

Dynamic Detection and Forecasting of Peculiarities within Communities

Alberto Fernández-Isabel, Isaac Martín de Diego, Alejandro G. Martín, Marina Cuesta, Carmen Lancho

Data Science Lab, Rey Juan Carlos University, Spain, www.datasciencelab.es, alberto.fernandez.isabel@urjc.es

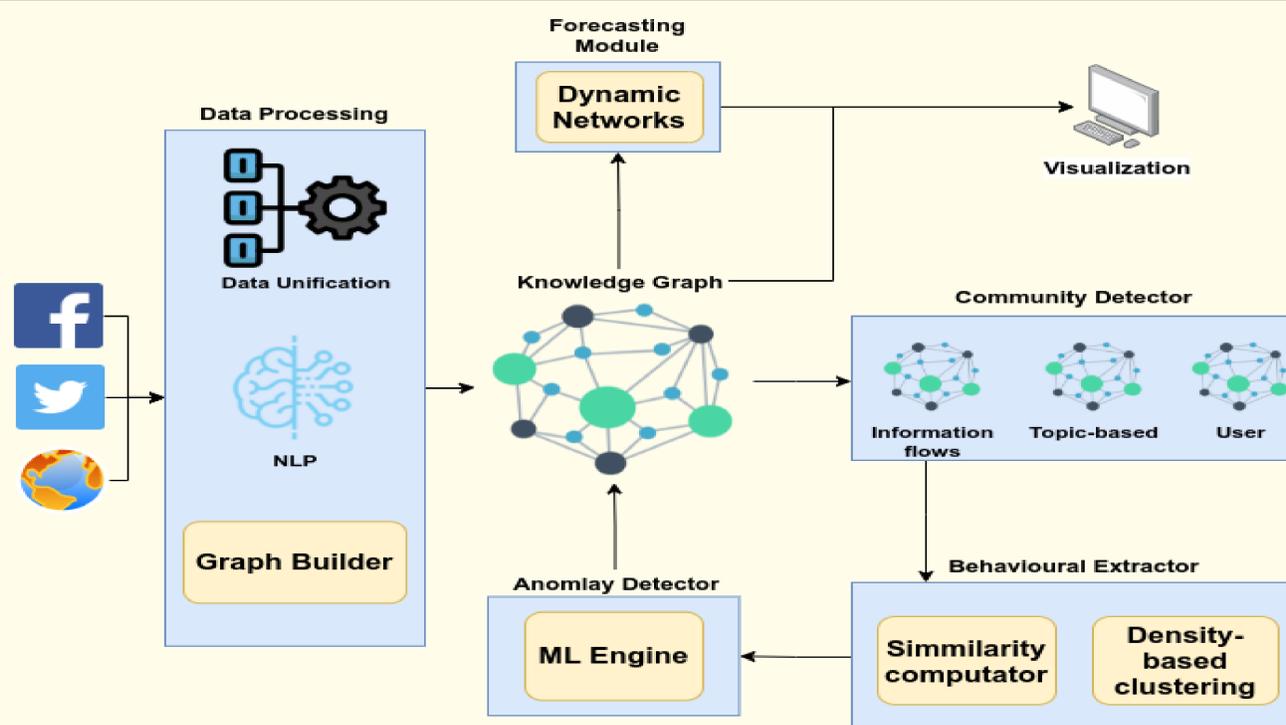
Abstract

Nowadays, **disinformation is everywhere**. On many occasions, the use of disinformation can make some citizens change their opinion regarding a particular issue. This can lead an influenceable citizen to start to tend towards extremist thoughts and become **radicalised** and even become an **extreme activist or cyber-activist**. To mitigate this, most research focuses on detecting false or extremist information in order to remove it from the media as soon as possible. What if it is too late and that false information has already penetrated a citizen's mind? In this case, it is necessary to analyse the behaviour of citizens who consume this information; and the simplest and most effective way to do this is by **analysing their behaviour regarding their community on social networks**.

The objective is to develop a system that using **natural language processing, graph analysis, and machine learning techniques can detect anomalous behaviours related to Online Social Networks and Media information**. Thus, the study of Social Networks graphs will lead to detecting different communities or groups of users and the peculiar users within each community. The system must be able to dynamically gather users' behaviour to capture its possible **peculiarity fluctuations over time**. **Forecasting techniques** will be needed so that the system will be able to anticipate future behaviour to create appropriate mitigation strategies.



Proposal



The framework presented consists of the following modules, components and elements:

- **Data Processing:** Unified the information from multiple sources. NLP is used to extract features. A knowledge graph is built with all this information.
- **Knowledge Graph:** Database containing processed information.
- **Community Detector:** Extract subgraphs according to information flows, topics and user information.
- **Behavioural Extractor:** Uses custom similarity measures and Density-based clustering techniques to extract behavioural kernels within communities.
- **Anomaly Detector:** Uses the behavioural kernels to feed a ML Engine that detects atypical values.
- **Forecasting Module:** Detect potential changes in the knowledge graph over time that will cause new atypical values to emerge.
- **Visualisation:** Shows the knowledge graph, communities and outputs of the framework.

Related Work

- [1] Manoel Horta Ribeiro, Raphael Ottoni, Robert West, Virgílio AF Almeida, and Wagner Meira Jr. Auditing radicalization pathways on youtube. In *Proceedings of the 2020 conference on fairness, accountability, and transparency*, pages 131–141, 2020.
- [2] Mariam Nouh, Jason RC Nurse, and Michael Goldsmith. Understanding the radical mind: Identifying signals to detect extremist content on twitter. In *2019 IEEE International Conference on Intelligence and Security Informatics (ISI)*, pages 98–103. IEEE, 2019.
- [3] Ilias Gialampoukidis, George Kalpakis, Theodora Tsikrika, Symeon Papadopoulos, Stefanos Vrochidis, and Ioannis Kompatsiaris. Detection of terrorism-related twitter communities using centrality scores. In *Proceedings of the 2nd international workshop on multimedia forensics and security*, pages 21–25, 2017.
- [4] Ruizhi Zhou, Qin Zhang, Peng Zhang, Lingfeng Niu, and Xiaodong Lin. Anomaly detection in dynamic attributed networks. *Neural Computing and Applications*, 33(6):2125–2136, 2021.

Future

In our opinion, this **CHIST-ERA** project could be the seed of a **future EU project**. This project could involve a higher number of participants of several domains throughout Europe. The presented architecture is a complete framework that could be developed to address the detection of radicalisation in social networks. It could also include more modules to improve the research goals.