

# Language-Independent Network Attitudinal Embedding



Pedro Ramaciotti Morales, Jean-Philippe Cointet, Marc Santolini, Emiliano Grossman  
médialab & Centre d'Études Européennes (Sciences Po), CRI (U. de Paris)

#SocialNetworks #NetworkEmbedding #OpinionMining

#ComputationalSocialSciences #Polarization #AlgorithmAudit #GNN

## Motivations

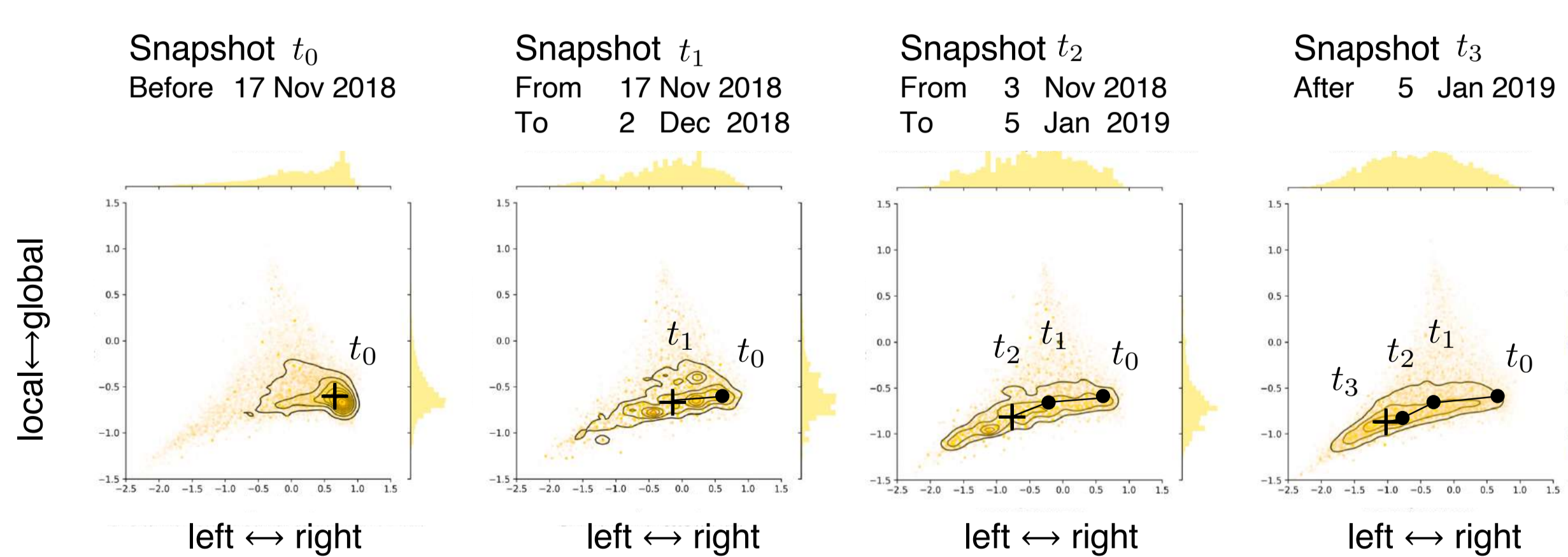
Recent advances have shown that opinions can be mined from digital traces in social network/media but have been developed in the US for one-dimensional opinions scales ranging from liberal to conservative opinions). Extending these methods to European settings in multidimensional opinion spaces remains an open challenge, with numerous potential applications in a multitude of disciplines.

## Proposed solution

To solve this shortcoming in existing methods, we propose leveraging social network embedding methods based on psychometric equations and embedding-matching in with opinion spaces using poll and survey data. The goal is to take purely topological network data, and project users and other entities into opinion spaces defined by political polls and surveys, and in which dimensions act as indicators for favorable and opposed opinions towards issues of public debate.

## Dataset Description

To tackle this problem and to explore solutions and downstream application tasks, we have collected Twitter networks in more than 40 countries in the EU and elsewhere, including more than 100 million users, and poll and survey data with more than 50 opinion dimensions. The project also has access to privileged Facebook and YouTube data.



Four snapshots of ideological distribution of Facebook groups of the Yellow Vest movement at different times, showing the ideological shift from right to left during the 2018 and 2019 protests.

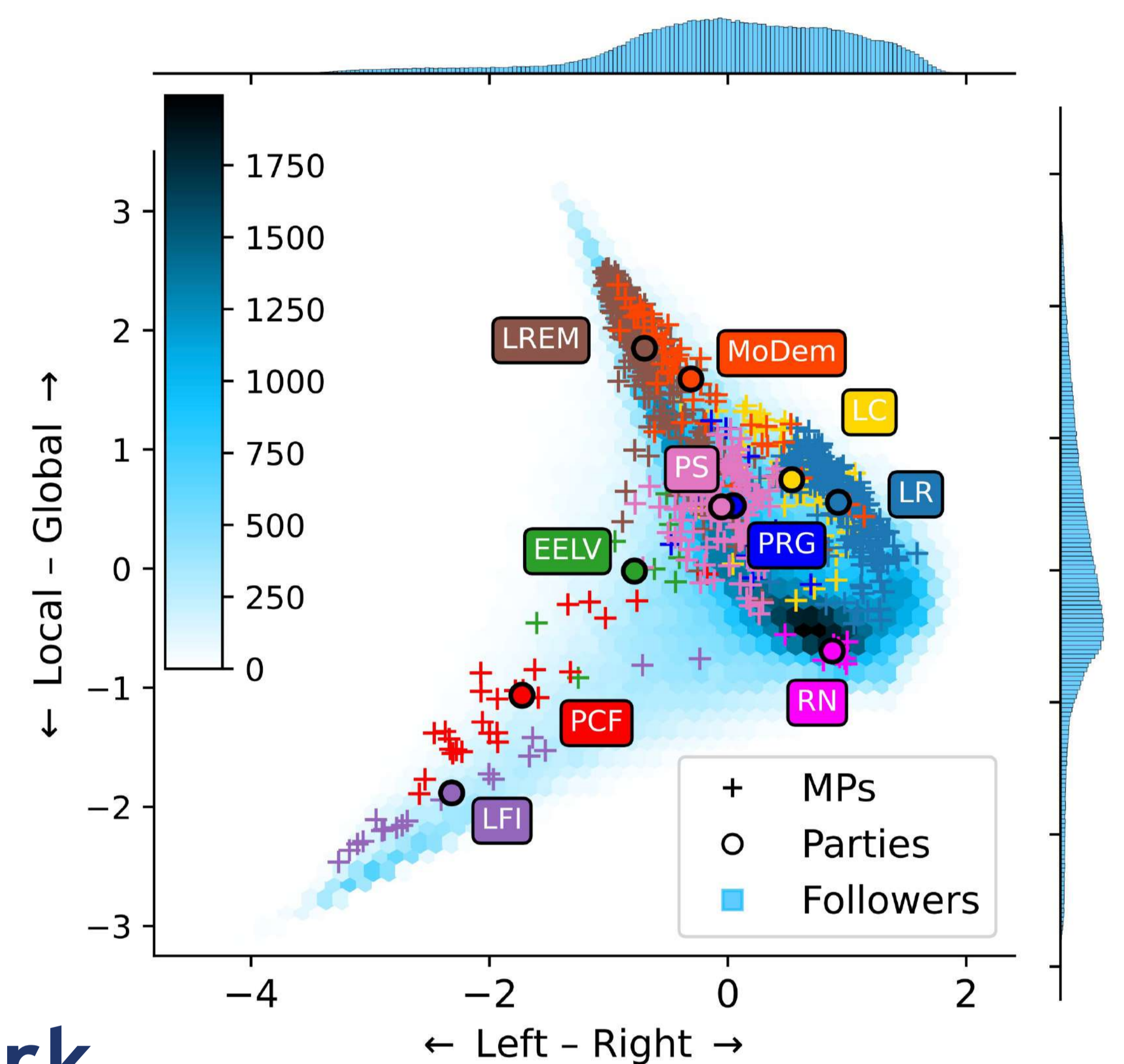
### References

- [1] Poole, Keith T., and Howard Rosenthal. "A spatial model for legislative roll call analysis."
- [2] Barberá, Pablo. "Birds of the same feather tweet together: Bayesian ideal point estimation using Twitter data."
- [3] Ramaciotti Morales, Pedro, et al. "Unfolding the dimensionality structure of social networks in ideological embeddings."
- [4] Cointet, Jean-Philippe et al. "What colours are the yellow vests? An ideological scaling of Facebook groups."

## Problem statement

Take social graphs, postulate network formation mechanisms using psychometric equations with spatial option parameters (e.g., mechanisms in which users close in opinion have higher chance of becoming friends). Use network observations to infer spatial opinions, and political poll and survey data to align embeddings and produce spaces with meaningful dimensions reflecting opinions towards identifiable issues of debate.

*Ideological embedding of a French Twitter network centered in parliamentarians, spatialized according to attitudes towards left- and right-leaning ideologies, and towards localism and globalism.*



## Related Work

Pioneering work in ideological spatialization comes from political science communities analyzing voting data [1]. Recently, researchers have proposed extending these methods from voting to befriending in social networks in the US [2], positioning tens of millions of users in liberal-conservative axes. Building on these methods, we have advanced methods for the embedding of social network users [3], groups, and media outlets [4] in multidimensional ideological spaces. Challenges moving forward include using political poll and survey data to produce cross-country comparable spatializations, and to exploit them in polarization metrics and in studies of recommender systems.

## Results

The main goal of the project is to produce multidimensional, multi-issue opinion spatialization of social networks that are applicable to a large set of countries. With these spatializations, this project seeks to develop multidisciplinary applications: studying polarization, analyzing algorithmic recommendations, media dynamics through their publics, their stances on issues, and studying social dynamics and political competition at large scales.

