Online Firestorms
and Resentment Propagation on Social Media.

Using AI-based techniques, social media platforms allow millions of people interact with one another, gather information and form opinions. Very recently, however, negative phenomena such as fake news, hate speech and online firestorms have shaken our beliefs and hopes about the positive power of social media to their very foundations.

With social media being an integral element of everybody's everyday life, enhancing fairness, minimizing biases and reducing negative dynamics on various online platforms is of crucial importance. This three-year project addresses the mathematical modeling of the formation and dynamics of opinions in large groups of interacting people on social media. In a joint effort by the Professorship of Computational Social Sciences and Big Data and the Chair for Applied Numerical Analysis at TUM, the project investigates the driving factors leading to negative dynamics at the social media group level. The fundamental goal is to reveal the possible relationship between the simple "social forces" acting at an individual level and the potential emergence of a global behavior. The goal of the project is to offer approaches on how to detect, react to and possibly mitigate these negative dynamics in an early stage. The results of the study will provide insights of ethical relevance by discussing responsibility, delegation and control mechanisms in human-AI interacting systems.

In 2020, the team focused on collecting data from 21 different online firestorms. These data sets typically contain between two and 20 thousand firestorm-related tweets and ten times this amount of reference tweets. The team performed an extensive analysis of linguistic features and cues such as the usage of pronouns.

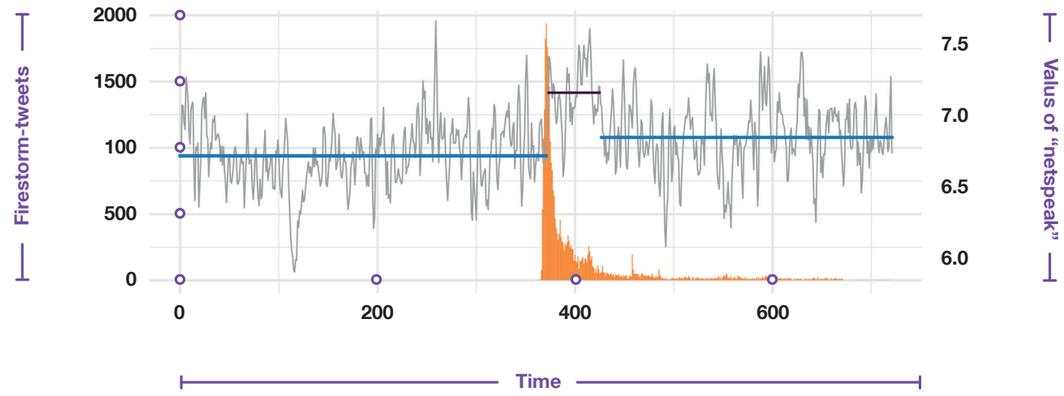
From this work, the team has found that

- linguistic features and cues have proven their usefulness in spotting outbreaks of online firestorms.
- this finding allowed for the development of a method to detect the point of change systematically spotting on linguistic cues of tweets.

Building on these results, the teams has extended the research into understanding the negative social dynamics of language change in social media networks. This allows for defining user-specific time series of both complete bags of words and well-motivated feature vectors containing exclusively appearing pronouns or various other word classes accounting for linguistic cues. A next step is to visualize these dynamics. A further study undertaken in 2020 is concerned with interacting multi-particle systems – consensus-based optimization. Based on this intuition from swarm intelligence, the team aims to find a global minimizer by considering a system of many interacting agents subject to different forces, such as the urge to gather, improve the local position and explore the region.

Plans for 2021

In 2021, the team hopes to soon be able to join together our obtained knowledge in the problem of learning and inferring interaction rules and energies from data samples with the performed data analysis of the real-world Twitter data from multiple online firestorms. Furthermore, the project will extend data collection to other social media platforms.



Principal Investigators

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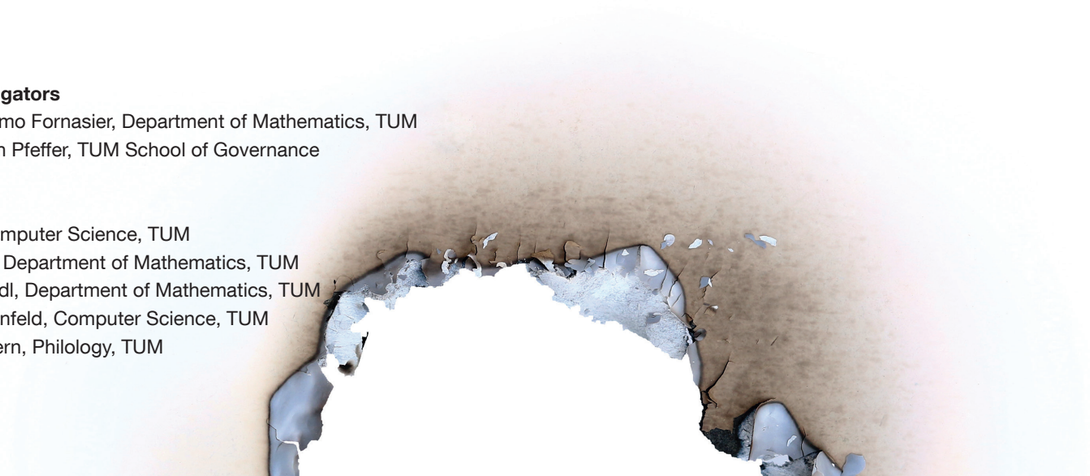

2020 Papers, Projects and Achievements Highlights

- Learning Energies from the Evolutions of Critical Points (working paper) (C. Cipriani, C., Fornasier, M., Huang, H., Riedl K.)
- Against the Others! Detecting Moral Outrage in Social Media Networks, ASONAM (Strathern, W., Schönfeld, M., Ghawi, R., Pfeffer, J.)
- A Convex Envelope Based Analysis of Consensus-Based Optimization (working paper) (Fornasier, M., Klock, T., Riedl, K.)
- Understanding Social Dynamics of Language Change in Social Media Networks. (under review) (Strathern, W., Schönfeld, M., Ghawi, R., Pfeffer, J.)
- Media coverage of topic in: ZDFzoom, ZDF, ZDFinfo and ORF2
- Participation in the TUM Data Innovation Lab, ca 26 projects (with ca 104 students) on several AI topics including Natural Language Processing
- Organization and advising of 17 Student projects (with 55 students) related to „Dynamics of Polarization and Radicalization" in two Computational Social Science project classes.

2020 Conferences

- Polarization on Reddit? Understanding Dynamics of User Interactions in Social Media Networks, INSNA Sunbelt 2020 – International Social Network Analysis Conference
- Against the Others! Detecting Moral Outrage in Social Media Networks, ASONAM 2020 – Conference on Advances in Social Network Analysis and Mining
- Plenary of M. Fornasier - Identification of Artificial Neural Networks, Istituto Nazionale di Alta Matematica (INdAM), December 2020
- TUM Exploratory Workshop on Geometric Deep Learning
- The Responsible AI Forum (TRAIF) Preview 2020, November 2020
- 12th annual Forum for Humane Economic Order "Menschenwürdige Wirtschaftsordnung" at the Academy for Political Education in Tutzing, March 2020
- Internal IT Cyber event of the European Central Bank