Dynamics of non-conservative voters

R. Lambiotte
Université catholique de Louvain

In collaboration with S. Redner
(Boston University)

Dynamics of Vacillating Voters, R. Lambiotte and S. Redner, *JSTAT*, L10001 (2007)
Dynamics of non-conservative Voters, R. Lambiotte and S. Redner, *arXiv:0712.0364*

Simplest interaction possible: imitation. People copy the behaviour of their friend, acquaintances, neighbours, etc.

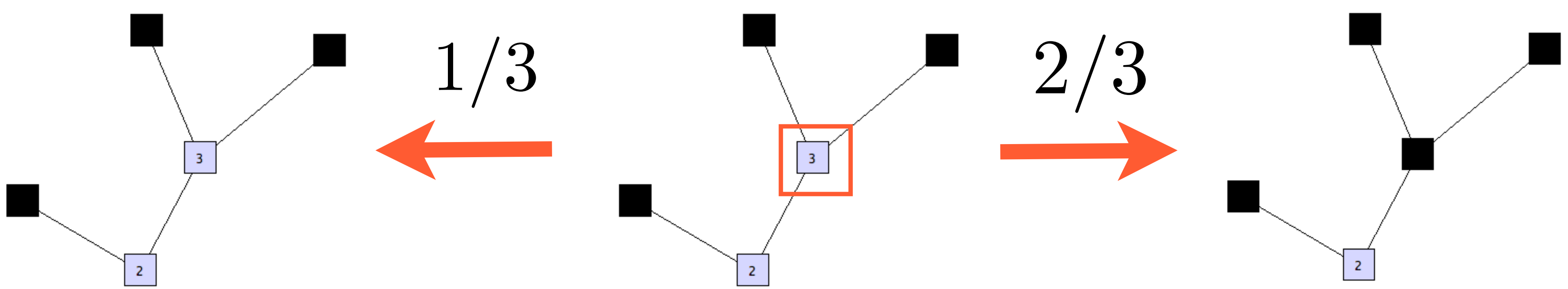
Voter Model

N agents have an opinion: -1 or 1

=> The average magnetization is conserved

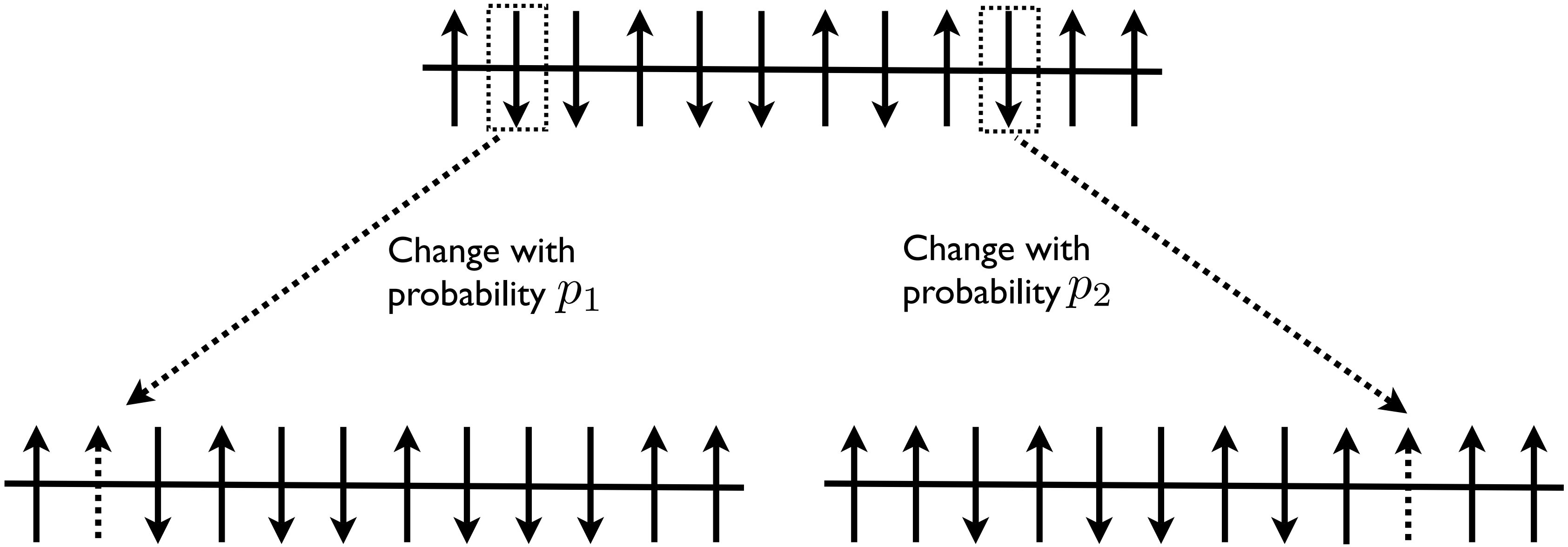
The population evolves by:
(i) picking a random voter
(ii) the selected voter adopts the state of a randomly-chosen neighbor
(iii) repeating these steps *ad infinitum* or until a finite system necessarily reaches consensus.

With this dynamics, a voter chooses a state with a probability equal to the fraction of neighbors in that state.



Claudio Castellano, Santo Fortunato, Vittorio Loreto, Statistical physics of social dynamics, Eprint arXiv: 0710.3256

Non-conservative Voter models



$$\gamma = p_2/p_1$$

$\gamma = 2$ one recovers the classical voter model

$\gamma > 2$ the combined effect of two neighbors is more than twice that of one neighbor. Equivalently, voters can be viewed as having a conviction for their opinion and strong peer pressure is needed to change their opinion.

$\gamma < 2$ one disagreeing neighbor is more effective in triggering an opinion change than in the classical voter model.

$$\frac{\partial s_j}{\partial t} = 2\gamma(s_{j+1} + s_{j-1}) - 2(\gamma+2)s_j - 2(\gamma-2)\langle\sigma_{j-1}\sigma_j\sigma_{j+1}\rangle$$

$$s_j \equiv \langle\sigma_j\rangle = \sum_{\{\sigma\}} \sigma_j P(\{\sigma\};t)$$

Coupling with higher order correlations
Need for a decoupling scheme

$$\langle\sigma_{j-1}\sigma_j\sigma_{j+1}\rangle \approx m m_2$$

Non-trivial initial state dependence:

$$m(\infty) = m(0)\, e^{(2-\gamma)/[2\gamma\,(m(0)^2-1)]}$$