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A model of anonymous influence with anti-conformist agents

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Abstract

We study a stochastic model of anonymous influence with conformist and anti-conformist individuals. Each agent with a 'yes' or 'no' initial opinion on a certain issue can change his opinion due to social influence. We consider anonymous influence, which depends on the number of agents having a certain opinion, but not on their identity. An individual is conformist/anti-conformist if his probability of saying 'yes' increases/decreases with the number of 'yes'- agents.

The seminal work of DeGroot (1974) and some of its extensions consider a non-anonymous influence in which agents update their opinions by using a weighted average of the opinions of their neighbors. We are interested in anonymous influence, which depends only on the number of individuals having a certain opinion and is not dependent on agents' identities. Forster and al (2013) investigate such kind of social influence by using the ordered weighted averages (commonly called OWA operators, Yager (1988) which are the unique anonymous aggregation functions. The authors departure from a general framework of influence based on aggregation functions Grabisch and Rusinowska (2013), where every individual updates his opinion by aggregating the agents' opinions which determines the probability that his opinion will be 'yes' in the next period. Both frameworks of Forster and al (2013) and Grabisch and Rusinowska (2013) cover only positive influence (imitation), since by definition aggregation functions are nondecreasing, and hence cannot model anti-conformism.

In order therefore to extend the analysis of anonymous influence to anti-conformism, we assume that every agent has a coefficient of conformism which is a real number in $[-1, 1]$, with negative/positive values corresponding to anti-conformists/conformists. The two extreme values -1 and 1 represent a pure anti-conformist and a pure conformist, respectively, and the remaining values – so called 'mixed' agents. We consider two kinds of a society: without mixed agents, and with mixed agents who play randomly either as conformists or anti-conformists.

For both cases of the model, we deliver a qualitative analysis of convergence, i.e., find all absorbing classes and conditions for their occurrence. We find nineteen terminal classes, whose dynamics can be distinguished into three categories : terminal states, periodic classes and aperiodic classes.

Though we do not examine issues like speed of convergence, average time between peaks in aperiodic classes and other quantitative results, we emphasize the need for such problem to be examined later. Another case for the need of such future research is that simulations show that, from a qualitative point of view, a society represented by a given absorbing class may exhibit a behavior similar to another terminal class, sometimes temporarily; i.e the behavior between two terminal classes, though qualitatively different, can be undistinguishable on data.

We argue that anti-conformism can be a word labelling different contexts, such as incomplete information or bounded rationality, that is, a wide range of processes based on imitation, signaling or coordination. Based on this remark and simulations of time series, we suggest that if some econometric method could be invented as a tool to disentangle a conformist and anti-conformist behaviors from time series, then such model could be useful to model irregular periodicity patterns, amplifying oscillations, booms and bursts; in particular, if an econometric method was to be designed to recover parameters of our model from times series, it could probably be used to predict some of the shocks due to imitation processes.

Mots-clefs : influence, anonymity, anti-conformism, convergence, absorbing class

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