Abusive Language Detection in Online Conversations by Combining Content- and Graph-based Features

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Objective

- Detect abusive messages in online conversations through content- and graph-based methods.

Approach

1. Exhibit the importance of structural information in the context of online abuse detection.
2. Combine textual and structural information by proposing fusion methods of both sources of information.

Context

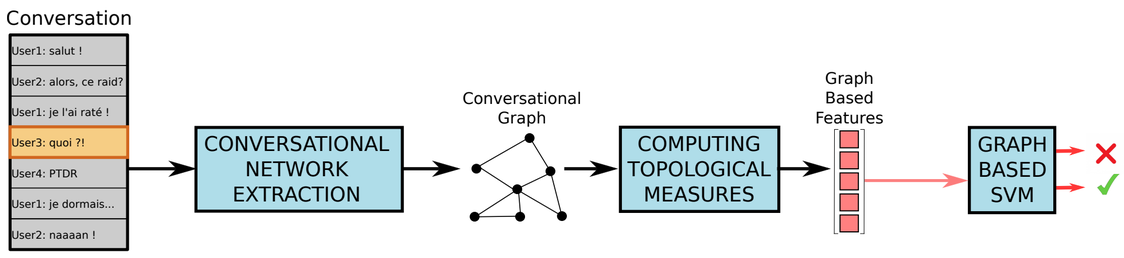
- 62% of french people experienced cyber-harassment at least once.
- Companies are responsible for content posted on their platforms.
- Billion daily users and messages sent on social networks.
- Moderation implies high human and financial costs.

Our proposition to automate the detection of abusive content online :

- A method based on a mix of standard NLP features.
- A graph-based approach that relies on interaction and completely ignores the textual content of messages.
- A combination of both approaches.

Graph-based method

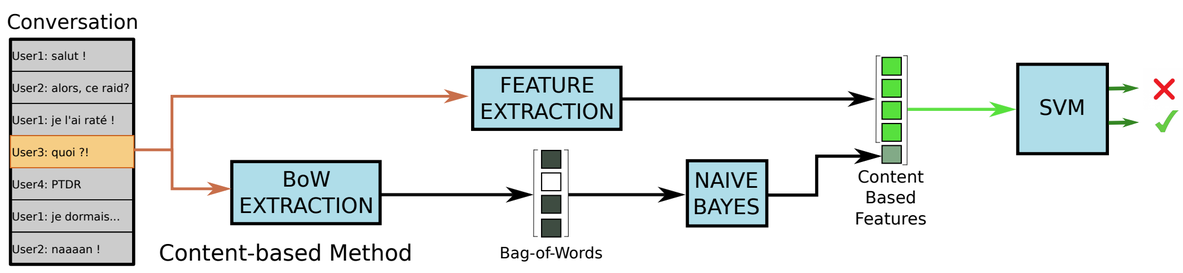
We extract a number of topological measures to describe the conversational graph. A SVM classifier is then trained using these values as features.



Graph-based pipeline. topological measures include density, edge count, degree centrality, eccentricity...

Content-based method

We extract NLP features from the content of each considered message to train a SVM classifier to distinguish between *Abuse* and *Non-abuse* class.



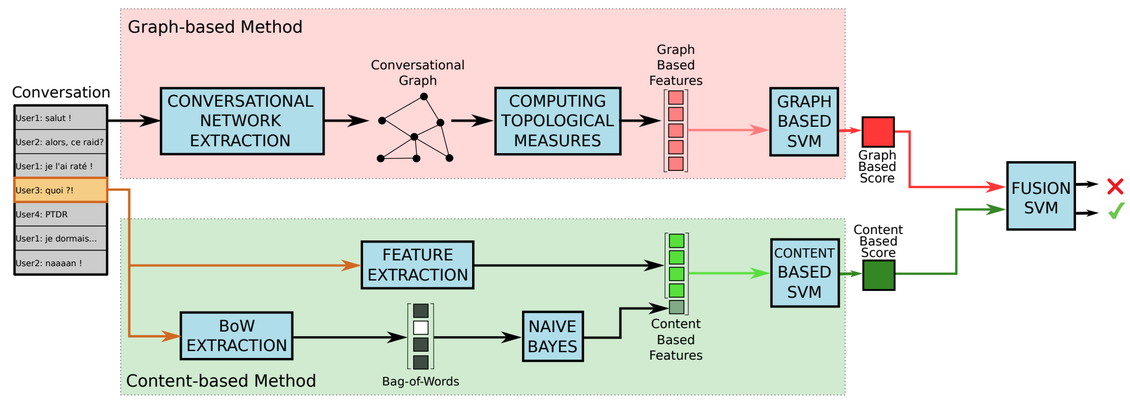
Content-based pipeline. NLP features include the count of unique characters in the message, classes of characters, proportion of capital letters and numbers.

A major limitation of the content-based methods is their sensitivity to intentional text obfuscation. Example :

Pi&ce 0f sh1t, **D4mn**, **f*ck y****, **bul..hit**

Fusion

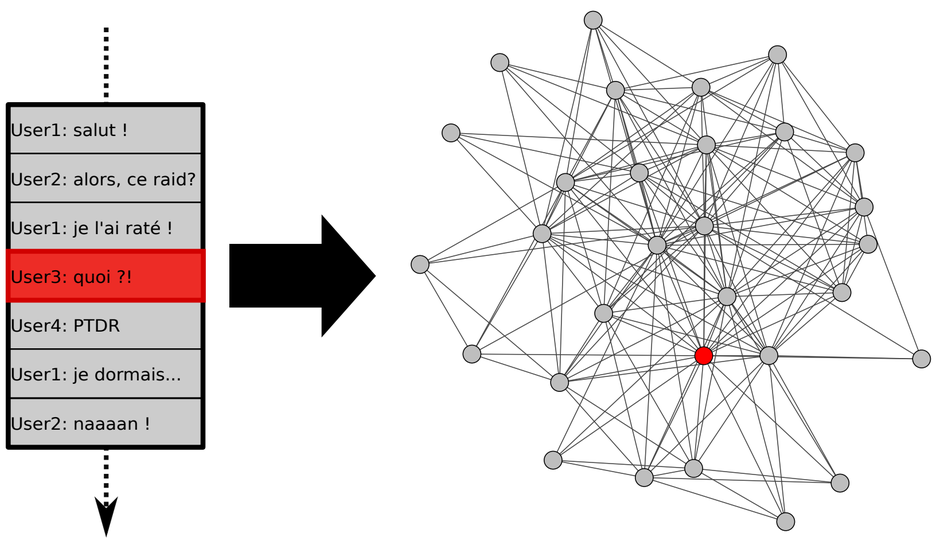
We propose a method seeking to take advantage of both previous ones by combining them.



Graph- and Content-based methods combined through a third SVM.

Conversational graph extraction

- Extraction of a conversational graph from a sequence of messages.
- Vertices represent users and edges model interactions between them.



A sequence of messages and the corresponding graph.

Results

- Graph-based method performs better than Content-based method.
- Fusion method obtains better results than them

→ Graph- and Content-based methods are complementary

Method	Number of features	Precision	Recall	F-measure
Content-Based	29	78.59	83.61	81.02
Graph-Based	459	90.21	87.63	88.90
Fusion	488 (2)	94.10	92.43	93.26

Comparison of the performances obtained with the methods Content-based, Graph-based and their Fusion. The dataset is extracted from the in-game chat of an online video-game.

Perspectives

- Replace NLP features extraction with text embedding.
- Replace graph topological measures with whole graph embedding.

CV HAL

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Main research interests :

- Representation learning
- Natural Language Processing