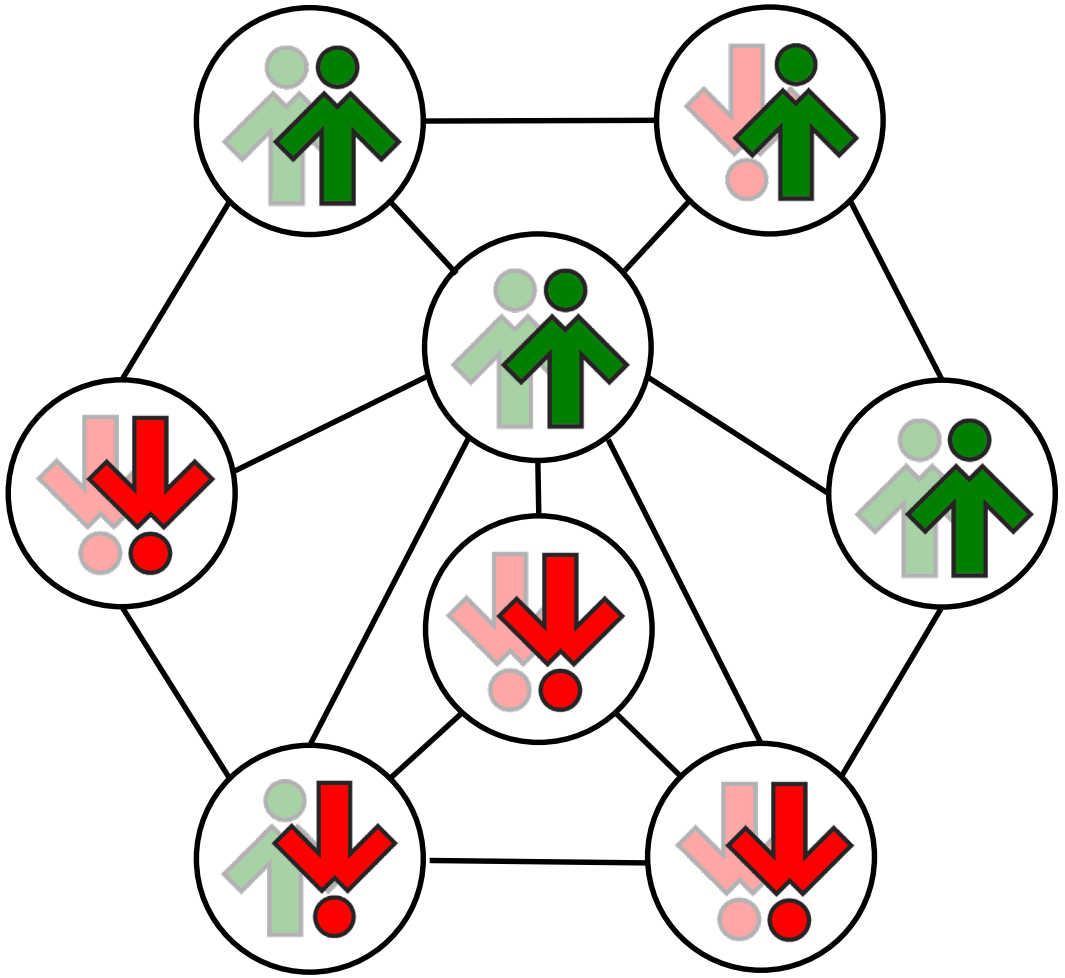
Act then Think (AT) model

- choose one voter at random, located at site i
- Act: update the **public** opinion S_i
- Think: update the **private** opinion σ_i



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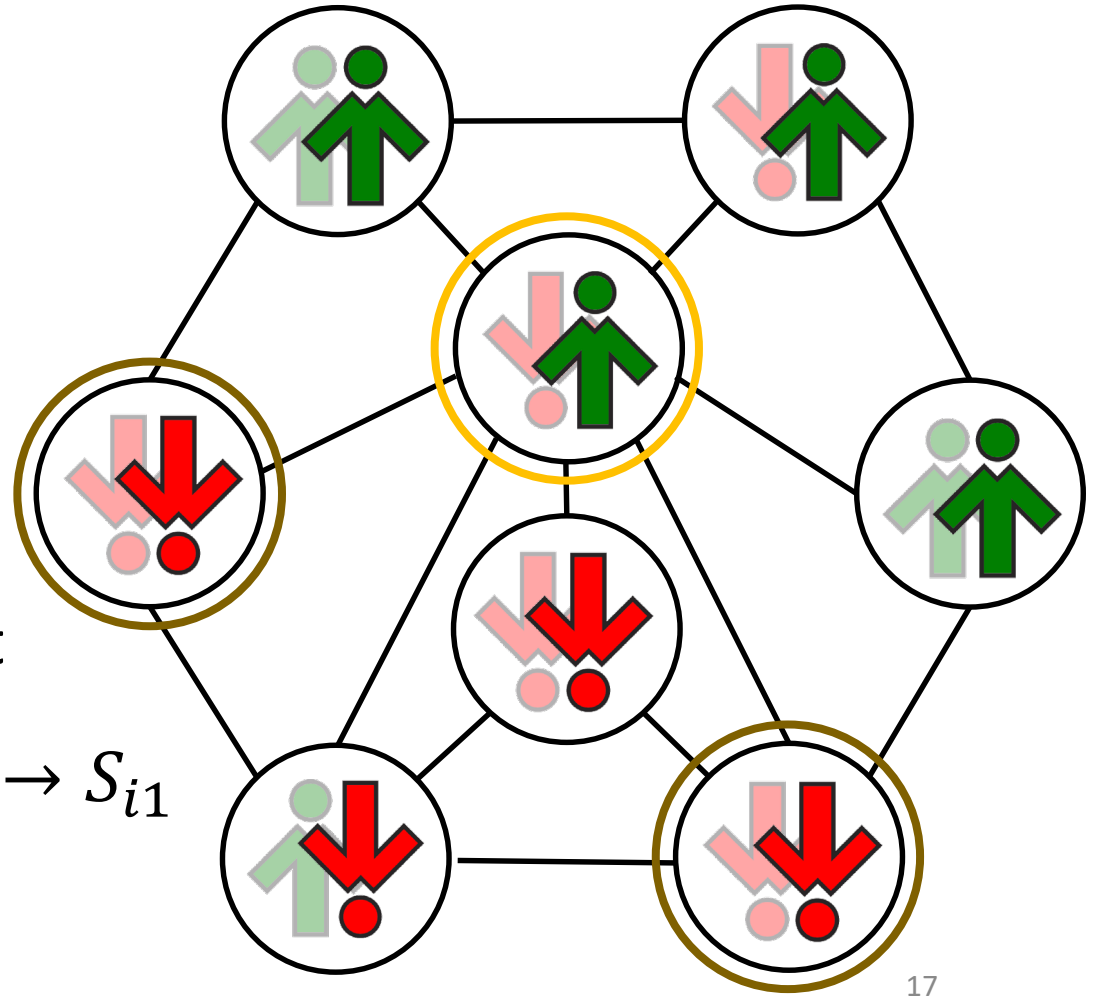
Act then Think (AT) model

- choose one voter at random, located at site i
- Act: update the **public** opinion S_i
- **Think**: update the **private** opinion σ_i
  - **Independence with prob p**

$$\sigma_i \xrightarrow{1/2} -\sigma_i$$

  - **Conformity with prob $1-p$**:
    1) pick randomly q neighbours without repetition
    2) unanimous: $S_{i1} = \ldots = S_{iq}$? YES: $\sigma_i \to S_{i1}$

Ex: $q = 2$

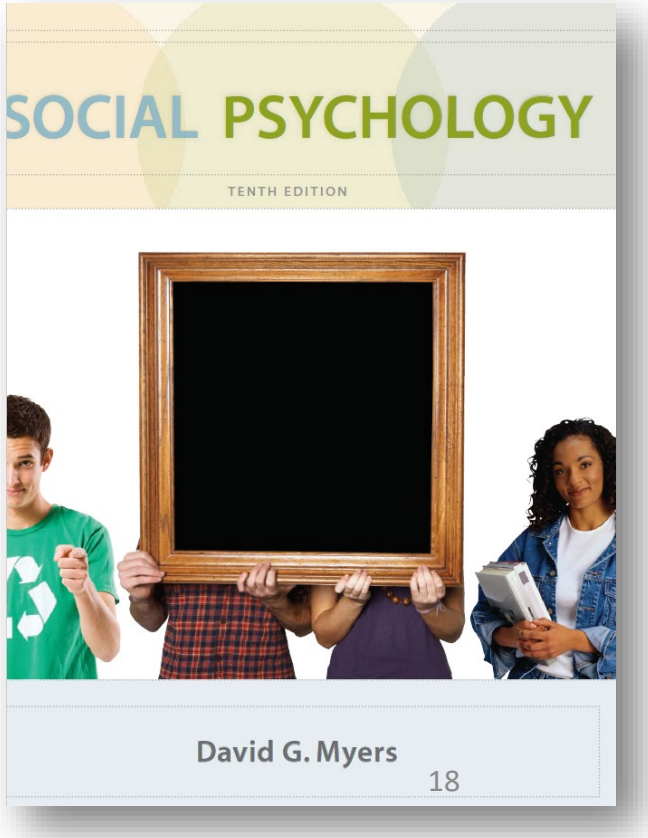


„Act then Think” (Public then private) or …?

- „It’s true that we sometimes stand up for what we believe.”
- „But it’s also true that we come to believe in what we stand up for.”
- „Saying Becomes Believing”

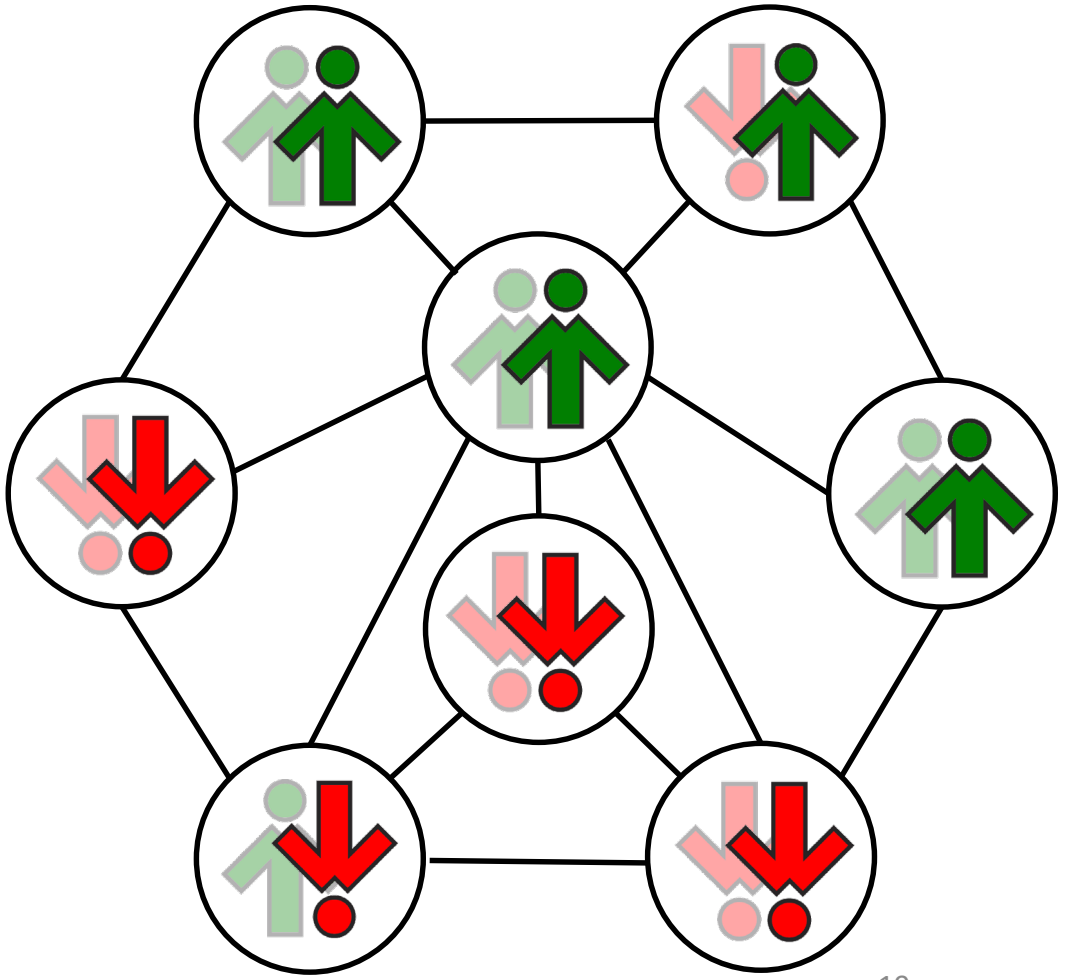
“If social psychology has taught us anything during the last 25 years, it is that we are likely not only to think ourselves into a way of acting but also to act ourselves into a way of thinking.”

[David G. Myers,
Social Psychology 10th Ed.
page 131]



Two versions of the model: AT vs. TA

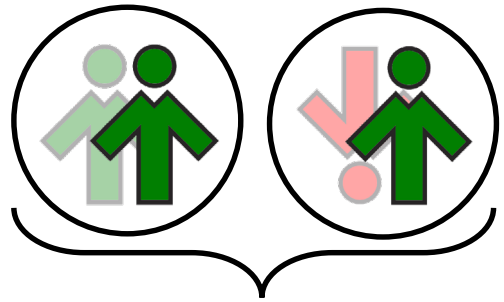
- **A**ct then **T**hink (AT) model
  - choose one voter at random, located at site i
  - Act: update the **public** opinion S_i
  - Think: update the **private** opinion σ_i
- **T**hink then **A**ct (TA) model
  - choose one voter at random, located at site i
  - Think: update the **private** opinion σ_i
  - Act: update the **public** opinion S_i



What do we measure?

- The fraction of individuals with the positive public opinion:

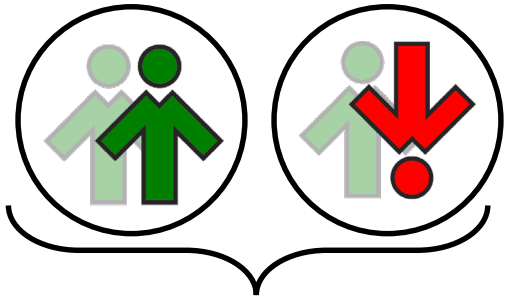
$$c_S(t) = \frac{N_{S=1}(t)}{N}$$



$S_i(t) = 1$

- The fraction of individuals with the positive private opinion:

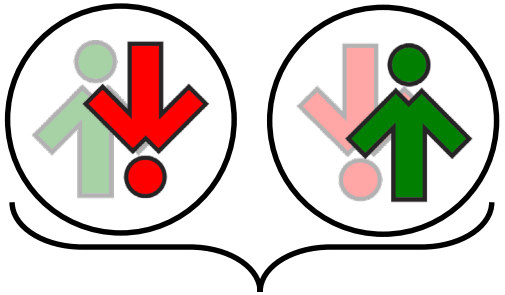
$$c_\sigma(t) = \frac{N_{\sigma=1}(t)}{N}$$



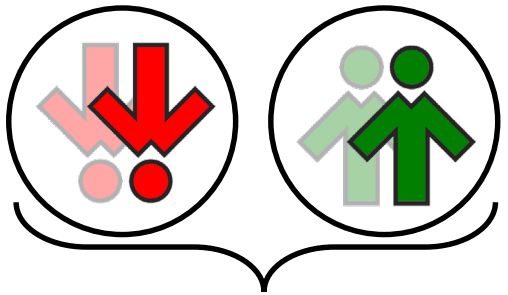
$\sigma_i(t) = 1$

- The level of dissonance = the fraction of individuals that have different public and private opinions:

$$d(t) = \frac{1}{2N}\sum_{i=1}^{N}(1 - S_i(t)\sigma_i(t))$$



$S_i(t)\sigma_i(t) = -1$



$S_i(t)\sigma_i(t) = 1$

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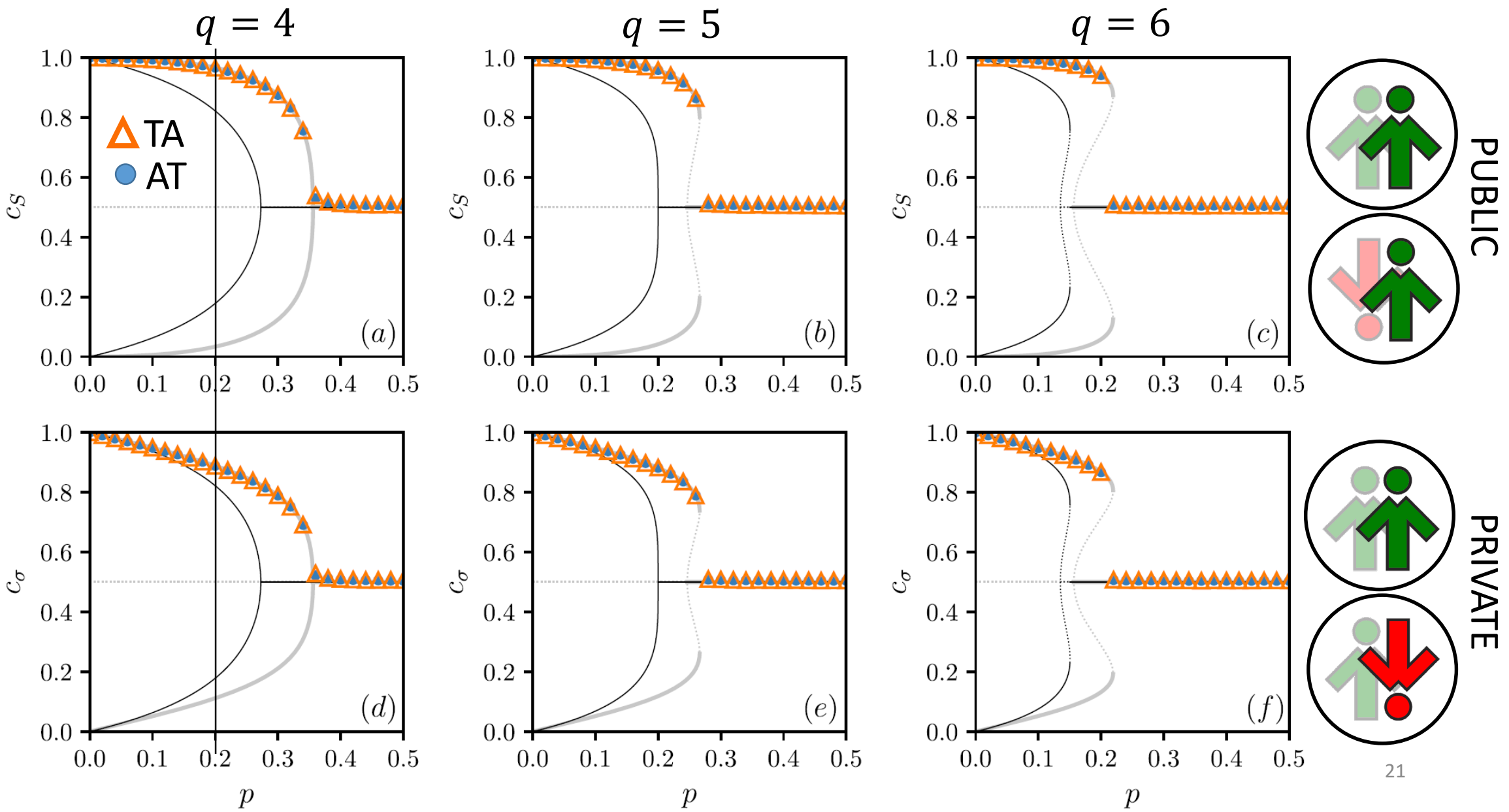
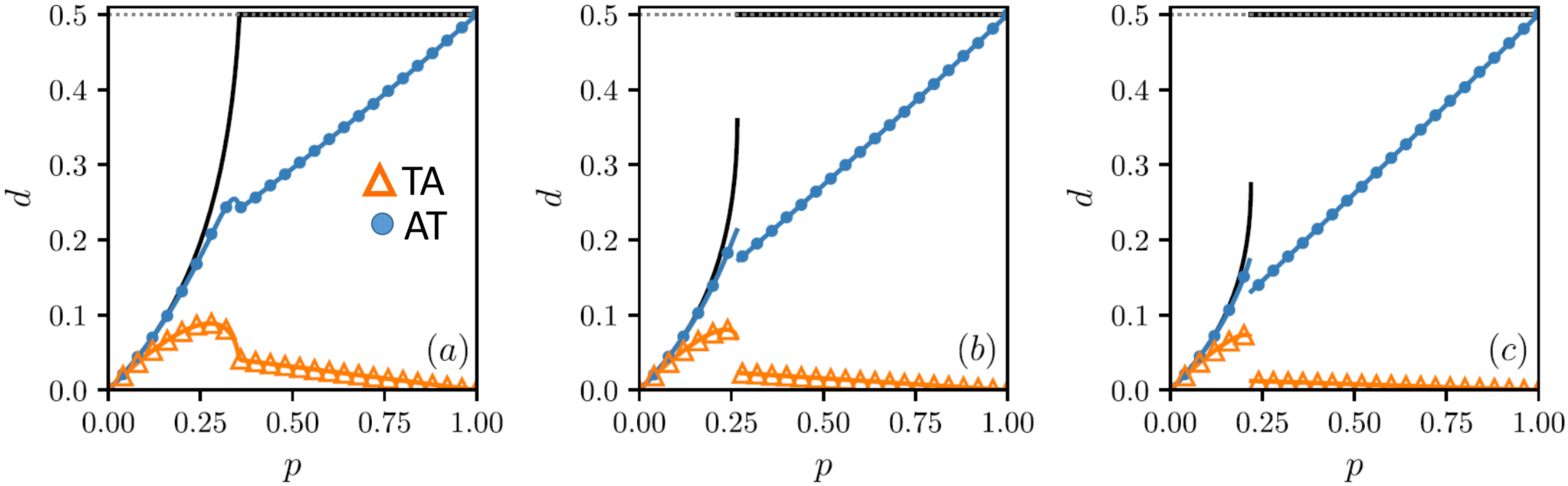
On the private level the majority is smaller

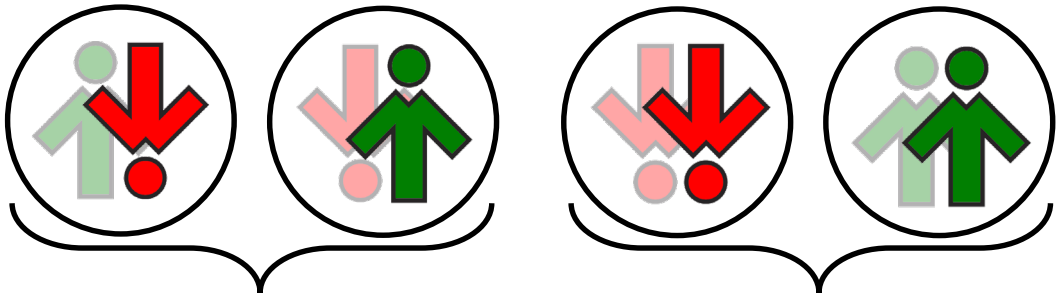


Stationary value of the dissonance

$q = 4$ $q = 5$ $q = 6$



$$d(t) = \frac{1}{2N}\sum_{i=1}^{N}(1 - S_i(t)\sigma_i(t))$$



$S_i(t)\sigma_i(t) = -1$ $S_i(t)\sigma_i(t) = 1$

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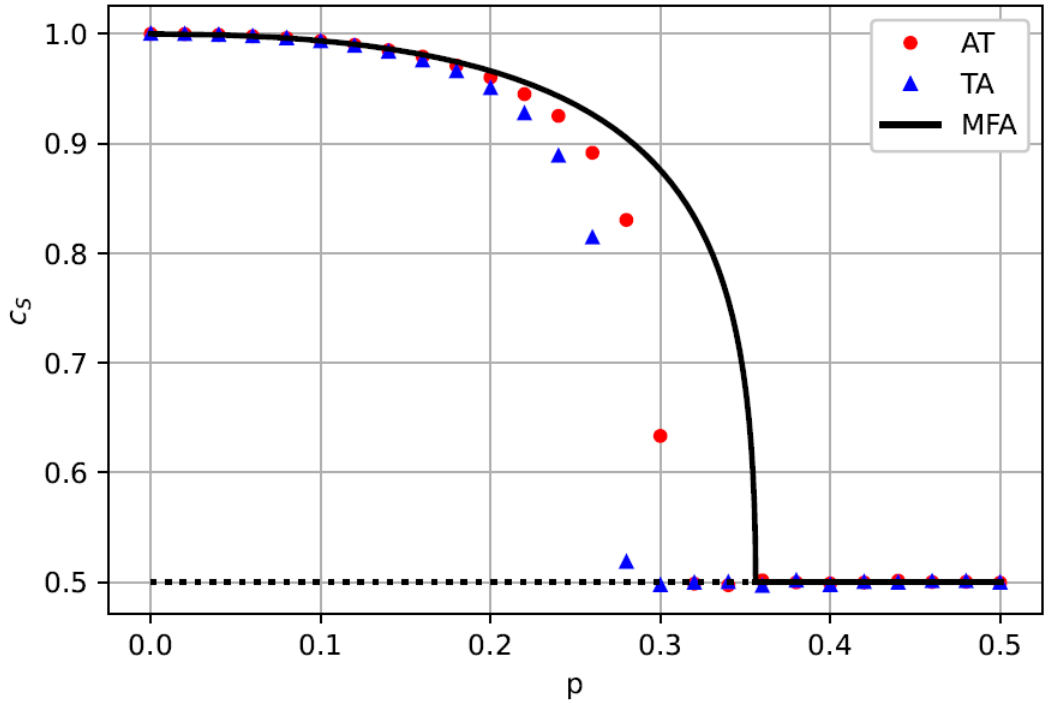
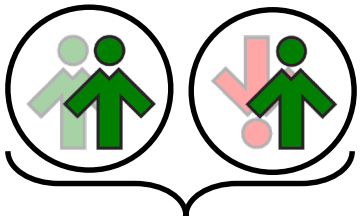
Watts-Strogatz (WS) network $\langle k \rangle = 14, \beta = 0.1$?

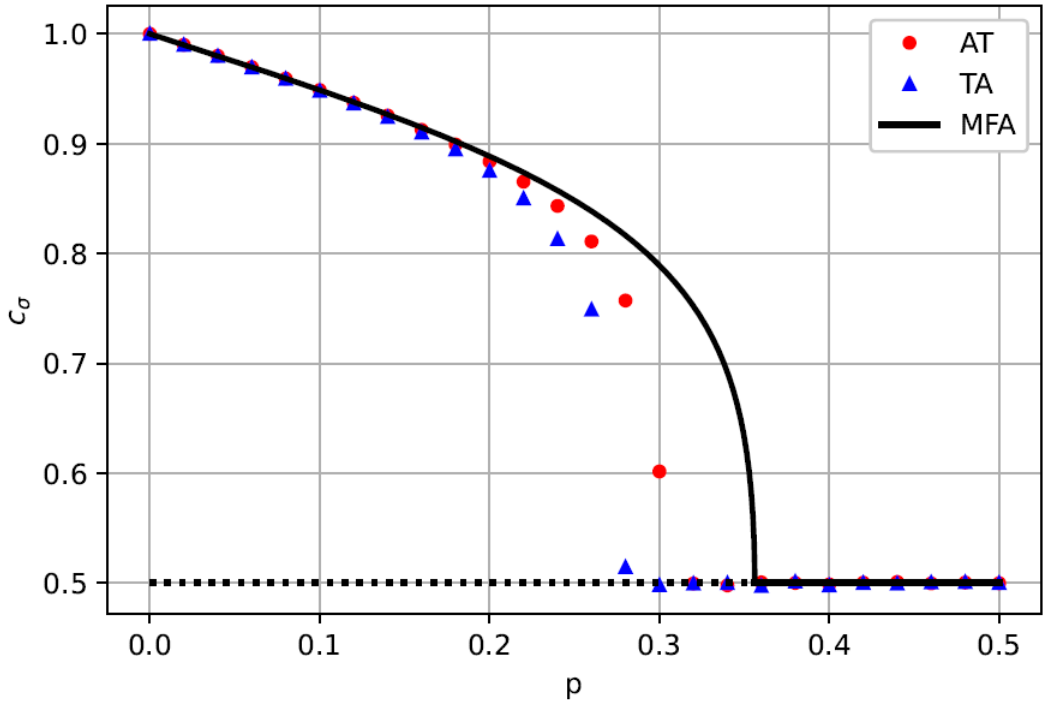
(a) $\mathbf{q} = 4$

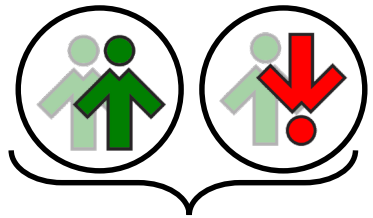




Public: $S_i(t) = 1$

(b) $\mathbf{q} = 4$





Private: $\sigma_i(t) = 1$

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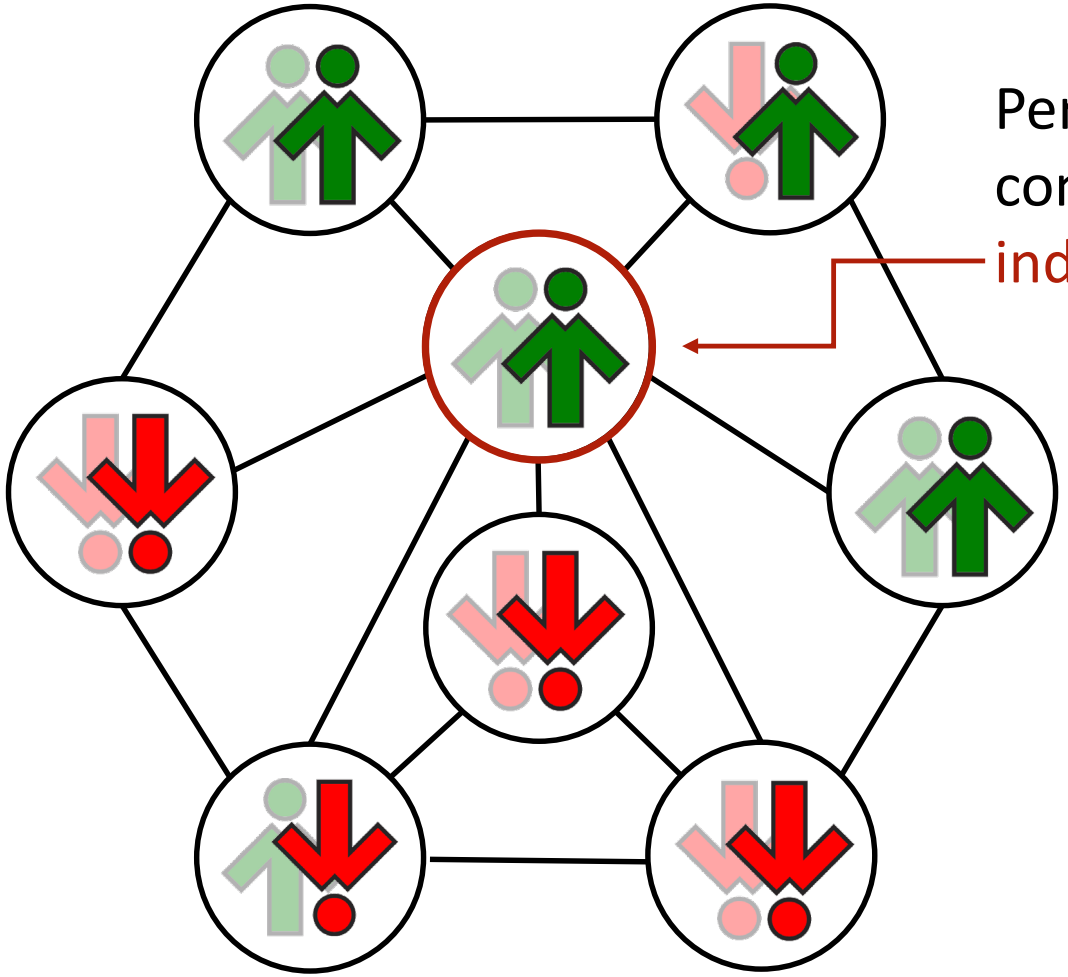
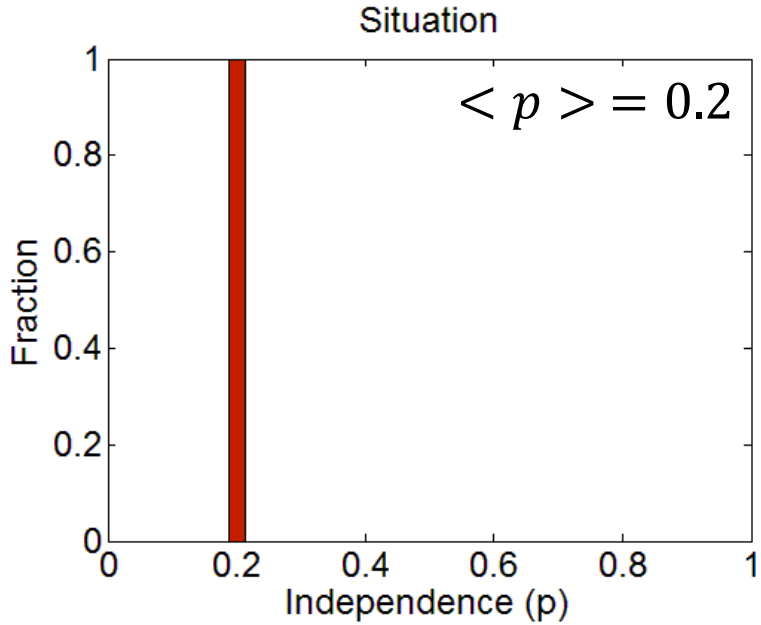
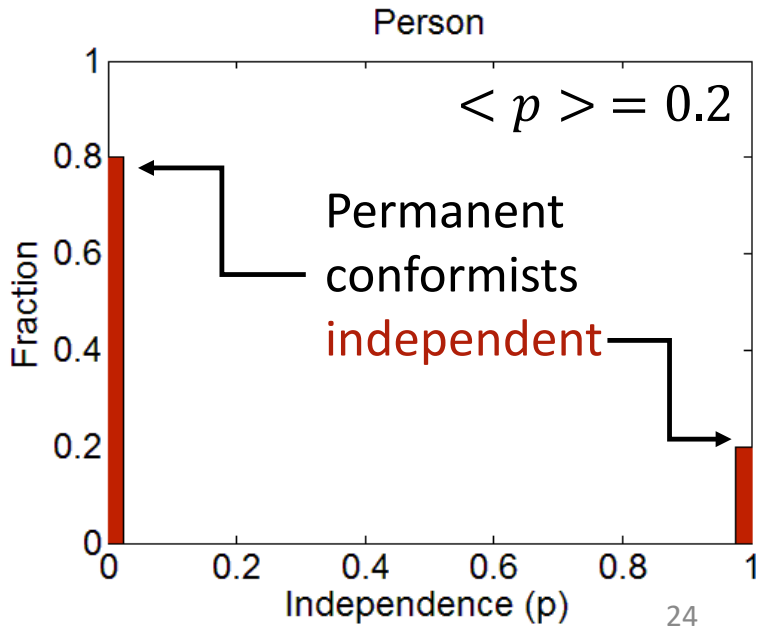
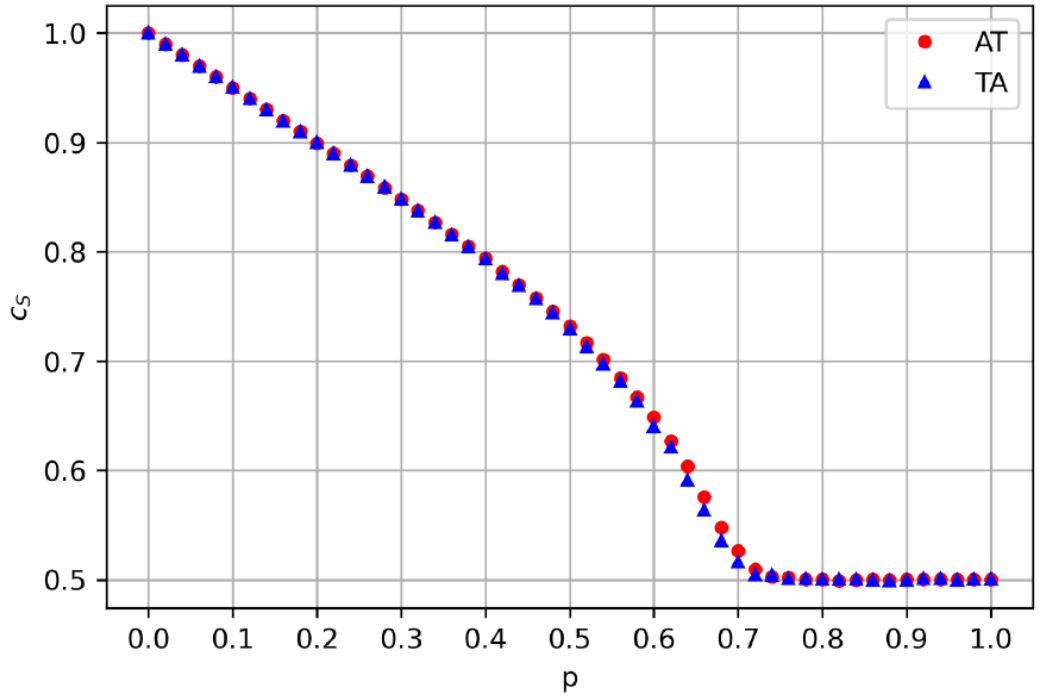
Person vs. situation
Queched vs. annealed



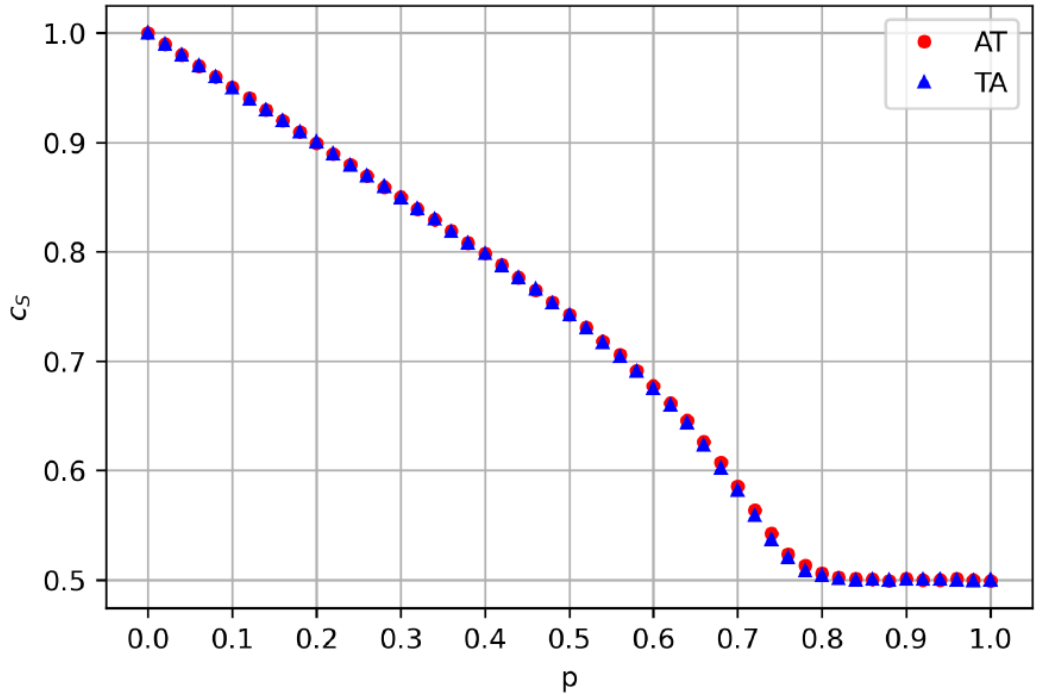




Person approach: public positive opinions on the Watts-Strogatz network $\langle k \rangle = 14, \beta = 0.1$

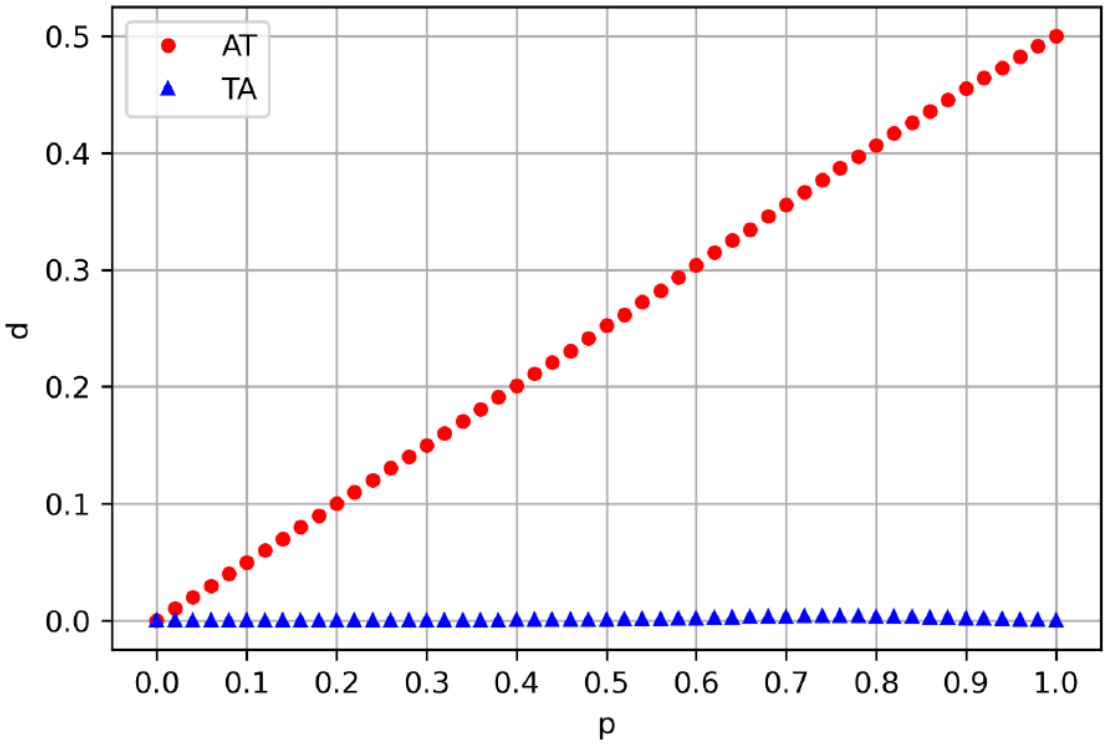


(a) $q = 4$

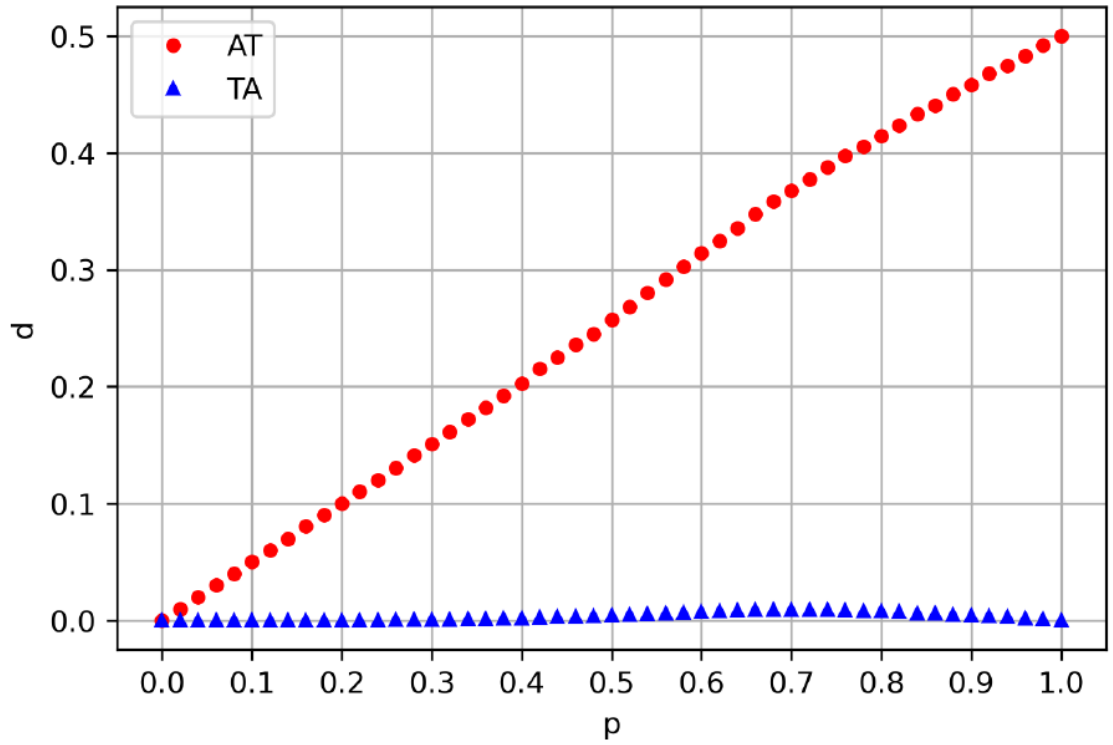


(b) $q = 5$

Person approach: dissonance on the Watts-Strogatz network $\langle k \rangle = 14, \beta = 0.1$



(a) $\langle k \rangle = 14,\ q = 5$



(b) $\langle k \rangle = 14,\ q = 4$

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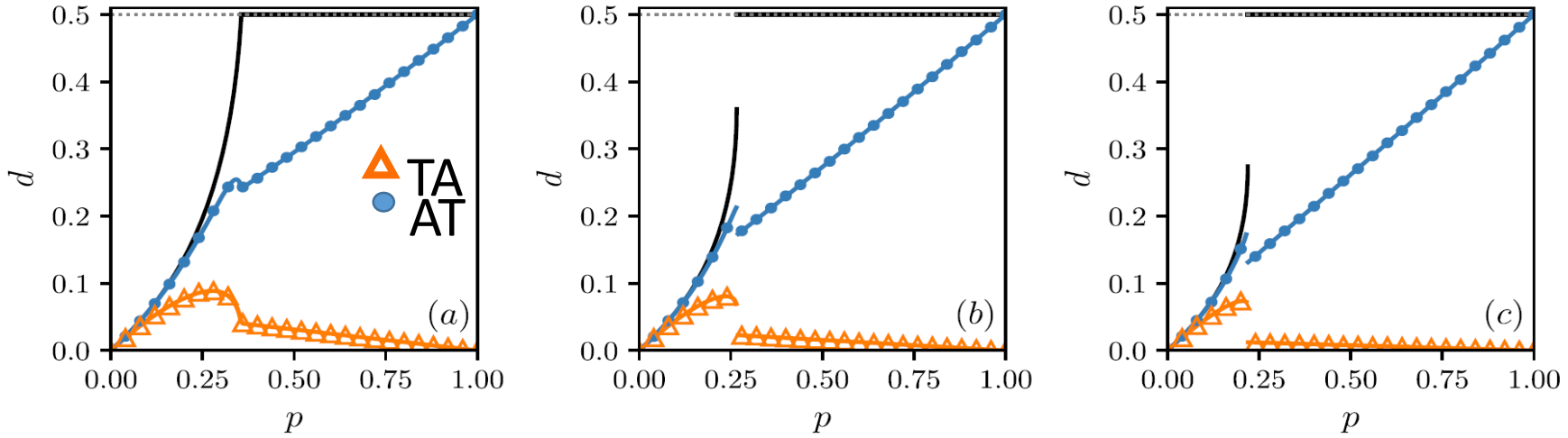
Summary

- Looking just at opinions TA=AT
- Critical point for private and public opinions is the same
- On the private level the majority decreases faster
- Looking at dissonance:
  - AT – increases with independence
  - TA – non-monotonic behaviour, much lower than for AT



It’s ok to follow the crowd but … think first!