Opinion Dynamics and Political Conflicts in the Media
A Complex Network Perspective

Laboratory: Laboratoire d'Informatique de Paris 6 (UMR 7606)

Team: Complex Networks (`http://www.complexnetworks.fr/`)

Supervisors: Robin Lamarche-Perrin (`Robin.Lamarche-Perrin@lip6.fr`)

Matthieu Latapy (`Matthieu.Latapy@lip6.fr`)

Clémence Magnien (`Clemence.Magnien@lip6.fr`)

Motivations: Social media and the digitisation of news are having far-reaching effects on the way individuals and communities communicate, organise, and express themselves. Can the information circulating on these platforms be tapped to better understand and analyse the enormous problems facing our contemporary society? Could this help us to better monitor the growing number of social crises due to cultural differences and diverging world-views? Studying the structure of debates in the public sphere requires sophisticated methods for the analysis of information flows between individuals. How information is shaped and broadcasted by mass media? How to describe the way opinions are discussed in social media? Debates are often represented as complex entanglements of such social interactions, embedded in space and time, and displaying a multilevel structure: From individual to institutional discourses; From regional to international matters; From the fast dynamics of media "buzzes" to the slower dynamics of social controversies.

Theoretical Work: To address these challenging issues, this internships aims at developing new methods for the analysis of multidimensional and multilevel networks in social sciences. Such methods could build on recent work in *graph theory* regarding the "link stream" representation of evolving networks, which provides a novel and intuitive formalism for the spatio-temporal description of social interactions by focusing on their causal structure (who interacts with whom, when) and concealing for a moment their content (how, why, about what). Jointly, using *information theory*, these methods could integrate recent developments in data aggregation to provide a macroscopic perspective on such interaction structures: How can one achieve a global understanding of complex interaction patterns? This internship does not require any preliminary knowledge about these two theoretical frameworks. However, it requires the capacity to work with abstract formalisms in general, in order to build novel and consistent methods in computer science.

Applied Work: The efficiency of the proposed analysis methods will be evaluated in parallel by empirical work on real data. First, the internship could focus on the analysis of opinion dynamics in social media, such as Twitter, by looking at a particular debate (*e.g.*, climate change, presidential elections, Brexit). In this case, a focus will be put on the study of typical interaction patterns between actors of the debate, such as: polarisation, leadership, communitarianism, and solidarity behaviours. Second, the internship could focus on the analysis of conflicting world views in mass media, by modelling news about international conflicts as a dynamical graph between countries (*e.g.*, co-occurrences in articles). The world view of different newspapers could then be compared by graph analysis, thus allowing to exhibit particular behaviours depending on the geographical, political, and economical interests of the media. This internship hence requires a curiosity for some of the research questions that arise in social sciences about social or mass media, and might lead to joint work with researchers in geography, political sciences, or media studies.

Research Context: This internship will take place in the "Complex Networks" team of the LIP6 (Laboratoire d'Informatique de Paris 6), located in Paris. It will be founded by the European project ODYCCEUS (Opinion Dynamics and Cultural Conflicts in the European Space).

References:

[1] Claude Grasland, Robin Lamarche-Perrin, Benjamin Loveluck, and Hugues Pecout. L'agenda géomédiatique international : analyse multidimensionnelle des flux d'actualité. *L'Espace Géographique*, 45:25–43, 2016.

[2] Robin Lamarche-Perrin, Yves Demazeau, and Jean-Marc Vincent. Building Optimal Macroscopic Representations of Complex Multi-agent Systems. Application to the Spatial and Temporal Analysis of International Relations through News Aggregation. *Transactions on Computational Collective Intelligence*, XV:1–27, 2014.

[3] Robin Lamarche-Perrin, Tiphaine Viard, and *al.* A General Framework for Graph Aggregation. *arXiv.org, CoRR*, Forthcoming in 2016.

[4] Tiphaine Viard, Matthieu Latapy, and Clémence Magnien. Computing maximal cliques in link streams. *Theoretical Computer Science*, 609:245–252, 2016.