PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

PhD Student: Elena Napoletano

XXX Cycle

Training and Research Activities Report – Third Year

Tutor: Franco Garofalo

1. Information

    a. Elena Napoletano, M. Sc. Degree cum laude in Ingegneria Gestionale – University of Naples Federico II
    b. XXX Cycle- ITEE – Università di Napoli Federico II
    c. Fellowship: «Fondo Sociale Europeo, P.O. Campania 2007/2013-2014/2020»
    d. Tutor: Prof. Franco Garofalo

2. Study and Training activities

    a. Courses

        - *"Piecewise smooth dynamical systems"*
          Lecturer: Prof. John Hogan

    b. External seminars

        - Title: *"Networked Control Systems: Robustness and Resilience"(Università degli studi di Firenze)*
          (4 CFU)
          Lecturer: Bruno Sinopoli
          Date: *19-22.06.2017*

3. Research activity

    a. Title: Informational cascade as a pinning control problem

    b. Study: Dynamics and control of complex networks, agent-based models, behavioural economics, artificial financial markets, pinning control.

    c. Research description

Informational cascades are imitation phenomena which can emerge in financial markets. When an informational cascade occurs, the agents completely disregard their own information and blindly follow the behavior of the other traders. The models in the literature, although capable of replicating this phenomenon, do not take into account the possibility of reproducing informational cascades of different intensities, displayed by empirical evidences.
To overcome this limitation, we introduce a new model of opinion dynamics capable of replicating informational cascades of different magnitudes. This is accomplished by viewing informational cascades as a diffusion of a certain opinion in a network of financial agents, whose trading strategies dynamically depend on that of their neighbors according to a nonlinear law. Following the logic of pinning control, we model the generic exogenous information triggering informational cascades as a control signal fed by an external entity, the pinner, to a subset of agents. By virtue of the received information, they take the trading action that will be imitated by the non informed traders.

In this framework, we can exploit some results of the so called ``partial pinning control'' in order to assess the number of non informed agents which reach consensus on the pinner's opinion, and thus are involved in the informational cascade. This assessment is based on the topological structure

connecting the agents: different topologies generate informational cascades of different magnitudes. We test our model of opinion dynamics in an agent-based artificial financial market, showing its capability of replicating informational cascades of different and predictable intensities.

4. Products
    a. Publications
        i. Already published: DeLellis, P., Garofalo, F., Iudice, F. L., & Napoletano, E. (2015). "Wealth distribution across communities of adaptive financial agents". *New Journal of Physics*, *17*(8), 083003.
        ii. Garofalo, F., Iudice, F. L., & Napoletano, E. "Herding as a consensus problem. *Nonlinear Dynamics (*Accepted*)*

5. Conferences and Seminars

    a. Seminar: "Informational cascade as a pinning control problem" (Politecnico di Torino) Date: 3.11.2017

Student: Elena Napoletano elena.napoletano@unina.it **Tutor: Franco Garofalo** franco.garofalo@unina.it **Cycle XXX**

	Credits year 1								Credits year 2								Credits year 3								
	Estimated	1 bimonth	2 bimonth	3 bimonth	4 bimonth	5 bimonth	6 bimonth	Summary	Estimated	1 bimonth	2 bimonth	3 bimonth	4 bimonth	5 bimonth	6 bimonth	Summary	Estimated	1 bimonth	2 bimonth	3 bimonth	4 bimonth	5 bimonth	6 bimonth	Summary	Total
Modules	18			3	4	7	6	**20**	9		6		3			**9**								**0**	**29**
Seminars	13		0,8	1,6	0,4		0,2	**3**	6		1,3	0,5	4,6	1,6		**8**					4			**4**	**15**
Research	34	10	9	5	7	6	5	**42**	42	10	3	9	3	8	10	**43**		10	10	10	5	10	10	**55**	**140**
	65	10	9,8	9,6	11	13	11	**65**	57	10	10	9,5	11	9,6	10	**60**	0	10	10	10	9	10	10	**59**	**184**