Seminar's title: "**Social Interactions and Social Dynamics**"
University: University of Paris-Sorbonne
Level: Master 2 (Recherche) Sociologie ("action, normes, économie et politique")
Dates: 6, 13, 27 February; 6, 13, 20, 27 March; 3, 17, 24 April; 15 Mai
Time: 10pm-12pm
Location: see sessions' description below
Language: French
Instructor's contact: gianluca.manzo@cnrs.fr

Overview

The seminar focuses on the dynamic links between small-scale behaviors and large-scale outcomes. In particular, the seminar explores a specific class of mechanisms bridging levels, namely *social multipliers*, in which the dynamic interdependence among actors' behaviours create a non-linear relation between actions and resulting structures. Three forms of behavioral interdependences will be especially studied: a/ aggregate-mediate interdependences, b/ space-based interdependences, c/ and, network-based interdependence.
Within this framework, research examples from classics, contemporary research and instructor's current work will be used to address a variety of macroscopic patterns and dynamics, including collective action, spatial segregation, systemic crises, opinion diffusion, homophilious social networks, educational inequalities, happiness, status inequality, and the diffusion of technological innovations.
The seminar has two minimal goals. First, it is intended to provide students with the conceptual and methodological bases needed to navigate the international literature on the analysis of complex social dynamics that nowadays develops at the intersection of social sciences, psychics, and computer science. Second, the seminar aims to provide students with a set of theoretical and methodological basic building blocks that they may combine to set out an original research design for their Master or PhD dissertation.
The seminar is based on mathematical models and computer simulations but techniques are not the primary focus of the class. Thus previous knowledge in formal models and programming is a plus but it is not required.

Session 1: Theoretical and methodological principles

6 February 2015, 10am-12pm, 28 Rue Serpente (75005), room D116

Session 1 introduces the general principles behind the models and the tools discussed in the seminar. These principles falls within a research program currently named "analytical sociology". The version of this research program animating the seminar focuses on three essential elements: a/ building explanations that bridge levels of analysis; b/ using dynamic interdependence structures as bridging mechanisms; c/ designing formal models to help theory building and testing. During *session 1*, as to (a), special attention is devoted to the so-called "Coleman boat"; as to (b), three different forms of behavioral interdependence are introduced; as to (c), the basic logic of agent-based modeling and simulation is presented.

Suggested readings (in chronological order)

Schelling, T.C. (1978) *Micromotives and Macrobehavior*, W.W. Norton, New York.
Boudon R. (1979). Generating models as a research strategy. In Robert K. Merton, James S. Coleman and Peter H . Rossi (eds.), *Qualitative and Quantitative Social Research*. New York: The Free Press, 51- 64.
Cherkaoui M. (2005). *Invisible Codes: Essays on Generative Mechanisms*, Oxford, Bardwell Press (chs. 3-5).
Scott J., Carrington P. (eds.) (2011) *The SAGE Handbook of Social Network Analysis*. Sage, London (chs. 2-5, 7).
Erikson E. (2013) Formalist and Relationalist Theory in Social Network Analysis. *Sociological Theory*, 31(3) 219–242.
Buskens V., Corten R., Raub (2014). Social Networks. Norman Braun & Nicole J. Saam, Hg. (2014). Handbuch Modellbildung und Simulation in den Sozialwissenschaften. Wiesbaden: Springer VS, W. 663–687.
Manzo G. (2014). Data, Generative Models, and Mechanisms: More on the Principles of Analytical Sociology. In G. Manzo (ed.), *Analytical Sociology: Actions and Networks*, Chichester, Wiley, p. 4-52.
Manzo G. (2015) Macrosociology-Microsociology. In: James Wright, Editor-in-Chief, *The International Encyclopedia of Social and Behavioral Sciences* 2e. Oxford: Elsevier Ltd.

Less technical

Gladwell (2000). *The Tipping Point: How Little Things Can Make a Big Difference*, Little Brown.
N. Christakis, J. H. Fowler (2011). *Connected*, Back Bay BooksM.

In French

Manzo G. (2005). Variables, Mécanismes et simulations : une synthèse des trois méthodes est-elle possible? Une analyse critique de la littérature. *Revue Française de sociologie*, 46, 1, 37-74.
Manzo G. (2007). Progrès et 'urgence' de la modélisation en sociologie. Du concept de modèle générateur et de sa mise en œuvre. *L'Année Sociologique*, 57, 1, 13-61.
Manzo G. (2014). Potentialités et limites de la simulation multi-agents : Une introduction. *Revue Française de Sociologie*, 55, 4, 653-688.

Session 2: Local thresholds, collective action, and spatial segregation

13 February 2015, 10am-12pm, 20 Rue Berbier du Mets (75013), room "Akoun" (1st floor)

How does heterogeneity in actors' preferences translate into systemic patterns when actors' choices are interdependent? *Session 2* addresses this question by introducing two classical models, namely Granovetter's models of collective action and Schelling's model of racial segregation. Both models study how behavioral interdependence can create non-linear and unexpected macroscopic, but they illustrate two different forms of interdependence, aggregate-mediated and space-based interdependence respectively. The conceptual structure of the two models is presented and an agent-based implementation is introduced to show how this kind of models can be studied and modified.

Suggested readings (in chronological order)

Schelling T. C. (1971). Dynamic Models of Segregation, *Journal of Mathematical Sociology*, 1, p. 143-186.

Granovetter M. (1978). Threshold Models of Collective Behavior, *American Journal of Sociology*, *83*, 6, p. 1420-1443.
Granovetter M., Soong, R. (1983). Threshold models of diffusion and collective behavior. *Journal of Mathematical Sociology*, 9, 165–179.
Granovetter M. (1988). Threshold models of diversity: Chinese restaurants, residential segregation and the spiral of silence. *Sociological Methodology*, 18, 69–104.
Bruch, E., & Mare, R. (2006). Neighborhood choice and neighborhood change. *American Journal of Sociology*, 112(3), 667–709.

Session 3: Information cascades, systemic crises, and opinion diffusion

27 February 2015, 10am-12pm, 20 Rue Berbier du Mets (75013), room "Akoun" (1st floor)

How does actors' interdependence turn heterogeneity in actors' beliefs into homogeneity, thus generating unexpected (and possible undesirable) systemic patterns? *Session 3* addresses this question by introducing two classical models in which aggregate- and/or space-mediated interdependence is based on imitation. In particular, Merton's classical concept of self-fulfilling prophecy and the original "voter model" are introduced and translated into an agent-based model in order to show how "systemic crises" and "opinion clusters" can emerge from the bottom-up and irrespectively from actors' intentions.

Suggested readings (in chronological order)

Merton R. (1948). The Self-fulfilling Prophecy. *The Antioch Review*, 8 (2), 193-210.
Bikhchandani, S., Hirshleifer, D., and Welch, I. (1992). A Theory of Fads, Fashion, Custom, and Cultural Change as Informational Cascades. *Journal of Political Economy*, 100, 5, 992-1026.
Biggs M. (2009). Self-Fulfilling Prophecies. In P. Hedström, P. Bearman, *The Oxford Handbook of Analytical Sociology*, Oxford: Oxford University Press, 2009, pp. 294-314.
Castellano, C., Fortunato, S., and Loreto, V. (2009) Statistical physics of social dynamics. *Reviews of Modern Physics*, 81, 591–646 (in particular, section III « Opinion Dynamics »).
Easley D., Kleinberg J. (2010). Information Cascades. In Easley D., Kleinberg J. (2010). *Networks, Crowds, and Markets: Reasoning About a Highly Connected World*, Cambridge University Press, Cambridge (ch. 16).

Session 4: Random networks

6 March 2015, 10am-12pm, 20 Rue Berbier du Mets (75013), room "Akoun" (1st floor)

In order better to understand network-based interdependences implied by macroscopic phenomena studied in sessions 7-11, *session 4* first introduces the concept of network and presents elementary node- and network-level descriptive statistics. Then, the simplest theoretical model of social network, i.e. Erdos and Renyi's model, is introduced. Algorithms and functions to manipulate (and visualize) network data and to generate random networks are also presented and explained.

Suggested readings (in chronological order)

Erdos P. Renyi A. (1959) On Random Graphs, *Publicationes Mathematicae*, (6), 290–297.
Jackson M. O. (2008) *Social and Economic Networks*, Princeton University Press, Princeton (chs. 2, 4, and 5).
Easley D., Kleinberg J. (2010). *Networks, Crowds, and Markets: Reasoning About a Highly Connected World*, Cambridge University Press, Cambridge (ch. 1).

Scott J., Carrington P. (eds.) (2011) *The SAGE Handbook of Social Network Analysis*. Sage, London (chs. 23-24).

Session 5: Small-world networks

13 March 2015, 10am-12pm, 20 Rue Berbier du Mets (75013), room "Akoun" (1st floor)

Real-world networks typically look different from random networks *à la* Erdos and Renyi. In particular, observed social networks tend to be more locally densely connected and more reachable. *Where do the co-existence of cliques and reachability come from*? Thus, *session 5* first describes Granovetter's original observations and intuitions on "strong" and "weak ties", and, then, introduces a second theoretical models of social networks, i.e. Watts and Strogatz's model, that was designed to capture the co-existence of "strong" and "weak" ties. Algorithms and functions to generate "small-world random networks" are also presented and explained.

Suggested readings (in chronological order)
Travers J., Milgram S. (1969). An Experimental Study of the Small World Problem. *Sociometry*, 32, 4, 425-443.
Granovetter M. (1973). The strength of weak ties. *American Journal of Sociology*, 78(6), 1360–1380.
Granovetter M. (1983). The strength of weak ties: A network theory revisited. *Sociological Theory*, 1, 201–233.
Watts D. J., Strogatz, S. H. (1998). Collective dynamics of 'Small-world' networks. *Nature*, 393, 440–442.
Watts D. J. (1999). Networks, dynamics, and the Small-World phenomenon. *American Journal of Sociology*, 105(2), 493–527.
Watts D. J. (2004). The new science of networks. *Annual Review of Sociology*, 30, 243–270.
Centola, D., & Macy, M. W. (2007). Complex contagions and the weakness of long ties. *American Journal of Sociology*, 113(3), 702–734.

To get an overview
Jackson M. O. (2008) *Social and Economic Networks*, Princeton University Press, Princeton (ch. 5).
Easley D., Kleinberg J. (2010). *Networks, Crowds, and Markets: Reasoning About a Highly Connected World*, Cambridge University Press, Cambridge (chs. 3, 20).
Kadushin, C. (2012) *Understanding Social Networks*. NY: Oxford University Press (ch. 8).

Session 6: Scale-free networks

20 March 2015, 10am-12pm, 20 Rue Berbier du Mets (75013), room "Akoun" (1st floor)

Real-world networks differs from both random networks *à la* Erdos and Renyi and "small-world" random networks *à la* Watts and Strogatz in one important respect, namely the distribution of node's degree. *Where does asymmetry in degree distribution come from*? *Session 6* introduces a third fundamental theoretical models of social networks, i.e. Barabasi&Albert's model, that was designed to capture the observation that a few nodes tend to concentrate a large fraction of links. Algorithms and functions to generate "scale-free" networks are presented and explained.

Suggested readings (in chronological order)
De Solla Price D. J. (1965). Networks of Scientific Papers. *Science* 149 (3683), 510–515.
Barabási A. L., Albert, R. (1999). Emergence of scaling in random networks. *Science*, 286(5439), 509–512.

Barabási A. L., Bonabeau Eric (2003). Scale-FreeNetworks, *Scientific American*, 288, 60-69 (2003).
Jackson M. O. (2008) *Social and Economic Networks*, Princeton University Press, Princeton (ch. 5).
Barabasi A.-L.(2009). Scale-free Networks: A Decade and Beyond. *Science* 325, 412-13.

Session 7: Homophilious network generation

27 March 2015, 10am-12pm, 20 Rue Berbier du Mets (75013), room "Akoun" (1st floor)

One of the most recurrent features of real-world social networks is homophily, i.e. the tendency of nodes with similar attributes to be linked together more frequently than one may expect given the distributions of these attributes. *Where do homophilious networks come from*? *Session 7* introduces a formal model, originally outlined by James Coleman and, more recently, refined by John Skvoretz, that explains homophilious networks through simple actors' behaviours that are interdependent. An agent-based implementation of Skvoretz's model is presented and simulated in order to show some counter-intuitive consequences fueled by the aggregate-mediated interdependence among actors' decision to form a link.

Suggested readings (in chronological order)
Lazarsfeld PF, Merton RK. (1954). Friendship as a social process: a substantive and methodological analysis. In *Freedom and Control in Modern Society*, ed. M Berger, pp. 18–66. New York: Van Nostrand.
McPherson J., Smith-Lovin L., & Cook J. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, 27, 415–444.
Skvoretz J. (2013). Diversity, Integration, and Social Ties: Attraction versus Repulsion as Drivers of Intra- and Intergroup Relations. *American Journal of Sociology* 119: 486-517.

Additional theoretical stimuli
Pujol J. M., Flache A., Delgado J., Sangüesa R. (2005) How Can Social Networks Ever Become Complex? Modelling the Emergence of Complex Networks from Local Social Exchanges. *Journal of Artificial Societies and Social Simulation* vol. 8, no. 4.
Jackson M. O. (2008) *Social and Economic Networks*, Princeton University Press, Princeton (ch. 6)
Hamill L., Gilbert N. (2009). Social Circles: A Simple Structure for Agent-Based Social Network Models. *Journal of Artificial Societies and Social Simulation* 12(2)3.

Session 8: Network-based externalities and education inequalities

3 April 2015, 10am-12pm, 20 Rue Berbier du Mets (75013), room "Akoun" (1st floor)

How does heterogeneity in actors' preferences and resources translate into systemic pattern of inequality when actors tend to follow others' choices along homophilious-social-networks lines? To address this question, *Session 8* first introduces the concept of "network externalities", and, then, applies it to educational inequalities. A formal model of educational choices is presented and, by means of agent-based simulations, it is shown how educational imitative behaviours spread through socially segregated social networks and generate distributions of education across social groups that strongly resemble actual distributions in contemporary France.

Suggested readings (in chronological order)
Manski, C. (1993b) Identification problems in social sciences. *Sociological Methodology*, 23, 1–56.

Manski, C. (2000) Economic analysis of social interaction. *Journal of Economic Perspectives*, 14(3), 115–136.
DiMaggio P. Garip F. (2011). How network externalities can exacerbate intergroup inequality. *American Journal of Sociology*, 116(6), 1887–1933.
DiMaggio P., Garip F. (2012) Network effects and social inequality. *Annual Review of Sociology*, 38, 93–118.
Manzo, G. (2013) Educational choices and social interactions: a formal model and a computational test. *Comparative Social Research*, 30, 47–100.

Session 9: Network-based comparisons and social satisfaction

17 April 2015, 10am-12pm, 20 Rue Berbier du Mets (75013), room "Akoun" (1st floor)

How do systemic levels of social satisfaction change when the structure of social comparisons in which actors are embedded is modified? To answer this question, *session 9* first introduces Merton's classical concept of "reference group", and, then, a theoretical model explaining why individuals may be unhappy with their choices when they look at others' choices. Then, through agent-based simulations, different network structures are introduced in the model and it is shown how network features, namely degree distribution, impacts on the type of comparisons actors can structurally perform and, ultimately, on the intensity of happiness at the systemic level.

Suggested readings (in chronological order)

Boudon R. (1982 [1977]). *The Unintended Consequences of Social Action*. London: Macmillan (ch. 5).
Gartrell, David. 1987. Network approaches to social evaluation. *Annual Review of Sociology* 13: 49-66.
Manzo, G. (2011) Relative deprivation in silico: agent-based models and causality in analytical sociology, in *Analytical Sociology and Social Mechanisms* (ed. P. Demeulenaere), Cambridge University Press, Cambridge, pp. 266–308.

In French

Manzo G. (2011). Satisfaction personnelle, comparaisons et sentiments de justice. in M. Forsé & O. Galland (eds.), *Les Français face aux inégalités et à la justice sociale*, Paris, Armand Colin, ch. 16, 171-178.

Session 10: Homophilious interactions and status inequality

24 April 2015, 10am-12pm, 20 Rue Berbier du Mets (75013), room "Akoun" (1st floor)

How do imitation and retaliation taking place in homophilious interactions contribute to generate systemic patterns of status inequality? To address this question, *session 10* builds on recent theoretical models of status hierarchies formalizing Merton's original intuitions on "rich-gets-richer" dynamics. A new model that makes simple heuristic interact with homophilious networks along status lines is introduced. Agent-based simulations are used to show how this model generates status inequality from virtual no inequality and how intense status inequality can be when low-status actors accept to interact with high-status actors and be snubbed by them.

Suggested readings (in chronological order)

Merton R. K. (1968). The Matthew Effect in Science. The Reward and Communication Systems of Science Are Considered. *Science*, 159:56-63.

Merton R. K. (1988). The Matthew Effect in Science, II: Cumulative Advantage and the Symbolism of Intellectual Property. *ISIS*, 79, 606-23.
Gould R. (2002). The Origins of Status Hierarchies: A Formal Theory and Empirical Test. *American Journal of Sociology*, 107, 1143-78.
DiPrete T. A., Eirich G. (2006). Cumulative Advantage as a Mechanism for Inequality: A Review of Theoretical and Empirical Developments. *Annual Review of Sociology*, 32, 271-97.
Freda L., Podolny J., Tao L. (2009). A Sociological (De)Construction of the Relationship between Status and Quality." *American Journal of Sociology*, 115, 755-804.
Bothner M. S. et al. (2010). When Do Matthew Effects Occur?" *Journal of Mathematical Sociology*, 34, 80-114.
Easley D., Kleinberg J. (2010). *Networks, Crowds, and Markets: Reasoning About a Highly Connected World*, Cambridge University Press, Cambridge (chs. 18).
Manzo G., Baldassarri D. (2014) "Heuristics, Interactions, and Status Hierarchies: An Agent-based Model of Deference Exchange", *Sociological Methods and Research*, pp. 1-59 (DOI: 10.1177/0049124114544225).

Less technical

Rigney, D. 2010. *The Matthew Effect - How Advantage Begets Further Advantage*. New York: Columbia University Press.

Session 11: Social networks and innovation diffusion

15 Mai 2015, 10am-12pm, 20 Rue Berbier du Mets (75013), room "Akoun" (1st floor)

How do social networks facilitate or obstruct the adoption of new products, social practices, or technological devices? *Session 11* addresses this question by discussing a case study concerning the diffusion of technological innovations among Muslim and Hindu potters leaving in rural contexts in North-western India. First, real-world networks concerning patterns of influences and parental links among potters are described. Then, a formal model relating actors' network location and the probability of adopting the new technique is introduced. Agent-based simulations are used to assess how important differences in Muslim and Hindu networks are for the explanation of the speed at which the new technology spreads within the two communities.

Suggested readings (in chronological order)

Coleman, J. S., Katz, E., Menzel, H. (1966). *Medical Innovation: A Diffusion Study*. Indianapolis: Bobbs-Merrill.
Valente, Th. (1995) *Network Models of the Diffusion of Innovations*. Hampton Press, Cresskill, NJ.
Rogers, E. M. (2003). *Diffusion of Innovations*. New York: Free Press (ch. 8).
Jackson M. O. (2008) *Social and Economic Networks*, Princeton University Press, Princeton (ch. 7).
Kadushin, C. (2012) *Understanding Social Networks*. NY: Oxford University Press (ch. 9).