Language-Independent Approaches to Detect Extremism and Collective Radicalisation Online

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Outline

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Introduction

- In the last few years, the advent of micro-blogging services has been impacting people's mind, communication, behavior, and activities conduct.
- Users use social networks for various purposes.
- However,
  - Few use it to spread distorted beliefs, negative opinion about things like spreading terrorism, extremism, and radicalism.
- Aim to provide a theoretical review related to extremism and collective radicalisation detection based on sentiment analysis.

Objective

To propose an effective system to detect extremism and collective radicalisation on social media based on sentiment analysis.

To do so, focus is on statistical and probabilistic methods that can be used to develop an unsupervised and language-independent system.

Machine Learning Classifiers for Extremism and Collective Radicalisation

- Radicalisation:

  Radicalisation involves a movement towards the support or representation of radical behavior(s).

- Extremism:

  Extremism is defined as the statistical sense of extreme views in terms of frequent behavioral occurrence within some aggregate or community.

- Sentiment Analysis

  Sentiment Analysis is the computational study of people's opinions, attitudes, and emotions toward an entity. The entity can represent an individual, event, or topic.

Case Study 1: The roots of radicalism

- Fernandez et Al [1] proposed:
  - An innovative NLP and Collaborative Filtering (CF) based approach for detecting radicalisation on social networks.
  - The different roots of radicalisation, i.e., micro-roots, meso-roots, and macro-roots, are captured , and each user is represented through keyword-based vector description.
  - The approach presented in [1], is sufficient enough to detect and predict radicalism.

Case Study 2: Terrorism Detection using Sentiment Analysis and Machine Learning

- The proposed work in [2] is to present a system for improvising current techniques for sentiment analysis through machine learning to detect terrorist acts on Twitter more accurately.

- The novelty of the research is having divided the sentence:
  - positive, negative, and neutral categories.

- All three categories are compared to the previous sentence for a given account holder based on the sentiment score for the latest and previous sentence.

Case Study 2: Terrorism Detection using Sentiment Analysis and Machine Learning

- This means a specific account holder's tweet history in each of the categories is extracted, and the sentiment value is calculated.

- The sentiment score from the above statement will be compared with the sentiment value of the identified sentiment.

Case Study 3: Learning with Hashtags

- An interesting weak supervised approach [3] based on for learning hashtags, hashtag patterns, and phrases associated with five emotions:
  - AFFECTION,
  - ANGER/RAGE,
  - FEAR/ANXIETY,
  - JOY,
  - SADNESS/DISAPPOINTMENT.

Case Study 3: Learning with Hashtags

- A bootstrapping framework for learning emotion hashtags is proposed, which has been further improved to learn more general hashtag patterns.

- The emotion phrases are extracted from the hashtags and the hashtag patterns to classify contextual emotions.
- For example:
  - #Angryatlife and #Angryattheworld have the same prefix.
  - Angry at that predicts ANGER emotion.

Supervised Natural Language Processing Approach

- Supervised Natural Language Processing (NLP) Approach:
  - Supervised machine learning involves labeling or commenting on a series of text documents with examples of what the machine is looking for and how it should interpret this aspect.
- Several methods used in a supervised approach,
  - Support Vector Machines
  - Bayesian Networks
  - Maximum Entropy Conditional Random Field
  - Neural Networks/Deep Learning.

Unsupervised Natural Language Processing Approach

- An unsupervised NLP approach:
  - Refers to a system where training inputs are not necessary to discover the target point of the learning.
  - The system needs to train itself without human supervision and intervention or with human intervention only if there is a need to add or change the functionalities.

Language-Independent NLP Approach

- Language-Independent Approach:
  - Refers to a single system that is applied to different natural languages (e.g., English, Chinese, German, etc.).
  - The results keep being satisfactory and the experiment values represent the reality in a viable way.
  - Once an algorithm has been developed for a specific language, the question arises, it can be trivially extended to another language.
  - All it is needed an adequate amount of training data for the new language.

Models

- The most common Machine Learning models, commonly used to resolve ambiguities in language knowledge with the main tasks of NLP:
  - Hidden Markov Model (HMM),
  - Conditional Random Fields (CRF)
  - Maximum Entropy (MaxEnt)
  - Support Vector Machines (SVM)
  - Decision Trees(DT)
  - Naive Bays (NB)
  - Deep Learning (DL)

Conclusion

- Social media have a significant role in the process of extreme ideas dissemination all over the world.
- People have the dissemination of similar information that can lead to collective radicalisation and extremism.
- Our aim of this study was:
  - To provide the state-of-art to construct an unsupervised and language-independent system for collective radicalisation and extremism detection using sentiment analysis.
- Furthermore, this study gave a generic structure and guidelines:
  - For developing a new unsupervised language independent-system for addressing radicalisation and extremism issue.

Conclusion

- This study will also guide students and researchers with essential resources:
  - To learn what is necessary to know and to advance further the integration of supervised and language-independent techniques with different machine learning models.

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THANK YOU