Title: Network-aware fake news mitigation on social media

Coordinators:

S.L. Dr. Ing. Ciprian-Octavian Truică (ciprian.truica@cs.pub.ro)

Conf. Dr. Ing. Elena-Simona Apostol (elena.apostol@cs.pub.ro)

Description: Fake news consists of news that is intentionally and verifiably false, and which could mislead readers by presenting alleged, imaginary facts about social, economic and political subjects of interest. This topic aims to design and implement new Network Analysis and Graph Mining models and strategies for mitigating the spread of fake news on social media using information extracted from the diffusion medium.

Implementation Language: Python

Libraries: Scikit-learn, PyTorch, Keras with Tensorflow, etc.

Storage & Distribution Technologies: MongoDB, Spark.

Title: Context and network-aware fake news detection and mitigation

Coordinators:

S.L. Dr. Ing. Ciprian-Octavian Truică (ciprian.truica@cs.pub.ro)

Conf. Dr. Ing. Elena-Simona Apostol (elena.apostol@cs.pub.ro)

Description: Fake news consists of news that is intentionally and verifiably false, and which could mislead readers by presenting alleged, imaginary facts about social, economic and political subjects of interest. This topic aims to design new Natural Language Processing, Machine Learning, Deep Learning, Network Analysis, and Graph Mining models, techniques, and strategies that use context and network information for mitigating the spread of fake news on social networks.

Implementation Language: Python

Libraries: Scikit-learn, PyTorch, Keras with Tensorflow, etc.

Storage & Distribution Technologies: MongoDB, Spark.

Title: Text simplification

Coordinators:

S.L. Dr. Ing. Ciprian-Octavian Truică (ciprian.truica@cs.pub.ro)

Conf. Dr. Ing. Elena-Simona Apostol (elena.apostol@cs.pub.ro)

Description: Text Simplification is the process of reducing the linguistic complexity of a text, while retaining the original information content and meaning. This topic aims to design new Natural Language Processing, Machine Learning, and Deep Learning models and techniques that successfully manage to simplify textual content.

Implementation Language: Python

Libraries: Scikit-learn, PyTorch, Keras with Tensorflow, etc.

Storage & Distribution Technologies: MongoDB, Spark.

Title: Gravitational-wave detection

Coordinators:

S.L. Dr. Ing. Ciprian-Octavian Truică (ciprian.truica@cs.pub.ro)

Conf. Dr. Ing. Elena-Simona Apostol (elena.apostol@cs.pub.ro)

Description: Recent research on developing new algorithms to optimize the search for gravitational waves has led to integrating machine learning techniques to the field of astrophysics. The aim of this research topic is to develop new Anomaly Detection and Change Point Detection models and techniques using Machine Learning and Deep Learning for analyzing time series data for detecting gravitational waves.

Implementation Language: Python

Libraries: Scikit-learn, PyTorch, Keras with Tensorflow, etc.

Storage & Distribution Technologies: MongoDB, Spark.

Title: Domain-specific multi-word extraction and abbreviation disambiguation for e-Health

Coordinators:

S.L. Dr. Ing. Ciprian-Octavian Truică (ciprian.truica@cs.pub.ro)

Conf. Dr. Ing. Elena-Simona Apostol (elena.apostol@cs.pub.ro)

Description: Hospitals collect huge amounts of data about their patients every year, in various ways. Such massive sets of data can provide great knowledge and information which can improve the medical services, and overall the healthcare domain, such as disease prediction by analyzing the patient's symptoms or disease prevention, by facilitating the discovery of behavioral factors that can turn into risk factors for disease. Unfortunately, only a relatively small volume of e-Health data is processed and interpreted, an important factor being the difficulty in efficiently performing Big Data operations, and that often this data, even if anonymous, is hard to obtain. This topic aims to design and implement new Natural Language Processing, Machine Learning, and Deep Learning methods and models for disambiguating abbreviations and extracting domain-specific multi-words to better understand medical documents and correlate medical terms with their meaning.
Implementation Language: Python
Libraries: Scikit-learn, PyTorch, Keras with Tensorflow, etc.
Storage & Distribution Technologies: MongoDB, Spark.

Title: Anomaly detection for Time Series
Coordinators:

S.L. Dr. Ing. Ciprian-Octavian Truică (ciprian.truica@cs.pub.ro)
Conf. Dr. Ing. Elena-Simona Apostol (elena.apostol@cs.pub.ro)

Description: An outlier or an anomaly is a data point that significantly differs from other observations in a Time Series. Outliers can appear due to an experimental error or an anomaly in the measurement. Such suspicious points in the Time Series data must be identified and interpreted separately in order not to interfere with the analysis step and lead to wrong conclusions. The aim of this research topic is to develop new Anomaly Detection models and techniques using Statistics, Machine Learning and Deep Learning.
Implementation Language: Python
Libraries: Scikit-learn, PyTorch, Keras with Tensorflow, etc.
Storage & Distribution Technologies: MongoDB, Spark.

Title: Change Point Detection for Time Series
Coordinators:

S.L. Dr. Ing. Ciprian-Octavian Truică (ciprian.truica@cs.pub.ro)
Conf. Dr. Ing. Elena-Simona Apostol (elena.apostol@cs.pub.ro)

Description: The problem of change point detection in Time Series data deals with finding the point in time when the properties (e.g., mean, variance, etc.) of the Time Series change abruptly. Thus, a change point is a transition point between different states or continuous segments in the Time Series data. The aim of this research topic is to develop new Change Point Detection models and techniques using Statistics, Machine Learning and Deep Learning.
Implementation Language: Python
Libraries: Scikit-learn, PyTorch, Keras with Tensorflow, etc.
Storage & Distribution Technologies: MongoDB, Spark.

Title: Scalable Graph Mining Algorithms for Social Media Analysis
Coordinators:

S.L. Dr. Ing. Ciprian-Octavian Truică (ciprian.truica@cs.pub.ro)
Conf. Dr. Ing. Elena-Simona Apostol (elena.apostol@cs.pub.ro)

Description: Graph Mining has seen an emerging use in Social Media Analysis with a focus on network analysis and information diffusion. As the graph dimensions are rapidly increasing current algorithms and strategies fall short when dealing in a timely manner with large data sets. Thus, this research topic aims to utilize Big Data Analysis technologies and Deep Learning to improve Graph Mining algorithms by proposing new frameworks for graph processing and new algorithms and graph embeddings for large graph data analytics.
Implementation Language: Python
Libraries: Graphframe, PyTorch, Keras with Tensorflow, etc.
Storage & Distribution Technologies: Hadoop Ecosystem and Spark Environment.