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# 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

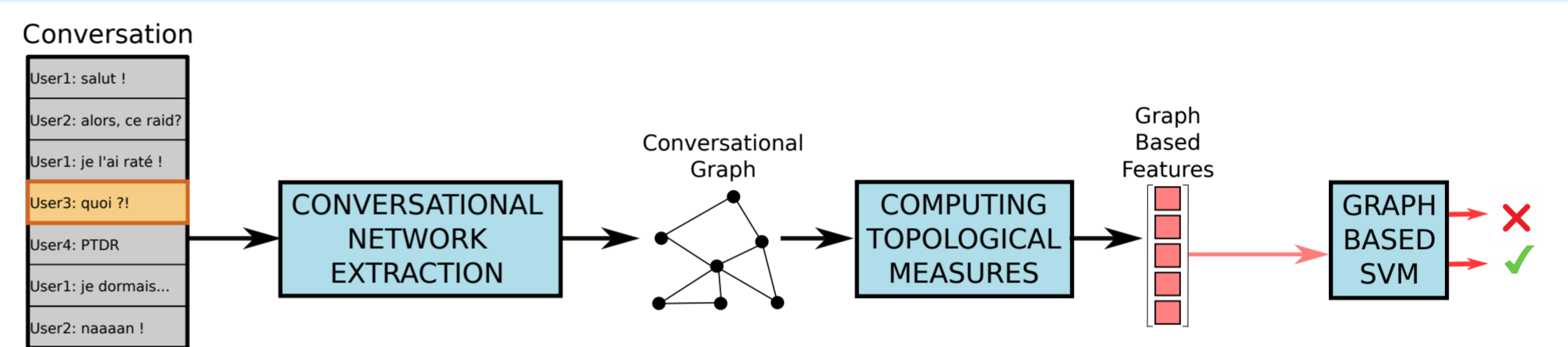
- 62% of french people experienced cyber-harassment at least once.
- Companies are responsible for content posted on their platforms.
- Billion daily users and messages sent on social networks.
- Moderation implies high human and financial costs.

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

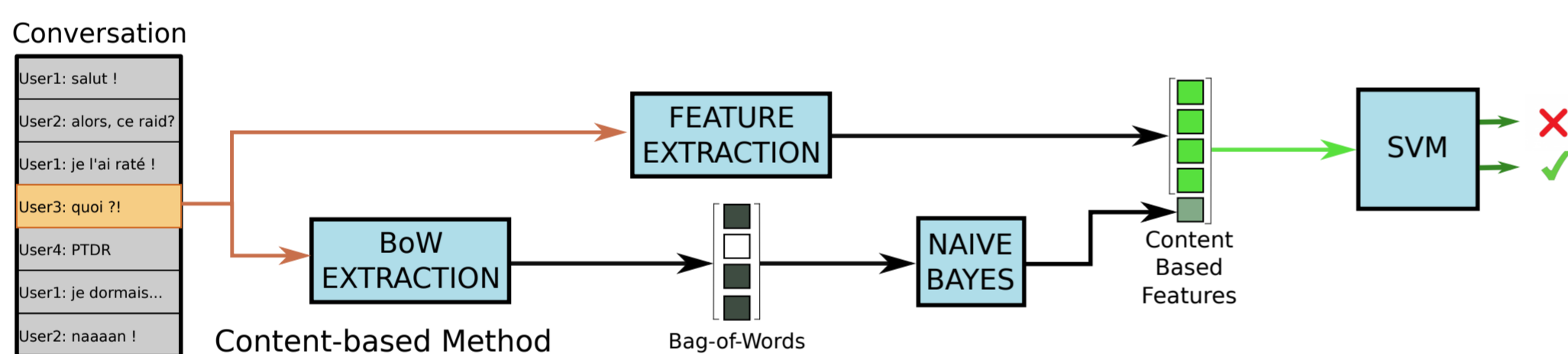
We extract a number of topological measures to describe the conversational graph. A SVM classifier is then trained using these values as features.



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.



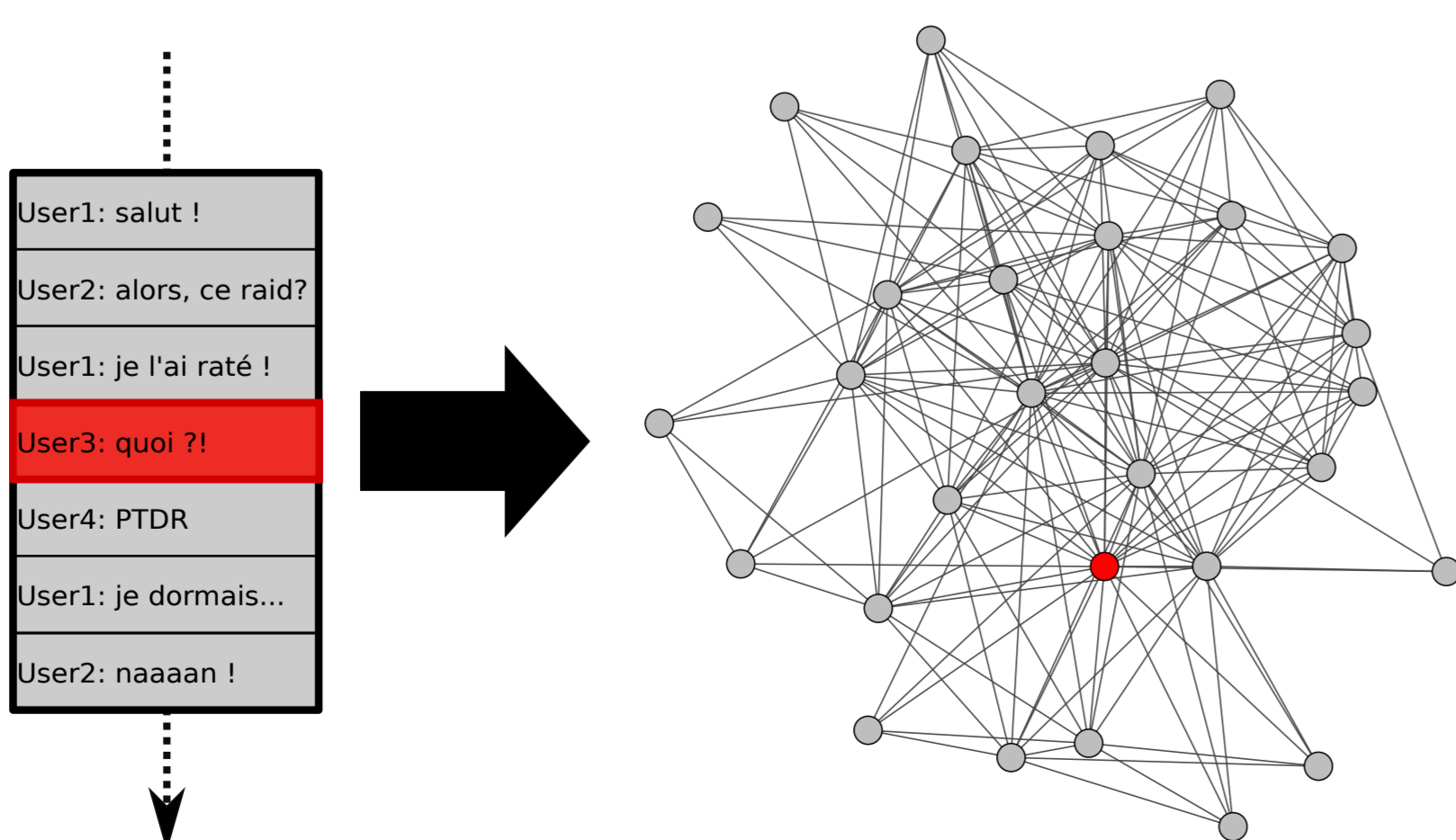
Content-based pipeline. NLP features include the count of unique characters in the message, classes of characters, proportion of capital letters and numbers.

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

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

## Conversational graph extraction

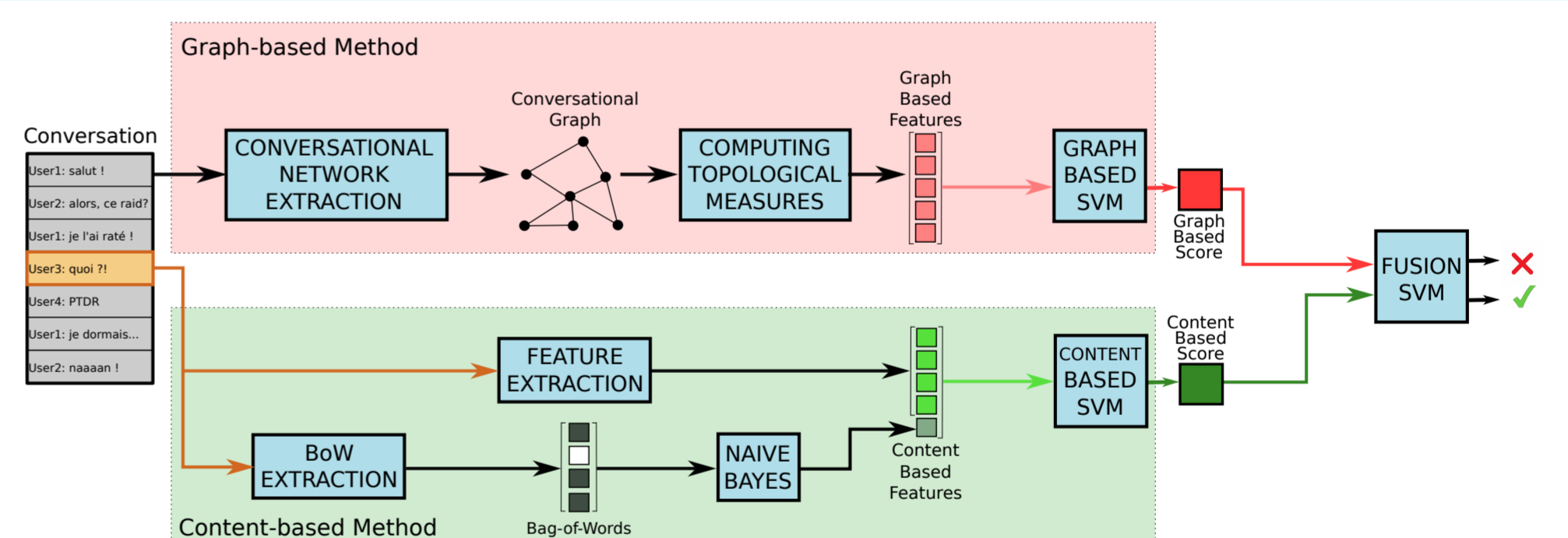
- Extraction of a conversational graph from a sequence of messages.
- Vertices represent users and edges model interactions between them.



A sequence of messages and the corresponding graph.

## 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.

## 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.



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Main research interests :

- Representation learning
- Natural Language Processing