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Strategy dynamics

Jacobs, F.J.A.

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BIBLIOGRAPHY

- [1] E. Akin, The general topology of dynamical systems, American Mathematical Society, Graduate Studies in Mathematics Volume 1, 1993
- [2] M. Ausloos and F. Petroni, Statistical dynamics of religions and adherents, Europhysics Letters, Volume 77, Number 3, 2007
- [3] F. Battiston, A. Cairoli, V. Nicosia, A. Baule and V. Latora, Interplay between consensus and coherence in a model of interacting opinions, Physica D: Nonlinear Phenomena 323, 12-19, 2016
- [4] J. Buescu, Exotic attractors. From Liapunov stability to riddled basins, Birkhauser, Progress in Mathematics Volume 153, 1991
- [5] K. Burghardt, W. Rand and M. Girvan, Competing opinions and stubbornness: Connecting models to data, Phys. Rev. E 93, 032305, 2016
- [6] C. Borghesi and S. Galam, chaotic, staggered, and polarized dynamics in opinion forming: The contrarian effect, Phys. Rev. E 73, 066118, 2006
- [7] C. Borghesi, J. Chiche and J. P. Nadal, Between order and disorder: a ‘weak law’ on recent electoral behavior among urban voters?, PLoS One Volume 7 0039916, 2012
- [8] J. S. Brown and T. L. Vincent, A Theory for the Evolutionary Game, Theoretical Population Biology 31: 140-166, 1987
- [9] A. M. Calvão, M. Ramos and C. Anteneodo, Role of the plurality rule in multiple choices, J. Stat. Mech. Volume 2016, 023405, 2016
- [10] C. Castellano, S. Fortunato and C. Vittorio Loreto, Statistical Physics of Social Dynamics, Rev. Mod. Phys. 81: 591-646, 2009
- [11] N. Champagnat, R. Ferriere and S. Méléard, From individual stochastic processes to macroscopic models in adaptive evolution, Stochastic models 24, 2-44, 2008
- [12] T. Cheon and J. Morimoto, Balancer effects in opinion dynamics, Physics Letters A 380, 429-434, 2016
- [13] C. Conley, Isolated invariant sets and the Morse index, American Mathematical Society, Regional Conference Series in Mathematics no.38, 1978

- [14] C. Darwin, On the Origin of Species by Means of Natural Selection, London John Murray, 1859
- [15] G. Deffuant, D. Neau, F. Amblard and G. Weisbuch, Mixing Beliefs Among Interacting Agents, Advances in Complex Systems, Volume 3, 87-98, 2000
- [16] F. Dercole and S. A. H. Geritz, Unfolding the resident-invader dynamics of similar strategies, J. Theor. Biol. 394, 231-24, 2016
- [17] U. Dieckmann and R. Law, The dynamical theory of coevolution: a derivation from stochastic ecological processes, J. Math. Biol. 34, 579-612, 1996
- [18] I. Eshel, Evolutionary and continuous stability, J. Theor. Biol. 103, 99-111, 1983
- [19] B. W. Fitzgerald, R. A. van Santen and J. T. Padding, Modelling of collective motion, Chapter 9 pgs. 305-328 in Complexity Science An Introduction eds. M. A. Peletier, R. A. van Santen, E. Steur, World Scientific, 2019
- [20] M. S. de la Lama, Juan M. López and Horacio S. Wio, Spontaneous emergence of contrarian-like behaviour in an opinion spreading model, Europhysics Letters, Volume 72, Number 5, 2005
- [21] S. Galam, Minority Opinion Spreading in Random Geometry, Eur. Phys. J. B 25, Rapid Note: 403, 2002
- [22] S. Galam, Sociophysics: a personal testimony, Physica A; Statistical Mechanics and its Applications 336 (1-2), 49-55, 2004
- [23] S. Galam, Contrarian deterministic effects on opinion dynamics: "the hung elections scenario", Physica A: Statistical Mechanics and its Applications 333, 453-460, 2004
- [24] S. Galam, The dynamics of minority opinions in democratic debate, Physica A: Statistical Mechanics and its Applications 336 (1-2), 56-62, 2004
- [25] S. Galam, Heterogeneous beliefs, segregation, and extremism in the making of public opinions, Phys. Rev. E 71, 046123, 2005
- [26] S. Galam, Local dynamics vs. social mechanics, Europhysics Letters, Volume 70, Number 6, 2005
- [27] S. Galam, Les mathématiques s'invitent dans le débat européen, Interview par P. Lehir, Le Monde, Samedi 26 Février, 23, 2005
- [28] S. Galam, From 2000 Bush-Gore to 2006 Italian elections: voting at fifty-fifty and the contrarian effect, Qual. Quant. Int. J. Methodology, Volume 41, 579-589, 2007

- [29] S. Galam, Public debates driven by incomplete scientific data: The cases of evolution theory, global warming and H1N1 pandemic influenza, *Physica A; Statistical Mechanics and its Applications* 389, 3619-3631, 2010
- [30] S. Galam, *Sociophysics: A Physicist's Modeling of Psycho-political Phenomena*, Springer, 2012
- [31] S. Galam, Y. Gefen and Y. Shapir, Sociophysics: A new approach of sociological collective behaviour. 1. Mean-behaviour of a strike, *Math. J. Sociology* 9: 1-13, 1982
- [32] S. Galam and S. Moscovici, Towards a theory of collective phenomena: Consensus and attitude changes in groups, *European Journal of Social Psychology*, Volume 21, 49-74, 1991
- [33] S. Galam and S. Wonczak, Dictatorship from majority rule voting, *Eur. Phys. J. B* 18, 183-186, 2000
- [34] S. Galam and F. Jacobs, The role of inflexible minorities in the breaking of democratic opinion dynamics, *Physica A: Statistical Mechanics and its Applications* 381, 366-376, 2007
- [35] S. Galam and T. Cheon, Tipping Point Dynamics: A Universal Formula, arXiv:1901.09622v2 [physics.soc-ph], 2019
- [36] J. P. Gambaro and N. Crokidakis, The influence of contrarians in the dynamics of opinion formation, *Physica A: Statistical Mechanics and its Applications* 486, 465-472, 2017
- [37] S. Gekle, L. Peliti, and S. Galam, Opinion dynamics in a three-choice system, *Eur. Phys. J. B* 45, 569-575, 2005
- [38] S. A. H. Geritz, J. A. J. Metz, É. Kisdi and G. Meszéna, Dynamics of adaptation and evolutionary branching, *Phys. Rev. Lett.* 78, 2024-2027, 1997
- [39] S. A. H. Geritz, É. Kisdi, G. Meszéna and J. A. J. Metz, Evolutionarily singular strategies and the adaptive growth and branching of the evolutionary tree, *Evolutionary Ecology* 12: 35-57, 1998
- [40] S.A. H. Geritz, E. van der Meijden and J. A. J. Metz, Evolutionary dynamics of seed size and seedling competitive ability, *Theor. Pop. Biol.* 55, 324-343, 1999
- [41] S. A. H. Geritz, J. A. J. Metz and C. Rueffler, Mutual invadability near evolutionary singular strategies for multivariate traits, with special reference to the strongly convergence stable case, *Journal of Mathematical Biology* 72, 1081-1099, 2016

- [42] S. Goncalves, M. F. Laguna and J. R. Iglesias, Why, when, and how fast innovations are adopted, *Eur. Phys. J. B* 85, 192-200, 2012
- [43] J. P. Grime, *Plant Strategies and Vegetation Processes*, J. Wiley Publishers, 1979
- [44] J. L. Harper and J. Ogden, The reproductive strategy of higher plants: I. The concept of strategy with special reference to *Senecio vulgaris L.*, *The Journal of Ecology* 58: 273-286, 1970
- [45] D. L. Hartl and A. G. Clark, *Principles of Population Genetics*, 2nd ed., Sinauer, Sunderland MA, 1989
- [46] M. W. Hirsch, Systems of differential equations which are competitive or cooperative: I. Limit sets, *SIAM J. Math. Anal.* 13, 167-179, 1982
- [47] M. W. Hirsch, Systems of differential equations that are competitive or cooperative: II. Convergence almost everywhere, *SIAM J. Math. Anal.* 16, 423-439, 1985
- [48] M. W. Hirsch, Systems of differential equations which are competitive or cooperative: III. Competing species, *Nonlinearity* 1, 51-71, 1988
- [49] J. Hofbauer and K. Sigmund, *Evolutionary Games and Population Dynamics*, Cambridge University Press, Cambridge UK, 1998
- [50] M. Hurley, Attractors: persistence, and density of their basins, *Trans. American Mathematical Society*, Volume 269, 1, 247-271, 1982
- [51] F. J. A. Jacobs and S. Galam, Two-opinions-dynamics generated by inflexibles and non-contrarian and contrarian floaters, *Advances in Complex Systems*, Volume 22, Number 4, 2019
- [52] F. J. A. Jacobs and J. A. J. Metz, On the concept of attractor for community-dynamical processes I: The case of unstructured populations, *Journal of Mathematical Biology* 47, 222-234, 2003
- [53] F. J. A. Jacobs and J. A. J. Metz, Adaptive dynamics based on Lotka-Volterra community dynamics, in preparation
- [54] F. J. A. Jacobs, A bifurcation analysis for adaptive dynamics based on Lotka-Volterra community dynamics, in preparation
- [55] A. Jedrzejewski and K. Sznajd-Weron, Person-Situation Debate Revisited: Phase Transitions with Quenched and Annealed Disorders, *Entropy* 19 (8), 415, 2017

- [56] R. Hegselmann and U. Krausse, Opinion dynamics and bounded confidence: models, analysis and simulation, *J. Artif. Soc. and Social Sim.*, Volume 5, Number 3, 2002
- [57] D. W. Kahn, *Topology. An Introduction to the Point-Set and Algebraic Areas*, Dover Publications Inc., New York, 1995
- [58] S. Y. Kim, C. H. Park and K. Kim, Collective Political Opinion Formation in Nonlinear Social Interaction, arXiv:physics//0603178v1, 2006
- [59] É. Kisdi, Evolutionary branching under asymmetric competition, *J. Theor. Biol.* 197, 149-162, 1999
- [60] <https://www.mv.helsinki.fi/home/kisdi/addyn.htm>
- [61] F. C. Klebaner, S. Sagitov, V. A. Vatutin, P. Haccou and P. Jagers, Stochasticity in the adaptive dynamics of evolution: the bare bones, *J. Biol. Dyn.* 5, 174-162, 2011
- [62] P. L. Krapivsky and S. Redner, Dynamics of Majority Rule in Two-State Interacting Spin Systems, *Phys. Rev. Lett.* 90, 238701, 2003
- [63] E. Lee, P. Holme and S. H. Lee, Modeling the dynamics of dissent, *Physica A; Statistical Mechanics and its Applications* 486, 262-272, 2017
- [64] A. C. R. Martins and S. Galam, Building up of individual inflexibility in opinion dynamics, *Phys. Rev. E* 87, 042807, 2013
- [65] M. Mäs, A. Flache and D. Helbing, Individualization as Driving Force of Clustering Phenomena in Humans, *PLoS Comp. Biol.* 6 (10): e1000959, <https://doi.org/10.1371/journal.pcbi.1000959>, 2010
- [66] M. Mäs, A. Flache and J.A. Kitts, Cultural Integration and Differentiation in Groups and Organizations. In: V. Dignum, F. Dignum (eds.), *Perspectives on Culture and Agent-based Simulations. Studies in the Philosophy of Sociality*, vol 3. Springer International Publishing Switzerland, doi 10.1007/978-3-319-01952-9_5, 2014
- [67] N. Masuda, Voter models with contrarian agents, *Phys. Rev. E* 88, 052803, 2013
- [68] R. M. May and W. Leonard, Nonlinear aspects of competition between three species, *SIAM J. Appl. Math.* 29, 243-252, 1975
- [69] J. Maynard Smith, The theory of games and the evolution of animal conflicts, *Journal of Theoretical Biology* 47: 209-221, 1974
- [70] J. Maynard Smith, *Evolution and the Theory of Games*, Cambridge University Press, 1982

- [71] J. Maynard Smith, Evolutionary Genetics, 2nd ed., Oxford University Press, Oxford UK, 1998
- [72] J. A. J. Metz, R. M. Nisbet and S. A. H. Geritz, How should we define "fitness" for general ecological scenarios? *TREE* 7, 198-202, 1992
- [73] J. A. J. Metz, S. A. H. Geritz, G. Meszéna, F. J. A. Jacobs and J. S. van Heerwaarden, Adaptive dynamics: a geometrical study of the consequences of nearly faithful reproduction, pp. 183-231 in Stochastic and Spatial Structures of Dynamical Systems, KNAW Symposium Lectures Section Science, First Series 45, eds. S. J. van Strien and S. M. Verduyn Lunel, Amsterdam: North Holland, 1996
- [74] M. Mobilia, Nonlinear q-voter model with inflexible zealots, *Phys. Rev. E* 92, 012803, 2015
- [75] M. Mobilia and S. Redner, Majority vs. minority dynamics: Phase transition in an interacting two-state spin system, *Phys. Rev. E* 68, 046106, 2003
- [76] M. Mobilia, A. Petersen, and S. Redner, On the role of zealotry in the voter model, *J. Stat. Mech.* Volume 2007 Po8029, 2007
- [77] A. Mohammadinejad, R. Farahbakhsh and N. Crespi, Consensus Opinion Model in Online Social Networks Based on Influential Users, *IEEE Access* Volume 7, IEEE, 28436-28451; doi: 10.1109/ACCESS.2019.2894954, 2019
- [78] S. Mukherjee and A. Chatterjee, Disorder-induced phase transition in an opinion dynamics model: Results in two and three dimensions, *Phys. Rev. E* 94, 062317, 2016
- [79] J. Nash, Essays on Game Theory, Edward Elgar Publishing, 1996
- [80] N. Perony, R. Pfitzner, I. Scholtes, C. J. Tessone and F. Schweitzer, Enhancing consensus under opinion bias by means of hierarchical decision making, *Advances in Complex Systems*, Volume 16, Number 6, 2013
- [81] W. Pickering, B. K. Szymanski and C. Lim, Analysis of the high dimensional naming game with committed minorities, *Phys. Rev. E* 93, 0523112, 2016
- [82] M. A. Pires and N. Crokidakis, Dynamics of epidemic spreading with vaccination: Impact of social pressure and engagement, *Physica A: Statistical Mechanics and its Applications* 467, 167-179, 2017
- [83] N. Rodriguez, J. Bollen and Y. Y. Ahn, Collective Dynamics of Belief Evolution under Cognitive Coherence and Social Conformity, *PLoS One* Volume 11 0165910, 2016

- [84] D. Ruelle, Small random perturbations of dynamical systems and the definition of attractors, *Comm. Math. Phys.* **82**, 137-151, 1981
- [85] D. Ruelle, Elements of differentiable dynamics and bifurcation theory. Academic Press, 1989
- [86] Săvoiu G., Econophysics Background and Applications in Economics, Finance, and Sociophysics, ed. G. Săvoiu, Academic Press, 2013
- [87] J. J. Schneider, The influence of contrarians and opportunists on the stability of a democracy in the Sznajd model, *Int. J. Mod. Phys. C* **15**, 659-674, 2004
- [88] F. Schweitzer, Sociophysics, *Physics Today* **71**, 2, 40; doi: 10.1063/PT.3.3845, 2018
- [89] F. Slanina and H. Lavička, Analytical results for the Sznajd model of opinion formation, *Eur. Phys. J. B* **35**, 279-288, 2003
- [90] P. Sobkowicz, Social Simulation at the Ethical Crossroads, *Science and Engineering Ethics* **25**, 143-157, 2019
- [91] S. Solomon, G. Weisbuch, L. de Arcangelis, N. Jan and D. Stauffer, Social Percolation Models, *Physica A: Statistical Mechanics and its Applications* **277**, 239-247, 2000
- [92] A. O. Sousa, K. Malarz, and S. Galam, Reshuffling Spins With Short Range Interactions; When Sociophysics Produces Physical Results, *Int. J. Mod. Phys. C* **16**, 1507-1517, 2005
- [93] D. Stauffer and S. A. Sá Martins, Simulation of Galam's contrarian opinions on percolative lattices, *Physica A: Statistical Mechanics and its Applications* **334**, 558-565, 2004
- [94] K. Sznajd-Weron and J. Sznajd, Opinion evolution in closed community, *Int. J. Mod. Phys. C* **11**, 1157-1165, 2000
- [95] K. Sznajd-Weron, J. Szwabinski and R. Weron, Is the Person-Situation Debate Important for Agent-Based Modeling and Vice-Versa?, *PloS One Volume 9 e0112203*, 2014
- [96] C.J. Tessone, R. Toral, P. Amengual, H.S. Wio, and M. San Miguel, Neighborhood models of minority opinion spreading, *Eur. Phys. J. B* **39**, 535-544, 2004
- [97] A. M. Timpanaro, Diversity and Disorder in the Voter Model with Delays, arXiv:1708.08756v2, 2017
- [98] R. Toral and C. J. Tessone, Finite Size Effects in te Dynamics of Opinion Formation, *Commun. Comput. Phys.* **2**, 177-195, 2007

- [99] C. Vitale and A. Best, The paradox of tolerance: Parasite extinction due to the evolution of host defence, *J. Theor. Biol.* **474**, 78-87, 2019
- [100] G. Weisbuch, From Anti-Conformism to Extremism, *J. Artif. Soc. and Social Sim.*, Volume 18, Number 3, 2015
- [101] H. S. Wio, M. S. de la Lama, and J. M. López, Contrarian-like behavior and system size stochastic resonance in an opinion spreading model, *Physica A: Statistical Mechanics and its Applications* **371**, 108-111, 2006