

Social Networks, Logic and Games

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1 Aim

Drawing on an ongoing Amsterdam-Beijing collaboration, we explore recent work on logical analysis of social phenomena, extending the usual emphasis on individual agents and their interaction to social structure. We cover a range from animal-style behavior to conscious deliberating agents, with games as an eventual interest. This is of theoretical importance in grasping fundamentals of social phenomena, but it may also have practical implications for a better understanding of the ‘information storms’ in society.

The project starts with a sort of mini-course on major current trends and techniques, where we will ask you to read some material before each session. *If this agenda turns out to be too much, we will drop some topics on the fly.*

After that, we want to have 2 or 3 groups working on a special topic in this area chosen in consultation with us. Two topics that appeal to us right now are: (a) modeling and understanding the border-line between deliberate and automated behavior, (b) design and analysis of social network games.

2 Topics

Week 1 Logic and information change in social scenarios.

- 1.1 Social knowledge: multi-agent, group level. Social relations. Epistemic friendship logic, and related logics for networks.
- 1.2 Communication and belief change in social settings. From automated update rules to evidence, trust, and deliberation.

Week 2 Information dynamics of networks and games.

- 2.1 Dynamics of social relations. Stepwise network change and local update logics. The long term: dynamical systems behavior over time, logical analysis of protocols that allow for fixed-points and oscillations.
- 2.2 Games over social networks: from algorithms to game theory. Network logics, Boolean games, and evolutionary game theory.

3 Meeting times

1. 14:00-16:00 hrs, Jan 8 (Friday)
2. 14:00-16:00 hrs, Jan 11 (Monday)
3. 14:00-16:00 hrs, Jan 13 (Wednesday)
4. 14:00-16:00 hrs, Jan 15 (Friday)
5. 14:00-16:00 hrs, Jan 18 (Monday)
6. 14:00-16:00 hrs, Jan 20 (Wednesday)

Work on small group papers: 21–29 Jan.

Deadline for submitting papers: 8 February.

4 Requirements

Knowledge of basic classical logic and modal logic.

5 Literature

What follows is a list to give you an impression of relevant literature, though we do not cover the whole current wave on logic and networks. Evidently, you will not have to study all the texts that follow here. We will indicate in due course which precise readings are needed to prepare for which topic.

- Alexandru Baltag, Fenrong Liu and Sonja Smets, ‘Reason-Based Belief Revision in Social Networks’, KNAW Workshop, Amsterdam, 2014.

- Alexandru Baltag, Zoe Christoff, Rasmus Rendsvig and Sonja Smets, ‘Dynamic Epistemic Logic for Threshold Models’, extended version of ELISIEM workshop paper, ILLC, University of Amsterdam, 2015.
- Johan van Benthem, *Logic in Games*, MIT Press, Cambridge MA, 2014.
- Johan van Benthem, ‘Oscillations, Logic and Dynamical Systems’, PP-2015-10, ILLC Prepublication. In S. Ghosh and J. Szymanik, eds., *Rineke Verbrugge 50*, College Publications, London, 2015.
- Zoe Christoff, *Logic, Networks, and the Spread of Opinion*, Ph.D. thesis under construction, ILLC, University of Amsterdam, 2015.
- Jan van Eijck and Malvin Gattinger, ‘Protocols for Evolving Networks’, ILLC & Joint Research Center for Logic Tsinghua University, 2015.
- Javier Gutierrez, Paul Harrenstein and Michael Wooldridge, ‘Reasoning about Equilibria in Game-like Concurrent Systems’, in C. Baral et al., eds., *Proceedings Fourteenth International Conference on Principles of Knowledge Representation and Reasoning*, Vienna, Austria, 2014.
- Vincent Hendricks and Pelle Hansen, *Infostorms*, Copernicus Books and Springer, New York, 2014.
- Fenrong Liu and Sonja Smets, book manuscript, *The Epistemic Labyrinth: an Introduction to Reasoning about Knowledge in Social Networks*, ILLC and Tsinghua University, 2015.
- Fenrong Liu, Jeremy Seligman, and Patrick Girard, ‘Logical Dynamics of Belief Change in the Community’, *Synthese*, Volume 191, Issue 11, 2403–2431, 2014.
- Jeremy Seligman and Declan Thompson, ‘Social Network Games’, in W. van der Hoek, W. Holliday and W-f. Wang, eds., *Proceedings LORI-V Taipei*, Springer Lecture Notes in AI, Heidelberg, 2015.
- Jeremy Seligman, Fenrong Liu and Patrick Girard, ‘Facebook and Epistemic Logic of Friendship’, in Burkhard C. Schipper, ed., *Theoretical Aspects of Rationality and Knowledge Proceedings of the 14th Conference Chennai*, India, 2013, 229–238.
- Brian Skyrms and Robin Pemantle, ‘A Dynamic Modal of Social Network Formation’, *Proceedings American National Academy of Sciences*, 97:16, 2000, 9340–9346.