

# Predicting Hateful Discussions on Reddit using Graph Transformer Networks and Communal Context

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**Abstract**—We propose a system to predict harmful discussions on social media platforms. Our solution uses contextual deep language models and proposes the novel idea of integrating state-of-the-art Graph Transformer Networks to analyze all conversations that follow an initial post. This framework also supports adapting to future comments as the conversation unfolds. In addition, we study whether a community-specific analysis of hate speech leads to more effective detection of hateful discussions. We evaluate our approach on 333,487 Reddit discussions from various communities. We find that community-specific modeling improves performance two-fold and that models which capture wider-discussion context improve accuracy by 28% (35% for the most hateful content) compared to limited context models.

**Index Terms**—Hate Speech, Social Media and Social Discourse, AI for Social Good, Graph Neural Networks, Natural Language Processing

## I. INTRODUCTION

The rise of social media has led to increased harmful discourse with damaging mental health effects. A recent study by Gao et al. measured the mental health of over 4800 Chinese citizens and found a high correlation between increased anxiety and depression with high social media usage [1]. These alarming trends have motivated the usage of automated detection methods to help moderate these platforms and prevent further harms.

A common approach of methods that tackle this problem is to detect the harmfulness of individual comments that belong to a wider discussion [2]–[4]. Two central challenges arise, however. First, conversational hate speech is deeply contextual. To properly understand if a comment is hateful, it is important to understand the context in which it was said. Second, by only analyzing the harmfulness of individual comments, we are bound to a reactive kind of moderation, which requires the damaging comment and the discussion that led to it be published first. This can lead to the spread of conversations that discuss harmful or sensitive subjects which can incite further hateful discourse. As such, it is important to proactively detect the tone and trend of conversations before they can delve into explicit hate speech.

Towards the goal of proactive detection, we also believe that it is important to consider the unique latent communal norms

and behaviours that underpin social groups. Content which may trigger a hateful reaction from members of one group can trigger a different reaction from another group. This focus is inspired by a recent study by Cisellie et al., which found that online communities are prone to the “echo chamber” effect, where extreme ideals can be encouraged and amplified [5]. As such, learning these cultural norms and behaviours is essential to properly model the direction of a conversation and whether that direction leads to hate speech.

Taking all these observations into consideration, the question is how to design a framework that can perform a rich analysis of branching social media discussions with a view of proactive hate speech prediction, and also how best to design experiments to demonstrate whether community-specific analysis provides important benefits.

To study the behaviours of diverse communities, we focus on the social platform Reddit, where discussions take place in topic-orientated communities called subreddits. These communities are highly varied, ranging from *aww*, to discuss cute animals, and *politics*, to discuss political affairs. Beyond their subject differences, prior work by Waller et al. found that these communities exhibit significant differences in their social makeup and discussion behaviours [6]. For example, discussions that take place on *The\_Donald* were found to have a significant political right leaning bias whereas *politics* has an opposing left leaning bias. Within these communities, conversations take place in branching trees structures where any user can reply to the comments of other users, forming a linked chain of replies that can branch off into sub-discussions. In addition to textual replies, users can explicitly provide their opinion by up-voting (approving) or down-voting (disapproving) the comments of other users.

The need for a deeper analysis of discussions with critical consideration of the relevant context becomes apparent when examining the excerpt from Reddit provided in Figure 1. Focusing on the first interaction is insufficient in properly detecting the tendency towards hate, as these initial comments are actually quite benign. Indeed, what is perhaps most troubling with this excerpt is the kind of snowball effect of anti-social sentiment, as the discussion progresses.

# Framework Reddit Discussions

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