A Survey on Combating Hate Speech through Detection and Prevention in English

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Abstract

The rapid rise of social networks has brought with it an increase in hate speech, which poses a significant challenge to society, researchers, companies, and policymakers. Hate speech can take the form of text or multimodal content, such as memes, GIFs, audio, or videos, and the scientific study of hate speech from a computer science perspective has gained attention in recent years. The detection and combating of hate speech is mostly considered a supervised task, with annotated corpora and shared resources playing a crucial role. Social networks are using modern AI tools to combat hate speech, and this survey comprehensively examines the work done to combat hate in the English language. It delves into state-of-the-art methodologies for unimodal and multimodal hate identification, the role of explainable AI, prevention of hate speech through style transfer, and counternarrative generation, while also discussing the efficacy and limitations of these methods. Compared with earlier surveys, this paper offers a well-organized presentation of methods to combat hate.

1 Introduction

The recent exponential growth of the internet, technology, and social media has revolutionized communication but also provided a platform to disseminate hateful content. The United Nations strategy and plan of action on hate speech describes hate speech as any kind of communication in speech, writing, or behavior that attacks or uses pejorative or discriminatory language concerning a person or a group based on who they are, in other words, based on their religion, ethnicity, nationality, race, color, descent, gender, or identity factor. [1]. Hate speech is used as a broad umbrella term for numerous user-created content intended to disparage, or dehumanize, any individual or any group based on some characteristics such as race, color, gender, nationality, ethnicity, etc. (Nockleby, 2000). With the advancement of natural language processing (NLP) technology, substantial research has been conducted on automatic textual hate speech detection in recent years. There are large-scale publicly available datasets collected from various social media platforms and tagged into sub-variants of hate such as aggression ((Kumar et al., 2018),(Bhattacharya et al., 2020) Hate((Toraman et al., 2022)(Davidson et al., 2017), (Mathew et al., 2021), (Mollas et al., 2020)), Offensive ((Davidson et al., 2017), (Zampieri et al., 2019), (Rosenthal et al., 2021)), Abusive (Nobata et al., 2016),(Curry et al., 2021), (Caselli et al., 2020),(Founta et al., 2018)), Harassment((Golbeck et al., 2017)) Toxic ((Wulczyn et al., 2017),(Sarker et al., 2023b), (Bhat et al., 2021),(Georgakopoulos et al., 2018)), Cyberbullying (Dadvar et al., 2012) (Dinakar et al., 2012), Racism (Waseem and Hovy, 2016)(Kwok and Wang, 2013), Sexism (Waseem and Hovy, 2016),Flame (Spertus et al., 1997) Misogynistic (Fersini et al., 2022). Facebook reports 510K comments/minute and X reports 350 tweets per minute [2]. Recent research has focused on developing automatic systems to detect hate speech on social media platforms. These typically employ semantic content analysis techniques built on Natural Language Processing (NLP) and Machine Learning (ML) methods such as Support vector machine (SVM) and logistic regression (LR), Convolutional neural networks (CNN), Long short-term memory (LSTM), Gated recurrent units (GRU), Bidirectional encoder representations from the transformer (BERT), etc. The task typically involves classifying a comment into non-hate or

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[1] https://www.un.org/en/hate-speech/un-strategy-and-plan-of-action-on-hate-speech

[2] https://bernardmarr.com/how-much-data-do-we-create-every-day-the-mind-blowing-stats-everyone-should-read/

hateful and measuring in terms of performance metrics. Hate speech is disseminated via multimodal data such as memes (text superimposed within images), audio, and video. Most of the work revolves around meme identification with the concepts of early fusion and late fusion. With the emergence of the Large Language Model (LLM), the employment of a vision transformer-based approach for identification has risen. However, little research focus is on audio or video identification. Recently, the model has been aided with the explanability information for better classification. The multimodal approach focuses on leveraging the multimodality features (Gomez et al., 2020), (Suryawanshi et al., 2020), (Kirk et al., 2022). Recently, the identification of hate span, and transforming/rephrasing the offensive into non-offensive has been in attention to counter the hate speech. The remainder of this paper is structured as follows: Section 2 reviews the dataset organized for the different subtasks of hate identification; Section 3 describes the features related to hate speech detection in the uni-modal identification. Section 4 introduces the tasks done to solve multimodal hate prediction, Section 5 presents the study to counter hate speech; and finally, Section 6 is about the implementation and role of explainable AI, Section 7 reports some challenges; and Section 8 concludes this work and discusses future work.

2 Corpus Details

This section covers the dataset collection process, the annotator's role, available datasets, and challenges associated.

2.1 Data Set Collection and Preparations

Most of the work done in hate speech detection for unimodal and multimodal relies on the labeled data. These corpus are mainly crawled through Twitter (Wijesiriwardene et al., 2020) (Jha and Mamidi, 2017) (Fersini et al., 2018), Facebook (Kumar et al., 2018), Reddit (Mollas et al., 2020), Gab (Kennedy et al., 2018), Wikipedia comments (Wulczyn et al., 2017) (Pavlopoulos et al., 2020). Nearly all the user-generated content has been crawled using a keyword-based approach (Waseem and Hovy, 2016) (de Gibert et al., 2018) with words being in negative polarity. Most of the datasets are topical focus (Kumar et al., 2018) (Founta et al., 2018) i.e the specific topics and abusive phenomena addressed The preprocessing is performed depending on the data quality and structure. This typically involves filtering and normalizing textual inputs, such as tokenization, stopword removal, misspelling correction, noise reduction, stemming, and lemmatization.

2.2 Annotations

The preprocessed data requires a manual review of the post/meme/audio to tag it into further granularity of hate. The data annotation is a relevant source of variability. There are various annotation frameworks (Founta et al., 2018)(Bhattacharya et al., 2020) (Zampieri et al., 2019). Typically the annotations are performed by hiring the experts, amateur/non-experts, or on crowdsourcing platforms such as Crowdflower (Davidson et al., 2017), and Amazon Mechanical Turk (Zampieri et al., 2019) (Founta et al., 2018). The annotators are generally pre-informed about the task. As per the annotation scheme, there are three main strategies. The first is a binary scheme: two mutually-exclusive values (typically yes/no) to mark the presence or absence of a given phenomenon. The second is a non-binary scheme: more than two mutually exclusive values. The third strategy features multi-level annotation, with finer-grained schemes accounting for different phenomena. The quality of annotated data is measured by the Inter Annotators agreement score. Most of the authors did not give much about the annotation process and only provided an Inter-annotator agreement score. Fleiss Kappa (Zampieri et al., 2019), Cohen Kappa (Golbeck et al., 2017) (de Gibert et al., 2018), Kripendrof's Kappa (Kumar et al., 2018) (Bhattacharya et al., 2020)

2.3 Available Datasets

The most common binary annotated corpus is (Golbeck et al., 2017) (de Gibert et al., 2018), (Bretschneider and Peters, 2016), (Ghosh et al., 2022) (Gao and Huang, 2017). To have better coverage of the hate variants, the binary task shifted to the single-layer 3-class (Davidson et al., 2017)(Waseem and Hovy, 2016)(Toraman et al., 2022)(Mathew et al., 2021) or multi-class (Founta et al., 2018)(Waseem, 2016)annotated data. There is an issue of imbalance in the number of hate and non-hate instances. (Davidson et al., 2017), (de Gibert et al., 2018), (Curry et al., 2021) constitutes 6%-20% hateful instances. (Kurrek et al., 2020) (Mathew et al., 2021) (Pavlopoulos et al., 2021) constitute 50%-60% of the abusive instances.

(Röttger et al., 2021), (Borkan et al., 2019) consists of around 70%-80% hate instances. The single layer tagging is shifted towards the creation of a hierarchical annotation schema (Zampieri et al., 2019) (Basile et al., 2019) (Mandl et al., 2021) covering the targets associated with hate in the subsequent layers. The targets are trans people (Röttger et al., 2021), religion (Mathew et al., 2021)(Kennedy et al., 2020), misogyny (Fersini et al., 2018). The tagging is also done at the multinomial level (Mollas et al., 2020), on a scale (Wulczyn et al., 2017), multi-task multi-tagging (Vidgen et al., 2020). The recent shift in marking the toxic span is also gaining pace. (Pavlopoulos et al., 2021) proposed annotated data for toxic span. (Sarker et al., 2023a) released $\approx$ 20K comments marked for toxic phrases. The shift in data creation from unimodal to multimodal is slow. The creation of multimodal data has recently gained pace with datasets like (Kiela et al., 2020), (Gomez et al., 2020), (Suryawanshi et al., 2020), (Fersini et al., 2022), (Ramamoorthy et al., 2022), (Aprosio et al., 2020), (Yang et al., 2019) (Tekiroglu et al., 2022) (Qian et al., 2019a). To combat the hate and generate counter-narrative statements, some datasets are created such as (Chung et al., 2019)(Fanton et al., 2021)(Qian et al., 2019a).

3 Unimodal: Textual Identification

The distinguishing approach in the classification tasks is the usage of features. This section covers the various approaches utilized to compute the features and various methods employed to improve the performance of the classifier. The encoded features are generally applied to the machine learning or deep neural network to get the probability distribution of the classes.

3.1 Simple Surface Features

Traditional Machine learning algorithms utilize surface features such as word n-gram and character n-grams features (Nobata et al., 2016) (Waseem and Hovy, 2016) (Zhang et al., 2018) (Chen et al., 2012) (Xu et al., 2012). These features were fed into Support vector machine (SVM) (Kapil and Ekbal, 2020)(Zhang et al., 2018), Logistic Regression (LR) (Waseem and Hovy, 2016)(Qian et al., 2018), Random Forest (RF) (Davidson et al., 2017). The other linguistic features such as Part-of-Speech (PoS) tag unigrams, bigrams, and trigrams, weighted by their TF-IDF and removing any candidates with a document frequency lower than 5; number of syllables; Flesch-Kincaid Grade Level and Flesch Reading Ease scores that to measure the 'readability' of a document (Zhang et al., 2018), (Davidson et al., 2017). (Gambäck and Sikdar, 2017), (Kapil and Ekbal, 2020) (Gambäck and Sikdar, 2017) used CNN with n-gram approach. Character n-grams provide the model to capture the obfuscation such as fck, kll, a$$hole. It is found to be more predictive than token n-grams (Mehdad and Tetreault, 2016)

3.2 Word Embeddings

With time, distributed word representations (based on neural networks), also referred to as word embeddings, are developed. These are Word2vec (Mikolov et al., 2013), FastText (Bojanowski et al., 2017), and Glove (Pennington et al., 2014). Word embedding is based on distributed assumptions and mapped words into a high-dimension feature space and maintains the semantic information. For each target sentence S = w_1, w_2, , w_N, each token w_i is substituted into a real-valued vector x_i using word embedding, where $x_i \in$R^d is the word vector and d is the dimensions of word vectors. These word embeddings were used with CNN (Badjatiya et al., 2017)(Kapil and Ekbal, 2020), LSTM (Zhou et al., 2021a) (Pitsilis et al., 2018), GRU (Zhang et al., 2018), (Zhou et al., 2021a)

3.3 Transformer-Based Approaches

The inclusion of transformer-encoder-based features outperformed the traditional machine learning and deep neural network techniques. It is leveraging the concept of multi-head self-attention (Vaswani et al., 2017). These models have emerged as the preferred approach for a variety of NLP tasks, owing to their capacity for effectively handling long-range dependencies while processing text in parallel. This parallel processing makes them more efficient and scalable than standard RNNs and CNNs. Transformer-based models' basic notion is their attention mechanism, which allows the model to focus on relevant areas of the input text while making predictions. More than 60% of the models submitted in the shared task (Bhattacharya et al., 2020)(Mandl et al., 2021) were based on transformer encoder embeddings (Curry et al., 2021)(Basile et al., 2019) (Fersini et al., 2022). Specifically, BERT is used by (Mozafari et al., 2020a)(Zhou et al., 2021a)(Mathew et al., 2021).

3.4 Lexical Resources

To make use of the general assumption that hateful posts contain negative words, these words can be used as the feature. There are many publicly available hate-related lexicons. The domain-specific lexicons are created by (Davidson et al., 2017) of size 179; (Bassignana et al., 2018) created HurtLeX, a multilingual lexicon of ¡100,000 hate words in 53 languages,(Olteanu et al., 2018) created 163 hate words; (Qian et al., 2019b) collected 2105 lexicons; and (Wiegand et al., 2018) proposed 1651 words. (Gitari et al., 2015) created a lexicon using subjectivity and syntactic features related to hate speech. (Xiang et al., 2012), (Nobata et al., 2016) (Burnap and Williams, 2016), (Burnap and Williams, 2015) employed lexicon lists; recently, BERT-based methods (Koufakou et al., 2020) leveraged from the lexicon. The recent development in encoding has seen a lesser creation of lexicons to capture standardized vocabulary and semantic information.

3.5 Knowledge-Enriched Features

The creation of a large number of annotated data poses a great challenge. It is therefore a wise idea to transfer this knowledge via multi-task learning (MTL), transfer learning, zero-shot learning, few-shot learning, etc. Given *m* learning tasks

$$\{T_i\}_{i=1}^{m} \tag{1}$$

where all the tasks or subsets of them are related, multi-task learning aims to help improve the learning of a model for classification task T_i by using the knowledge in some or all of the *m* tasks. (Kapil and Ekbal, 2020) experimented with CNN-based MTL on five hate datasets. (Ghosh et al., 2023a) transformer-based multi-task network to address (a) aggression identification, (b) misogynistic aggression identification, (c) identifying hate-offensive and non-hate-offensive content, (d) identifying hate, profane, and offensive posts, and (e) type of offense. The other forms of MTL were employed, such as fuzzy-based (Liu et al., 2019), multi-task multilingual (Mishra et al., 2021). The empirical analysis showed the approaches following MTL outperformed the other classifier with the (Maity et al., 2023) analyzing the efficacy of MTL over single task learning (STL). Transfer learning aims to transfer the learned knowledge in one domain or application to another domain for which no data exists. (Mozafari et al., 2020a) fine-tuning BERT-based transfer learning, and (Yuan et al., 2023) explored deep transfer learning by projecting multiple datasets in a common space. (Qian et al., 2021) proposed Variational Representation Learning (VRL) along with a memory module based on LB-SOINN (Load-Balancing Self-Organizing Incremental Neural Network) to lifelong data learning without forgetting the previously learned knowledge. There are some other learning methods, such as Few-shot learning (FSL), i.e generally as n-shot learning, a category of artificial intelligence that also includes one-shot learning (in which there is only one labeled example of each class to be learned) and zero-shot learning (in which there are no labeled examples at all). Several work involved the usage of these learning (Mozafari et al., 2022), (Awal et al., 2023), (Pamungkas et al., 2021)

3.6 Relation with Sentiment Analysis and Emotion

Hate speech data is closely related to sentiment and emotion analysis, as understanding the underlying negative sentiments and intense emotions is crucial for accurate detection and effective intervention. (Gitari et al., 2015) (Dinakar et al., 2012) followed the approach where a classifier dedicated to detecting negative polarity is applied prior to the classifier specifically checking for evidence of hate speech. (Van Hee et al., 2015) uses sentiment lexicon to identify the number of positive, negative, and neutral words in a comment text. The BERT-based models have also leveraged the sentiment and emotion data in the training. (Min et al., 2023) validate the correlations between hate speech and certain negative emotion states and propose an emotion-correlated hate speech detector. (Rajamanickam et al., 2020) advantage of the affective features to gain auxiliary knowledge through a hard-sharing double encoder model and gated double encoder based on Bi-LSTM. (Zhou et al., 2021a) use multiple feature extraction units to share multi-task parameters to better share sentiment knowledge, and then gated attention is used to fuse features for hate speech detection. (Kapil and Ekbal, 2021) proposed CNN-based MTL sharing sentiment analysis data. (Kapil and Ekbal, 2022) (Ghosh et al., 2023a) make use of sentiment and emotion recognition data in the BERT-based MTL.

3.7 Augmentation

As the neural networks are data-specific, the performance of the model can be enhanced by increasing the training data by augmentation and solving the problem of data scarcity and data imbalance. Most researchers have employed pre-trained transformers to generate synthetic posts. (Wullach et al., 2021) utilized GPT LLM (BERT, RoBERTa, ALBERT) for generating synthetic data (Ilan and Vilenchik, 2022) applied data augmentation using real, unlabelled data, selected from the online platform. Unlike other data augmentation approaches that generate synthetic data, HARALD (Hate Augmentation with ReAL Data) generates a continuous stream of relevant real data authored by multiple authors with diverse stylistic, grammatical, and semantic forms. (Hartvigsen et al., 2022) created machine-generated datasets TOXIGEN by developing a demonstration-based prompting framework and an adversarial classifier-in-the-loop decoding method to generate subtly toxic and benign text with a massively trained language model. (Kim et al., 2023) proposed TOXIGEN-CONPROMPT, a pretraining strategy to leverage machine-generated data via contrastive learning. (Cao and Lee, 2020) deep generative reinforcement learning adversarial-generated-based data augmentation to enhance the performance by 5%.

3.8 Impliciteness

The detection method mainly works well for hate expressed explicitly. One of the challenging aspects is to detect hate expressed in an implicit manner (Kumar et al., 2018)(Kim et al., 2022) (Hartvigsen et al., 2022). Previous research has mostly addressed overt or explicit hate speech in an accurate way, neglecting the more prevalent type of coded or indirect language. (ElSherief et al., 2021) proposed benchmark corpus. In (Wiegand et al., 2021), Wiegand discusses the challenges of learning implicit abuse in existing datasets and suggests improvements to their design. (Qian et al., 2019b) deciphered hate symbols using a sequence-to-sequence model using Urban Dictionary. (Ocampo et al., 2023a) generated adversarial implicit hate messages leveraging auto-regressive models. (Ghosh et al., 2023b) explicitly incorporates user- and conversational context to detect implicit hate (Wiegand et al., 2023) proposed new data set generated from GPT-3 to identify euphemistic abuse. (Cooper et al., 2023) designed Hate speech detection models inoculated against real-world homoglyphs. (Ocampo et al., 2023b) investigate implicit and explicit embedding representations. (Kim et al., 2022) leveraged contrastive learning to learn implicit posts.

4 Multi-modal

The early works of multimodal hate identification involve the usage of meta-tweet features aided to the main tweet (Founta et al., 2018), (Qian et al., 2018). (Pitsilis et al., 2018) proposed an ensemble of recurrent neural network (RNN) classifiers, incorporating various features associated with user-related information, such as users' tendency towards racism or sexism. (Founta et al., 2019) (Chatzakou et al., 2017) utilizes a wide variety of metadata, such as tweet-based, user-based, and network-based features. The properties of bullies and aggressors were studied. (Rajadesingan et al., 2015) derived 10 features grouped into text-based features, emotion-based features, familiarity-based features, contrast-based features, and complexity-based features (Waseem and Hovy, 2016) leveraged the gender and demographic information, (Unsvåg and Gambäck, 2018) investigates the potential effects of users' features such as gender, network (number of followers and friends), activity (number of statuses and favorites), and profile information (geo-enabled, default profile, default image, and number of public lists). (Chaudhry and Lease, 2022) investigate profiling users by their past utterances as an informative prior. But in the current scenario, social media has also seen an upsurge in memes, GIFs, audio, and video to propagate hate. However, most of the data are available for multimodal meme identification. Memes—that have recently emerged as popular engagement tools and which, in their usual form, are image macros shared through social media platforms mainly for amusement—are also being increasingly used to spread hate and/or instigate social unrest and therefore seem to be a new form of expression of hate speech on online platforms (Fersini et al., 2022)(Suryawanshi et al., 2020). Some of these multimodal publications are only hate speech because of the combination of the text with a certain image (Kiela et al., 2020). Multimodal hate speech detection integrates various data types, such as text, images, audio, and video, to enhance the accuracy and robustness of identifying hate speech. The next part covers the feature extractor and usage of a multimodal pretrained transformer.

4.1 Feature Extraction

The text superimposed is generally extracted through optical character recognition (OCR). Unimodal feature extraction: The textual feature is extracted by using pre-trained word embedding (Mikolov et al., 2013)(Pennington et al., 2014) through LSTM ((Gomez et al., 2020), (Botelho et al., 2021), (Aman et al., 2021) RF ((Gomez et al., 2020) CNN (Suryawanshi et al., 2020). The transformer encoder BERT ((Sabat et al., 2019), (Kiela et al., 2020), (Hossain et al., 2022), (Prasad et al., 2021)), to get encoded text representations. Several pre-trained CNN architectures have been used. These are Imagenet used by (Gomez et al., 2020) (Sabat et al., 2019)(Hossain et al., 2022) Xception (Botelho et al., 2021) VGG 16 (Suryawanshi et al., 2020) (Aman et al., 2021) (Lee et al., 2021) ResNET (Ma et al., 2022) (Zhang et al., 2023a). Early multimodal identification work generally involves merging the unimodal features through fusion. To have better representations, unimodal features were fused based on concatenation (Kumar et al., 2021) (Kiela et al., 2020) (Hossain et al., 2022)(Kumar and Nandakumar, 2022). The fusion based on summation (Kumar et al., 2021),(Zhou et al., 2021b). The transformer architecture serves as the foundation for today's cutting-edge vision language learning models. There are two main approaches: Single-stream models/early fusion, such as VisualBERT (Kiela et al., 2020), UNITER (Zhang and Wang, 2022) (Lippe et al., 2020), OSCAR (Lippe et al., 2020) (Kiela et al., 2020), use a single transformer to process the image and language input at the same time. Dual-stream models/late fusion, such as LXMERT (Lippe et al., 2020), CLIP (Kumar and Nandakumar, 2022), DeVLBERT, and VilBERT (Lee et al., 2021), rely on separate transformers for vision and language, which are then combined towards the end of the model. New approaches leveraging the multimodal techniques to enhance the performance have been proposed.

4.2 Context Aware Information

(Zhou et al., 2021b) utilizes image captioning process (Xu et al., 2022) proposed MET-Meme rich in metaphors . (Cao et al., 2022) proposed PromptHATE to prompt pre-trained language models (PLMs) for multimodal classification. (Shang et al., 2021) developed GNN-based KnowMeme to enrich from human commonsense knowledge. (Hossain et al., 2024) developed context-aware framework; (Pramanick et al., 2021) proposed MOMENTA that leverages local and global perspectives to detect memes. (Botelho et al., 2021) decipher implicit hate (Yang et al., 2022) uses cross-domain knowledge transfer (Chhabra and Vishwakarma, 2023) leverages knowledge distillation architecture

4.3 Audio and Video Detection

(Rana and Jha, 2022) proposed new video hate detection data and combined the auditory features representing emotion and the semantic features to detect hateful content. (Das et al., 2023) curate 43 hours of videos from BitChute and manually annotate them as hate or non-hate, along with the frame spans, which could explain the labeling decision. They showed that models having multiple modalities surpass the performance obtained by uni-modal variants. (Gupta et al., 2023) explore the context for hate detection for video pages by using like description, transcript, and visual input. (Ibañez et al., 2021) develop a hate speech classifier from online short-form TikTok videos (Bhesra et al.) collected audio-based hate speech data; (Prasad et al., 2023) video frame features in the multimodal identification.

5 Dehatify

This section mainly deals with the advancement in the style transfer and counter-narrative response. Preventing hate speech through style transfer entails rephrasing toxic information in neutral or positive language and using advanced NLP techniques to change the tone while preserving content. In NLP, style transfer involves adding certain stylistic attributes to text while maintaining its basic structure and meaning. It follows the concept of encoder and decoder. The model is trained using unsupervised (no parallel data) or in a supervised manner (parallel data).

5.1 Span Prediction

Span prediction refers to identifying the start and end positions of a relevant text segment within a larger document. The inclusion of shared task (Pavlopoulos et al., 2021) To ease the moderators, this part will predict the toxic span. There were 36 system submission, with winners employing BERT with CRF. The results were computed using character-based F1. (Ranasinghe and

Zampieri, 2021) presents MUDES, a multilingual system to detect offensive spans in texts. It features pre-trained models, a Python API for developers, and a user-friendly web-based interface. (Pouran Ben Veyseh et al., 2022) proposed multi-task setting for toxic span prediction, and (Nouri, 2022) developed data augmentation with dual training for Offensive Span Detection

5.2 Style Transfer

(Mangal and Jindal) filters out hate words based on a lexicon. The void is predicted by using Google with the CBOW model. The second approach uses back translation to lose the original style but preserves content; it is then regenerated using desired styles. (Santos et al., 2018) trained a GRU-based encoder-decoder using non-parallel data. The framework combines collaborative classifiers, attention, and cycle consistency loss. (Ahmad et al., 2022) proposed a decoding technique following lexical constraints over the zero-shot style transfer method. (Masud et al., 2022) curated a parallel corpus of hate texts and their counterpart. A model NACL, a hate speech normalization operating in three stages: identifying the hate posts, identifying the toxic span, and then rephrasing it to non-hate. (Tran et al., 2020) designed a retrieve, generate, and edit unsupervised style transfer pipeline. The part of Speech (POS) tag sequences is identified, followed by the generation of suitable candidates, and corrected by the edit module. (Atwell et al., 2022) released a parallel corpus of comments with its style-transferred counterparts. The proposed model leverages discourse frameworks and parsing to preserve content.

5.3 Counter Narratives

The counter-narrative data is prepared with the intervention of humans. These data will be trained, and the output is to generate counternarratives concerning the post. (Bonaldi et al., 2022)presented generated dialogue data aided by the intervention of human expert annotators to automate counter-narrative writing. (Hong et al., 2024) proposed constrained generation of counter speech by incorporating two conversation outcomes in the text generation by prompt with instructions, prompt and select, LLM finetune, and LLM Transformer reinforcement learning. (Tekiroglu et al., 2020) employed a generative pre-trained transformer (GPT)-2 to generate silver counter-narratives, followed by expert validation/post-editing. (Chung et al., 2019) described the creation of the first large-scale multilingual hate speech/counter-narrative pairs by experts. (Fanton et al., 2021) presented a HITL framework for data collection based on an author-reviewer paradigm. (Chung et al., 2021) presented a knowledge-bound counter-narrative incorporating external knowledge retrieved through extracted and generated keyphrases. The process of dehatification needs to be more researched with the SOTA methods.

6 Model Implementation and Explainable AI

6.1 Model Parameters and Evaluation Metric

The experiments were performed using a 5-fold cross-validation (Zampieri et al., 2019)(Ghosh et al., 2022) (Kapil and Ekbal, 2020) approach. The 4-fold training set is split into 15% validation and 85% training, while the last fold is treated as the test set to evaluate the model. Most of the deep learning models were implemented using Keras (Zhang et al., 2018) (Pitsilis et al., 2018) with Tensorflow as the backend. Evaluation of the performance of hate speech (and also other related content) detection typically adopts the classic Precision, Recall, and F1 metrics. Precision measures the percentage of true positives among the set of hate speech messages identified by a system. The model employs precision (Badjatiya et al., 2017) (Dinakar et al., 2012)(Wiegand et al., 2018), recall (Burnap and Williams, 2015)(Gitari et al., 2015)(Waseem and Hovy, 2016) The model performance for unimodal is measured by F1 (harmonic mean of precision and recall) (Kapil and Ekbal, 2020)(Waseem and Hovy, 2016)(Zhang et al., 2018)(Badjatiya et al., 2017). Most of the multimodal models employ AUC-ROC (Kumar et al., 2021)(Kiela et al., 2020) (Shome and Kar, 2021) as its metric. The F1 score also used (Hossain et al., 2022)(Aman et al., 2021)(Lee et al., 2021) The quantitative metrics generally used in the generative task are consistency preservation (Santos et al., 2018), perplexity (Santos et al., 2018) (Masud et al., 2022), BLEU (Bilingual Evaluation Understanding) (Ahmad et al., 2022) (Masud et al., 2022)(Tran et al., 2020)(Atwell et al., 2022), ROGUE (Tran et al., 2020), METEOR (Tran et al., 2020) The novelty of generated text is also measured using relevance and effectiveness (Hong et al., 2024)(Bonaldi et al., 2022)

6.2 Mitigating Bias

Annotator bias refers to the systematic errors or tendencies introduced by individuals who label or annotate data used in machine learning and other data-driven applications. (Wich et al., 2021)(Al Kuwatly et al., 2020) This bias can affect the quality, reliability, and generalizability of the annotated data, leading to skewed or misleading results in models trained on such data. (Waseem, 2016) concluded that annotator bias can stem from various sources, including personal biases, unclear tagging details, task complexity, social bias, etc. Several bias mitigation methods are proposed to make the model more efficient. (Cheng et al., 2021) proposed debiasing strategy based on Reinforcement learning (RL), (Sahoo et al., 2022) extracted social bias data, and (Zhang et al., 2023b) introduced two mitigation approaches, such as multi-task intervention and data-specific intervention. (Mun et al., 2023)(Elsafoury et al., 2022) investigated countering of stereotypical bias, (Badjatiya et al., 2019) (Maity et al., 2019) mitigated internal stereotypical bias through knowledge representations, (Davidson et al., 2019) studied racial bias (Xia et al., 2020) proposed demoting racial bias by adversarial training; (Mozafari et al., 2020b) mitigated racial bias (Ahmed et al., 2022) tackled racial bias using geometric learning, (Halevy et al., 2021) mitigated racial bias using ensemble; and (Shah et al., 2021) studied reducing target group bias.

6.3 Explainable AI

The performance of the model can be enhanced by making the model learn the human rationale of the input in an explainable form. (Lin et al., 2024) explainable approach through reasoning. (Lin et al., 2024) model is empowered to perform dialectical reasoning over intricate and implicit harm-indicative patterns, utilizing multimodal explanations originating from both harmless and harmful arguments. (Clarke et al., 2023) introduced rule By example, an exemplar-based contrastive learning framework to explainable hate speech detection. (Yang et al., 2023) introduced the framework HARE, harnessing the reasoning capabilities of LLMs.

7 Challenges

Degradation of datasets, non-uniform definitions of hate, non-disclosure of the annotation guidelines, annotators' bias, time-consuming annotation, mental illness, etc. The mental health of hate victims has also been studied.

7.1 Effect on Mental Health

Cyberbullying and other subhate can be detrimental causes in mental health. The computational approach has not solved it; rather, a string of surveys based on questionnaires and responses, the degree of scale of depression is studied. (Bucur et al., 2021) analyzed the relationship between mental depression and online postings. (Saha et al., 2019) studied the psychological effects of hateful speech in relation to depression. (Wachs et al., 2022) explored the relationship between online hate speech victimization and adolescents' mental well-being through the use of questionnaires assessing online hate speech victimization, depressive symptoms, and resilience. (Torres et al., 2020) examined the effect of social, verbal, physical, and cyberbullying victimizations on academic performance.

8 Conclusion and Future Work

In this survey, we provided a critical assessment of how the automatic identification of hate speech in text has advanced over the last several years. Other realms of hate speech that we examined included cyberbullying, abusive language, discrimination, sexism, extremism, and radicalization. The work done in the unimodal text identification, multimodal hate identification, style transfer, counter-narrative generation, and discussion on mental health is done. The future work should focus more on fine-grained hate detection, a more mathematically efficient fusion approach, adding more explainability, and the continuous learning paradigm.

Limitations

Hate speech detection is a very vast domain covering multiple languages. This survey covers only the research done so far for the English language. The number of open repositories is very few, and the inconsistent guidelines and differences in annotator expertise further complicate the reliability of the data, impacting the effectiveness and accuracy of detection models. The data is, in most cases, very difficult to share because of privacy issues. Most of the work completed is not deployed, and if deployed, released by very few. The multimodal audio and video identification are in the very preliminary stage.

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