

Polarization in Reddit Discussions

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ABSTRACT

We investigate the formation of polarized groups of users in Reddit. We consider the formation of two types of polarized groups, namely, groups that barely communicate with each other (*unsigned*), and groups that communicate to express disagreement (*signed*). We study the formation of polarized groups both within (*intra*), and across communities (*inter*), that discuss the same topic. We also investigate the impact of controversial discussions in group polarization. We adopt an approach that exploits the structure of the user interactions. Our results show that: (i) there is evidence of unsigned inter-polarization and (ii) signed intra-polarization. Controversy seems to increase unsigned polarization.

1 Introduction & Problem Definition

Nowadays, millions of people use Reddit to express their views on a variety of topics, such as politics, economy and sports. Reddit is a large community made up of smaller sub-communities known as “subreddits”. Each subreddit consists of submissions related to a specific theme. Users can create submissions and comment on them. They can also cast positive or negative votes, called upvotes and downvotes respectively, for each submission and comment. Different extreme points of view may lead to negative social phenomena such as polarization.

Our main goal is to explore whether there is polarization in discussions in Reddit where people discuss a common topic and two opposing views prevail dividing users into two opposing polarized partitions (*sides*). We investigate the following questions: **RQ1:** Is there intra- or inter- signed or unsigned polarization in Reddit? There is *unsigned polarization* if there is low user interaction between the two polarized groups. There is *signed polarization* if individuals agree with the individuals from their own group and disagree with those from the other group. Also, *intra*- and *inter-polarization* refer to the formation of polarized groups within a single subreddit or across two subreddits respectively. **RQ2:** Does controversy increase polarization? i.e., are controversial submissions more prone to polarization than non-controversial ones? In Reddit, a submission is controversial if the number of upvotes is roughly equal to the number of downvotes.

2 Methodology & Results

We follow a 3-step methodology to answer the questions. In the first step, we collect all controversial and non-controversial submissions on a topic based on a set of keywords posted in the subreddits for which we want to compute polarization. In the second step, we build appropriate graphs to capture the communication between users that participate in the submissions. We build undirected edge-signed graphs where nodes indicates users and there is an edge if a user replies to another user in any of the submissions. The edge sign expresses either agreement (“+”) or disagreement (“-”) between users and exploits the upvotes and downvotes of the comments. In the third step, we measure the level of

polarization in the graphs by applying existing unsigned and signed polarity metrics. The unsigned metrics are based on random walks and boundary connectivity [1, 2]. Random walks (RW) metric captures the intuition of how likely a random user on either side is to be exposed to content of a high degree user from the opposing side. The more polarized are the two polarized groups, the lower the probability of not crossing the two polarized partitions, and therefore, the higher the polarization. The signed polarity metrics are based on eigensign properties [3]. Applying signed metrics, we can also detect the two most polarized subgroups in the graphs where the majority of signed edges within polarized subgroups express agreement and disagreement across.

We focus our study on specific historical controversial events. We select appropriate subreddits for each topic for which we want to quantify polarity and detect polarized subgroups. We present results related to the conversion of Hagia – Sophia museum in Istanbul to a mosque. We focus on Greece and Turkey subreddits.

	RW(rr)	RW(pp)	RW(rp)
NC	0.60	0.43	0.57
C	0.91	0.98	0.96

Table 1: Unsigned inter polarization between Greece and Turkey for non-controversial (NC) and controversial (C) submissions by applying Random Walks metric. RW(xy) means that a random walk starts from x users from one polarized partition and ends to y users from the opposite partition where x and y users can be either random (r) users or high degree (p) users. Zero values indicates low polarization while values close to one indicates high polarization.

We conclude that there is evidence of unsigned inter-polarization (see Table 1). Also, we notice that users tend to communicate with users of similar degree within groups in non-controversial submissions i.e. high degree users with high degree one. Furthermore, random users from one group do not easily reach high degree users in the other group. Also, we observe low overlap of users who discuss the same topic and participate in submissions in both subreddits.

PS	PE		PEA	S1		S2	
	S1, S2			Gr	Tr	Gr	Tr
3.25	66%, 95%	0%	9%	78%	5%	90%	

Table 2: Signed polarity (PS) between Greece and Turkey for all (controversial and non-controversial) submissions. Two polarized groups S1 and S2 are detected: percentage of positive edges (PE) within S1 and S2, percentage of edge across S1 and S2 and percentage of Greek (Gr) and Turkish (Tr) people in each group.

In addition, we observe that there is some degree of signed intra-polarity which means that the most polarized groups of users are detected within subreddits and not across them (see Table 2). Finally, there is an indication of increased polarity between users that participate in controversial submissions when compared to users participating in non-controversial submissions for both intra- and inter- polarization (see Table 1).

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