



# Memory-based opinion dynamics

M.Sc. project

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## Supervisors

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## Location

Centre de Recherche en Automatique de Nancy, UMR CNRS 7039  
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## Length

5 to 6 months, starting date from February, 1 2019

## Keywords

Opinion dynamics, stability, Lyapunov theory, hybrid dynamical systems, multi-agent systems

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## Topic

Dynamical models of opinion dynamics are promising tools to improve our understanding of trends evolution within a social network, see [1-3] for instance. The main idea is to model the members' opinions by local variables, whose evolutions depend on the interactions with some neighbors. Most of these models assume that a person is influenced by another provided their instantaneous opinions are close, in some suitable sense. While this modelling choice makes sense, it does not take into account the history of a relationship between two persons. While, loosely speaking, if two persons were close friends some time ago, this will necessarily have an impact on their relationship but most existing models miss this point.

The project goal is to analyze this phenomenon by proposing an appropriate mathematical dynamical model, which copes with memory-based interactions. The model will be hybrid as it will combine continuous-time dynamics, to describe the evolution of the opinions, as well as discrete-time dynamics, to cope with loss and creation of links within the network. The proposed model will first be numerically validated using Matlab. Afterwards, we will analyze its stability by exploiting hybrid Lyapunov techniques like in [4].

It has to be noted that this project is at the crossroad of control engineering, applied mathematics and sociology.

The project will be supervised by Romain Postoyan (CNRS, CRAN, Université de Lorraine) and Constantin Morarescu (CRAN, CNRS, Université de Lorraine) in Nancy (France). The work will be done in close collaboration with Luca Zaccarian (CNRS, LAAS, University of Trento).

## Candidate

We are looking for a candidate doing a M.Sc. in control engineering or in applied mathematics.

There is the opportunity to pursue this work with a PhD.

Feel free to contact Romain Postoyan ([romain.postoyan@univ-lorraine.fr](mailto:romain.postoyan@univ-lorraine.fr)) for further information.

## References

- [1] Parsegov, S. E., Proskurnikov, A. V., Tempo, R., & Friedkin, N. E. (2017). Novel multidimensional models of opinion dynamics in social networks. *IEEE Transactions on Automatic Control*, 62(5), 2270-2285.
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- [3] Friedkin, N. E., & Johnsen, E. C. (1990). Social influence and opinions. *Journal of Mathematical Sociology*, 15(3-4), 193-206.
- [4] Frasca, P., Tarbouriech, S., & Zaccarian, L. (2016). A hybrid model of opinion dynamics with limited confidence. *IFAC-PapersOnLine*, 49(18), 351-355.

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