

FAKE NEWS SOURCE DETECTION IN SOCIAL NETWORKS

Damian FRĄSZCZAK

Keywords: social networks; fake news source detection; disinformation; rumour outbreaks identification; ensemble learning; social network exploration; social network modelling; fake news propagation

In today's world, social networks play a pervasive role in shaping public opinion, making false news source identification critically important. History offers numerous examples where carefully orchestrated disinformation campaigns have achieved their intended impact. One such instance involves public panic caused by rumours of fuel shortages at gas stations, which ultimately led to actual shortages and massive queues. This work aims to propose a suite of techniques to identify the initiators of such disinformation more rapidly, enabling better control, prevention, and a deeper understanding of the mechanisms behind the spread of falsified information.

This dissertation conducts a comprehensive review of existing solutions for the disinformation source detection in social networks. It identifies the strengths and weaknesses of these approaches, proposing some improvements. In this regard, an innovative contribution is made by developing a dedicated analytical-simulation tool, RPaSDT, which serves as a foundation for future research. For the first time, the problem rumour propagation outbreaks detection has been defined as a key aspect of the source detection problem. Moreover, the study conducts the first detailed examination of network partitioning techniques in the context of source identification. Based on these analyses, a new detection method - BLOCD - has been proposed, which is more effective in both locating propagation outbreaks and detecting sources.

In the context of reconstructing propagation graphs, the SHNI technique has been proposed. It utilizes structural analysis of social networks. Despite its low computational complexity, it received satisfactory results.

Additionally, the study challenges previous assumptions that propagation outbreaks are inherently single source in nature. A new approach involving the selection of multiple sources within a single outbreak has been proposed, thereby increasing the efficiency of identification. Moreover, this dissertation confirmed that ensemble techniques are more effective in identifying the sources of disinformation than individual methods.

The effectiveness of the developed techniques has been confirmed in a real-world case of a disinformation campaign regarding the alleged illness of Pope Francis due to COVID-19.

The findings of this dissertation offer a meaningful step forward in tackling disinformation by introducing tested, effective methods for tracing the origins of false information. As a result, this study provides valuable insights and tools for understanding and mitigating the spread of disinformation in social networks.