

# Galam models

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# GALAM MODEL

БАШНЯ ВЫСОКОГО ИССЛЕДОВАНИЯ  
ТЮМЕНСКИЙ НАУЧНО-ПОДОГОДОВОЙ УНИВЕРСИТЕТ

We would like to model elections with the help of two main ideas

These are:

- Shocking statements
- Public debates

## 2016 United States presidential election

How did shocking Trump's statement such as:

*Border wall and illegal immigration*

effect opinion dynamics

We start with a population on  $N$  agents.

The agents are voting for two opinions  $A$  and  $B$  with initial support of opinion  $A$  with  $p_0 \in [0, 1]$ . The Galam model consists of 3 steps:

- random distribution of agents into small groups of up to 6 people
- in each group the new opinion is determined by the local majority, in case of a tie opinion  $A$  wins with probability  $k$  and  $B$  with  $1 - k$
- reshuffles all agents

## Mathematical formulation of the model

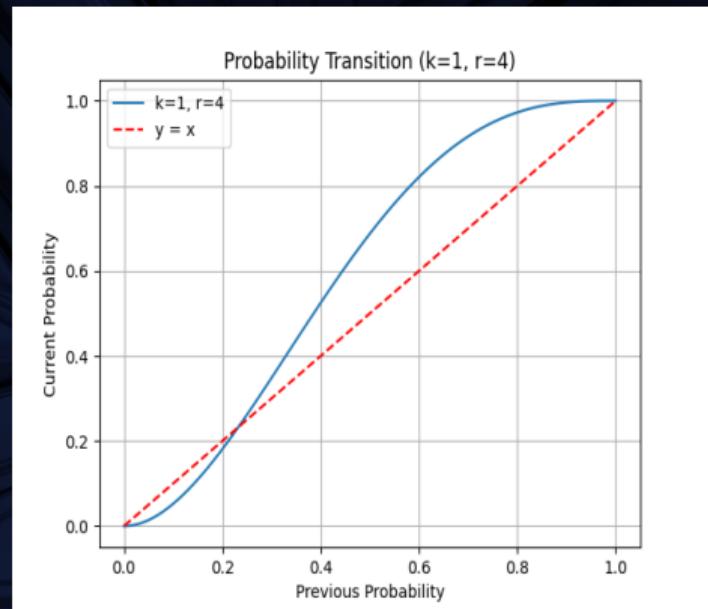
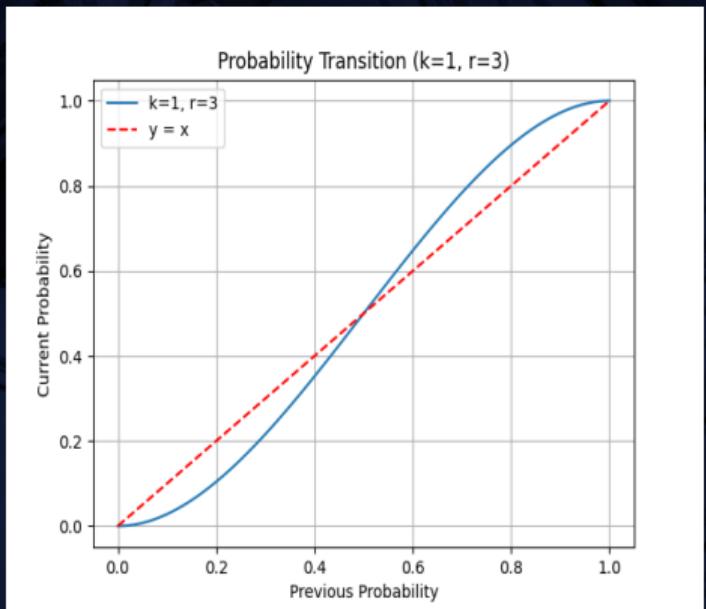
Therefore  $p_n$  is calculated from  $p_{n-1}$  as:

$$p_n := \sum_{r=1}^L a_r \mathbb{P}_r(p_{n-1}),$$

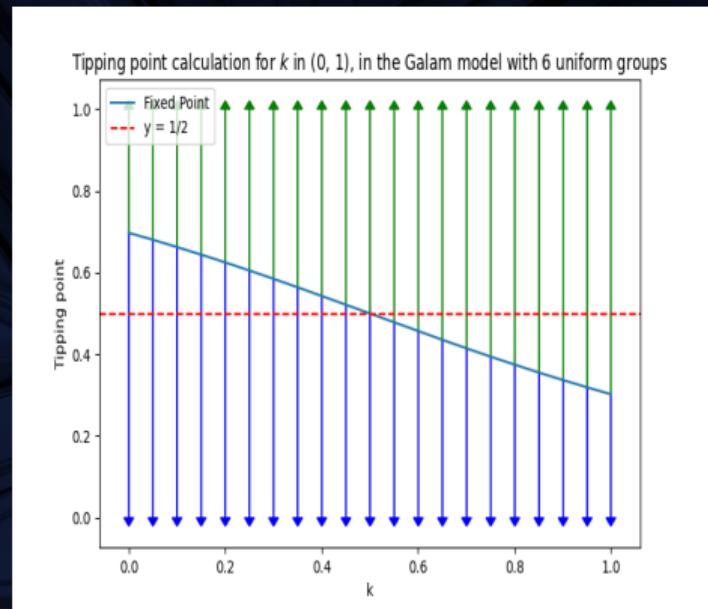
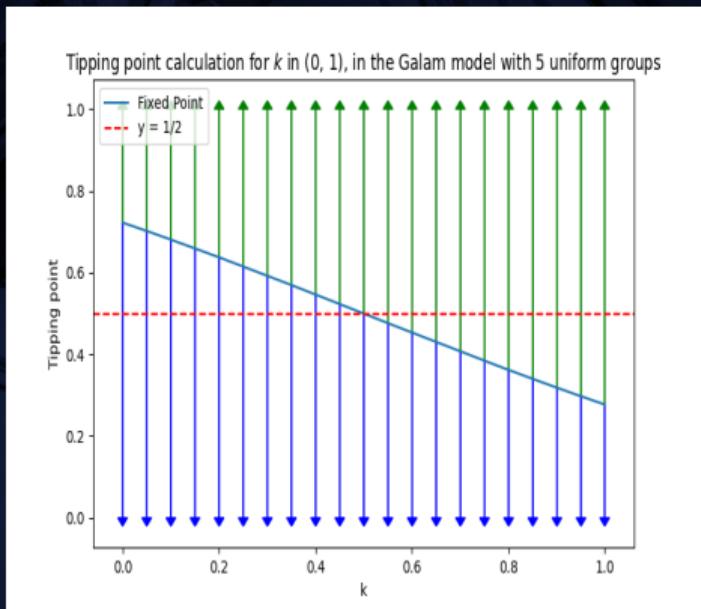
where  $a_r \in [0, 1]$  represents the proportion of groups of size  $r$  and  $\mathbb{P}_r$  is the probability that the group consisting of  $r$  agents is updated along choice A. The probability  $\mathbb{P}_r$  exhibits variation based on whether  $r$  is an odd or even number

# Probability transitions depending on the number of agents in the group

7



# Fixed points for even and odd number of agents in a group



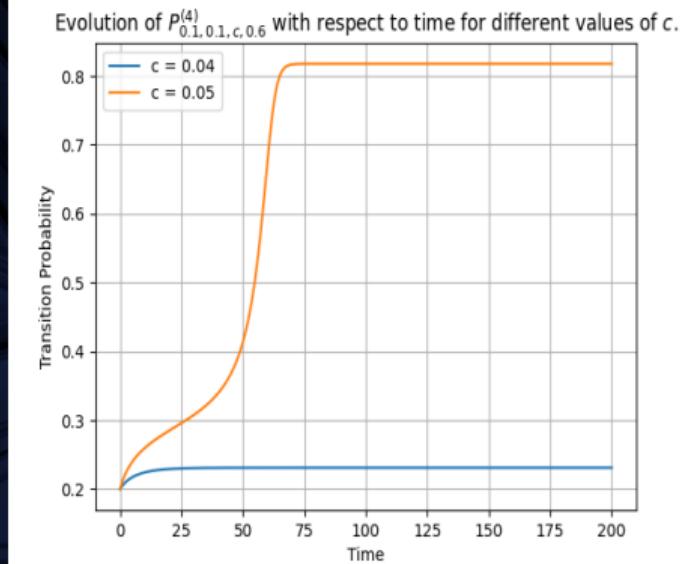
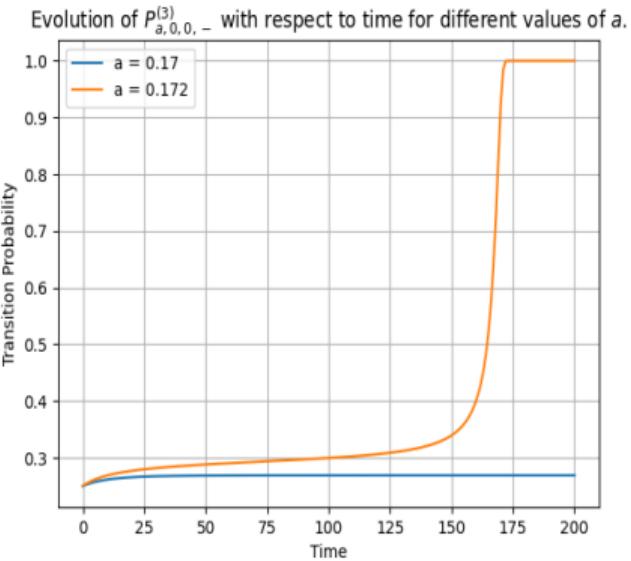


## EXTENSIONS OF THE MODEL

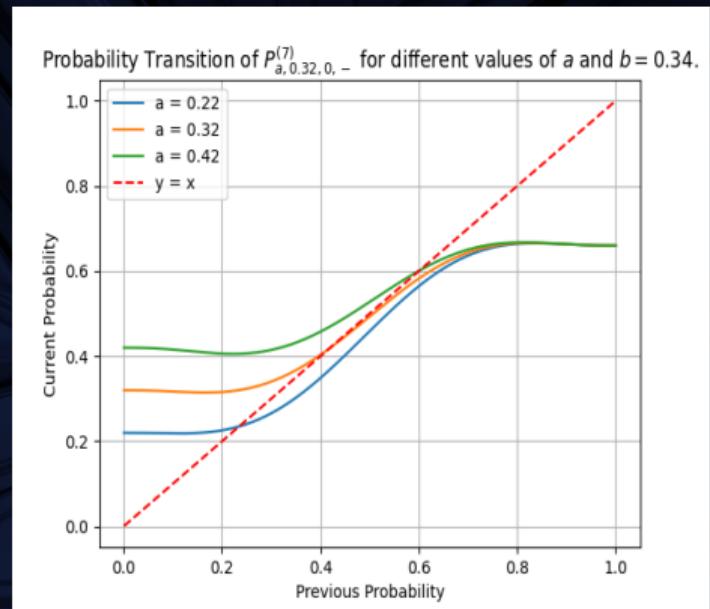
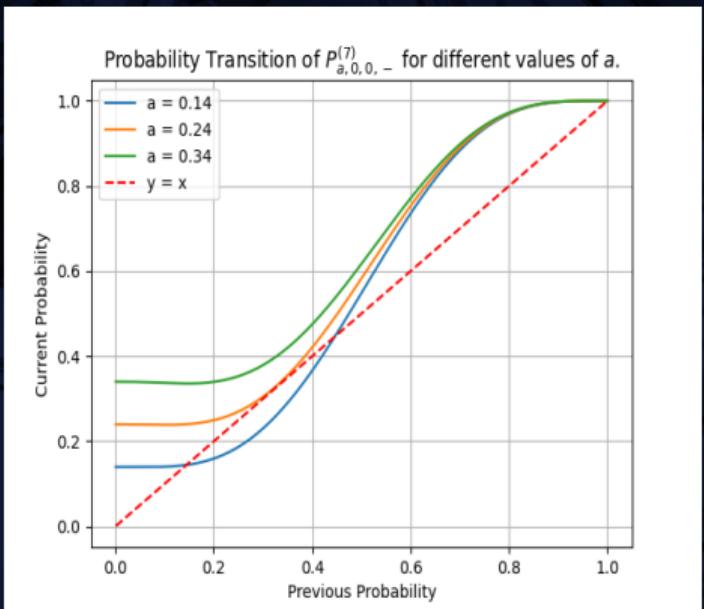
## Differentiation between the agents

- **Floaters:** Agents from the basic Galam model
- **Inflexible Agents or Zealots:**  $A$ -inflexible agents consistently hold opinion  $A$ , and  $B$ -inflexible agents always hold opinion  $B$ .
- **Contrarians:** Initially floaters, independently decide to oppose the group majority they contributed to once the groups are dismantled

# Effects of $c$ and $a$ on the opinion dynamics



# Effects of $a$ and $b$ on the fixed points

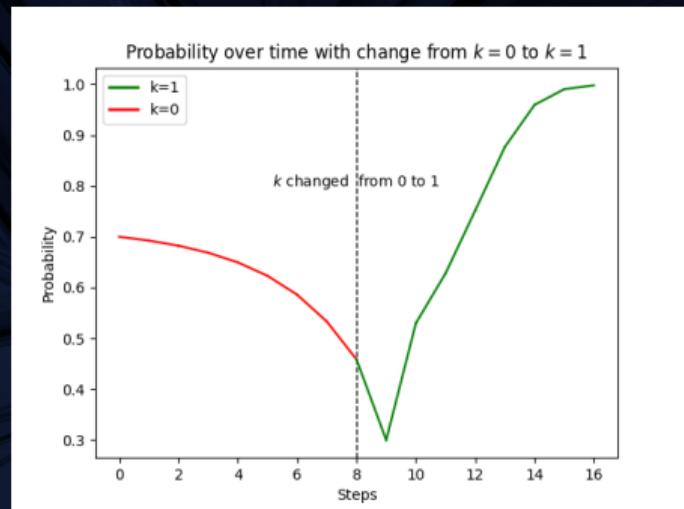




## 2016 UNITED STATES PRESIDENTIAL ELECTION EXAMPLE

# The effect of $k$ on the elections

- Depending on the  $k$  a local minority can become a local majority



## Criticisms of Trump:

- **Lack of Political Experience:** Critics argued that Donald Trump's lack of political experience was a significant drawback.
- **Controversial Statements:** Trump made several controversial statements during his campaign, which some people found offensive or divisive.
- **Questionable Business Practices:** Opponents raised concerns about Trump's business practices, including bankruptcies and lawsuits against his companies.

Controversial stamens secured the nomination of Trump as the Republican Party's presidential nominee:

- **Temporary Muslim ban proposal:** December 2015, following the San Bernardino terrorist attack. This proposal was met with both support and condemnation.
- **Border wall and illegal immigration:** 2016 campaign, Donald Trump pledged to construct a border wall along the U.S.-Mexico border.

2016, he clinched the official nomination

- "**Make America Great Again**" slogan: Trump's campaign slogan became tapping into a sense of nostalgia.
- **Anti-establishment rhetoric:** Trump positioned himself as an outsider, criticizing the political establishment.
- "**Lock Her Up**" Chant": Trump and his supporters frequently used the slogan "Lock Her Up" in reference to Hillary Clinton's use of a private email server while she was Secretary of State.

Trump's victory in the electoral college with 304 votes in 2016, while Clinton garnered 227 votes



# Contacts

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Thanks for listening!