Construct of Sarcasm on Social Media Platform

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Abstract—**The basic idea behind machine learning-based systems, or artificial intelligence in general, is mimicking how humans operate. This idea is particularly true for our problem, sarcasm detection on social networking sites (SNSs). Therefore, before proceeding to build a system that can detect sarcasm on SNSs, we attempt to understand how humans do the same. Many studies propose approaches based on personal experience and word-level definition of "sarcasm" [1], [2]. However, in this paper, we aim to find more general themes that are typical with users while detecting and expressing sarcasm on SNSs through a qualitative study to build a more effective sarcasm detection model.**

I. Introduction

Sarcasm is an interesting aspect of human communication. It is different and usually more complex to understand than positive and negative statements. There are two opposing meanings of a sarcastic statement: one literal meaning and one intended meaning [3], whereas for non-sarcastic statements, literal and intended meanings of a statement are the same. Sarcasm detection has long been ignored from sentiment analysis perspective. Tepperman et al. [4] introduced the first work in sarcasm detection in 2006 from a computer science view point. After that, there has been some research in this field. Most of these works are machine learning-based detection approaches [3], [5], [6]. However, all of those works depend on a specific definition of sarcasm or the authors' hypotheses based on personal experience on social media instead of being grounded into psycholinguistic theory about sarcasm. We argue that to make machine learning based models more reliable and robust, we need to learn from cognitive theory of sarcasm.

Sarcastic statements are usually associated with non-verbal cues in in-person communication. According to Gibbs et al. [7], to understand a sarcastic remark, one has to understand both verbal and non-verbal cues at the same time. However, in this age of social networking sites (SNS), a large portion of conversations take place online and non-verbal cues of in-person sarcasm need to be expressed in a different way due to the limited communication modes available on SNS platforms. Though sarcasm has been well-researched by psycholinguists, most studies were conducted before the rise of social media, and they do not consider how sarcasm on SNS platforms is different from that of in-person communication. For example, non-verbal cues like amplitude change of voice or air-quotations are not possible on SNS platforms. In this paper, we are interested to study how the limited number of available modes of data on social media platforms imposes changes on sarcasm.

Since the objective of our study is to understand the construct of sarcasm on social media, we interviewed active social media users who have regular exposure to sarcasm in our targeted setting. We asked participants how they detect sarcasm on SNS platforms; when and how they express their sarcastic remark. To understand the role of language in this regard, we carefully recruited participants from two different language speaking people. This helped us understand how people from all over the world can detect and express sarcasm in a multilingual setting as well. Besides knowing an individual's method for detecting and expressing sarcasm, we were also interested to know about general response to sarcastic contents on these platforms.

Since there has been no prior theory about the construct of sarcasm on SNSs, we used a grounded theory based approach to analyze our data. We compared our data analysis with that of the study by Gibbs et al. [7] to see how non-verbal cues of in-person sarcasm change according to the modes available on SNS platforms.

Our qualitative study results in two different models for sarcasm on SNS platforms. The first one is on detection and expression of sarcastic posts and the second one is on use and non-use of sarcasm on SNSs. Our study critiques traditional unimodal machine learning approaches [3], [5]. It re-emphasizes the importance of multimodal approaches like some research works [1], [8], [9] and provides pointers about potential directions for multimodal sarcasm detection models. The rest of the paper is organized as follows: section II gives an overview of prior related works in literature; section III discusses the methodology of our study; section IV and V describes our two models respectively; section VI points out the design implications of the study; and finally, we conclude with a brief discussion.

II. Literature Review

Most works that study sarcasm are from linguistics, psychology, and cognitive science. Gibbs et al. [7] conducted experiments with 256 undergraduate students, where they showed how non-literal interpretations of sarcastic statements are processed by humans before the literal meaning. They said that when a sarcastic statement is made in an in-person conversation, and the audience have access to non-verbal cues besides the verbal statements, the audience translate the

statements into the corresponding intended meaning, i.e., non-literal meaning before translating the statements into their surface/literal meaning. They also discussed how sarcasm impacts how long the participants of a conversation remember a particular statement. They highlight the ease of processing and memory for sarcastic utterances. In a collection of several empirical and theoretical works, Gibbs et al. [10] discuss the theory of irony, especially comprehension of sarcasm in verbal form, social contexts, and functions of irony.

Sarcasm detection as a field of computer science can be placed under the field of sentiment analysis, which first drew the attention of computer science researchers in 2006. Tepperman et al. [4] developed the first work that recognized the problem of sarcasm detection from the perspective of computer science. They experimented with sarcasm recognition using cues like contextual (e.g., acknowledgement, agreement/disagreement), prosodic, and spectral features (e.g. pitch, energy, duration of each word). Given the limited capability of natural language processing at that time, they proposed a naïve approach of detecting sarcasm from text data. They emphasized on the nature of sarcasm of being associated with several commonly used phrases. In their work, they only searched for the phrase "yeah right" as an indicator of sarcasm.

Several studies have invested effort to define what it means to be "sarcasm". Gonzalez-Ibanez et al. [3] identified the opposite nature of literal and intended meaning of micro-blog posts as sarcasm. According to them, sarcasm is different from positive or negative statements made on social media. It conveys negative sentiment while the literal meaning (also termed as surface sentiment) of the statement is positive and likewise, conveys positive intended sentiment with apparently negative surface meaning. That means, the study by [3] argues that sarcasm has one intended and one surface sentiment that have opposite polarity, i.e., positive surface meaning with negative intended meaning, and vice-versa. For example, in a statement like: *"Thank you for ruining my day."*, the phrase "thank you" is used with criticizing intention (i.e., negative intended meaning), whereas the phrase itself literally expresses gratitude (i.e., positive surface meaning). However, several other studies do not agree with [3] in this regard. Filatove et al. [11] argue that sarcasm always has positive literal meaning with a negative intended meaning. They also present observations of sarcasm having clear victims in micro-blogging platforms, including social media, blogging sites, etc. They discussed sarcasm and irony inter-changeably in their work. Kreuz et al. [12] from a linguistic perspective agree with the argument of Filatova et al. [11] on sarcasm having always positive literal meaning with negative intended meaning.

Clift et al. [13] explained sarcasm as a phenomenon of divergence between the spoken words and their intended meaning with the Traditional Oppositional Model (TOM). However, this model was criticized for ignoring the requirement of these two aspects of meaning happening at the same time. Sperber et al. [14] suggested that audiences just process the intended meaning of sarcasm in a model named "Echoic/Interpretation Model". Later building on this model, the "Echoic Reminder Model" was proposed and reemphasized by Kreuz et al. [12] and Colston et al. [15] discussed the role of generally expected situation or social norms. Instead Kumon-Nakamura et al. [16] suggested sarcasm is achieved by mentioning part of an expected situation that has occured while some other part was violated. Later Colston et al. [17] in their book, discussed how verbal sarcasm can be viewed as violation of expectation, and the pragmatically insincere or contrary relationship between literal and intended meaning of statements. This is echoed in the studies by [3], [11], [12] where we can see sarcasm as violations of Grice's maxims [18]. According to Grices Maxims [18], there are two of the major principles for cooperative dialogue: the maxim of quality and the maxim of manner. The maxim of quality states that one tries to be truthful and does not give information that is false or that is not supported by evidence. The maxim of manner says that one tries to be clear as one can in what one says avoiding obscurity and ambiguity. According to Tepperman et. al. [4], sarcastic speech always violates at least of one of Grice's maxims for cooperative dialogue.

Bamman et al. [6] gave importance to context information for the task of sarcasm detection. They tried to capture extra-linguistic information from the context of an utterance of sarcasm on Twitter. According to them, inclusion of properties of author, audience, and the immediate communicative environment can contribute to the sarcasm detection task. Their argument also situates itself in a line with linguistic study by Utsumi et al. [19] who discuss the comprehension of verbal irony for in-person conversational settings. The role of context can also be explained with the expectation of certain social norms as in [12], [15], [17], and thus reestablishes the incident of violating Grice's maxims [18].

III. METHODOLOGY

Our qualitative study started with goals to (1) understand how users recognize sarcastic contents on social media, with or without context, (2) study what factors impact the ways of how they express sarcasm, and (3) study how users on social media respond to sarcasm. To achieve these goals, we conducted an interview-based qualitative study with social media users situated in Missouri, United States and Dhaka, Bangladesh. Our data collection consisted of semi-structured interviews with 20 participants from these two countries.

A. Semi-Structured Interviews

We conducted semi-structured interviews with participants between November and December 2018. The interviews targeted understanding participants' social media using practices and their ways of recognizing as well as conveying sarcasm. The first author (23 years old, Male) in this work was born and brought up in Bangladesh, and has been living in the United States for more than one year. He speaks both local languages, Bengali and English. Since use of sarcasm is very common on social media, we began by recruiting participants who were active on social media. We adopted a blend of convenience sampling, purposive sampling, and snowball sampling [20]. First, two participants were recruited from the authors' social network by convenience sampling. Second, since the focus area of this research is the social media platform, authors

posted the recruitment flyer of this research on social media. In the flyer, we described the inclusion criteria for our study and gave a high level overview of the objective of the study. We distributed the flyer through departmental email. Second, we used social media itself as a channel for recruiting participants since most of the users on this platform will inherently satisfy one of the inclusion criteria. We shared the recruitment flyer on the social media. As a result, the subjects of interests in this research could be easily reached through purposive sampling. Third, as previous literature suggest, by keeping the comment section public for tagging improves the response rate [21], we welcomed tagging other potential participants. Again, our participants recruited through convenience sampling in the first phase helped us recruit additional participants. Thus, snowball sampling in both online and in-person social network helped us to recruit potential subjects. We also utilized in-person communication and recruited participants through word-of-mouth. In total, we recruited 20 participants speaking two different languages from two different countries.

Participation in the study was voluntary. The average completion time of the interviews was around 25 minutes. The interviews were conducted one-on-one. We gave the participants a high level overview of the study objective at the beginning of the interview. We encouraged them to ask any question they might have, and we obtained written consents from participants before the interviews with the informed consent form. The consent form was devised keeping it at a high school standard reading level. However, we also summarized the consent form in their native language. Interviews were conducted at a place preferred by each participant, or over Skype, and in his/her native language. Interviews were audio-recorded with permission from the participants.

Interviews were semi-structured and guided by a list of topics. We collected participant demographic information like their age, gender, most recent occupation, highest attended educational level, etc. We asked about their experience about using social media, e.g., with whom they mostly interact with, what kind of contents they usually see in their newsfeed. We then asked questions that sought an understanding of how they recognize and express sarcasm, including their views about overall user response to sarcastic contents on social media.

B. Participants Characteristics

Our 20 participants (16 males and 4 females) came from two different language speaking communities originated from two different countries and ranged in age from 19 to 34 years (average = 25.1 years, standard deviation = 4.48) . With respect to their social media usage, all of our participants satisfy these following criteria:

- Must have an account with at least one SNS for more than a year.
- Must be an active user on SNS with spending 5-7 hours per week.

Participants possessed a range of socio-economic backgrounds. Five of them are undergraduate students, six are graduate students, six are employed having undergraduate or graduate degrees, and three are currently unemployed. More

TABLE I
DEMOGRAPHICS OF PARTICIPANTS (N=20) IN THE INTERVIEW ON SARCASM USE ON SNS

ID	Gender	Age	Language
P1	Male	33	English
P2	Male	29	Bengali
P3	Male	21	English
P4	Male	28	English
P5	Female	22	English
P6	Male	22	English
P7	Female	29	English
P8	Male	20	Bengali
P9	Male	31	Bengali
P10	Male	34	Bengali
P11	Male	30	English
P12	Female	22	Bengali
P13	Male	20	English
P14	Male	25	Bengali
P15	Female	24	Bengali
P16	Male	25	Bengali
P17	Male	21	Bengali
P18	Male	25	Bengali
P19	Male	19	English
P20	Male	22	English

detailed information about our recruited participants are shown in Table I.

The participants we studied represent two different sets of social media users. The participants recruited from the United States were mostly users of both Twitter and on Facebook. On the other hand, participants collected from Bangladesh were mostly active on Facebook, some of them having accounts on Twitters that they do not use often. Participants from the United States use English in all their social media activities whereas participants from Bangladesh varied in their language use on social media. They used both Bengali and English on social media, as well as a version of Bengali called "Banglish", Bengali words using English alphabet.

C. Data Collection and Analysis

The data we collected resulted in a total of 283 minutes (4 hours 43 minutes) of audio-recorded interview data and a collection of field notes. The first author of this paper transcribed the interviews and translated them to English. These qualitative data were analyzed using an inductive approach. We utilized grounded theory [22] as the inductive method on the interview scripts. Since to the best of our knowledge, there has been no research on theory about users' sarcasm behavior on online platforms, we in the early phase of our study, aimed to have insights/theories about users' sarcasm behavior on social media. Therefore, grounded theory data analysis meets our need. As *core phenomenon*, we are interested to study how users detect sarcastic remarks on social media. We studied what factors initiate the circumstances of a sarcastic conversation to occur or a sarcastic remark to appear as a part of a conversation as the *causal condition*. This leads to our studies of *strategies*, i.e., how users express sarcasm on social media. Then we study what *consequences* or impacts sarcasm has on users' interaction on social media.

After we conducted interviews, we prepared transcriptions of the sessions. We identified parts of the participants' quotes where they discussed their methods of expressing sarcasm. A

participant mentioned his use of interjections inappropriately to convey sarcasm. We open-coded this response descriptively as "wrong use of interjection". Repeated patterns in users' interaction give rise to axial codes. For example, "wrong use of interjection" and "association of wrong adjectives" are two open codes categorized under "opposing sentiments as parts of a single sentence". The final codes were agreed upon when themes came to a saturation. In selective coding phase, we integrated the emerged axial codes into theoretical models. Our qualitative study resulted in two separate models: (1) sarcasm detection and expression model for SNSs and (2) sarcasm use and non-use model for SNSs.

IV. SARCASM DETECTION AND EXPRESSION PRACTICES

Before discussing how sarcasm shapes users' responses to a content on social media, it is important to understand how our participants recognize and express sarcasm on social media. Broadly, the subjects we interviewed recognized sarcasm in two ways: (1) unusual emotion/sentiment expression style and (2) usual patterns of sarcastic posts.

A. Unusual Style of Sentiment Expression

The topics that are usually discussed on social media are often subjective human interaction. That means, users discuss their views, give opinions, and express their feelings about a matter. As discussed earlier, a substantial amount of research has been done to analyze the sentiment and emotion of these user generated contents on social media. Usually, a particular content/post generated by a user contains his/her views, and thus the sentiment towards the corresponding topic. However, in case of sarcasm, our participants report that this sentiment in a particular post might seem unusual.

1) Exaggeration of Sentiments: Many of our participants agree that exaggeration of sentiments in text is a sign of a post being sarcastic. They think that in well-constructed sarcasm, there are two objectives (1) to point out a flaw of a targeted person (this was previously identified by previous works) and (2) to entertain others if an audience is available, which is common in usual social media settings. According to participant P8,

"It does not matter what emotion you are showing, exaggeration of it will automatically make your targeted person confused whether it is sarcasm or not, since it is so common. Your audience will often find it funny, so you get some people on your side at least, even if the person who was your target does not get the sarcasm."

While discussing this context further, an interesting reasoning was posed by our participants. According to them, when one tries to make a general post, the objective is usually to inform, to share opinion that will eventually lead the audience to some direction. However, in posts with sarcasm, the composer has no such motivation rather the sole goal here is to make people laugh and that can be done by making the post subjective. We found this reasoning plausible during our quantitative analysis presented by [9].

2) Opposing Sentiments: In a subjective writing, a person shares his/her positive or negative sentiment. As previous studies have suggested, a sarcastic remark often has a negative intended meaning. Our participants share the same view as the study by Cliche et al. [23]. They say that in a sarcastic post we can expect to observe opposing sentiments as part of the text. This might be evident by their sentence construct: "Wow! This is ugly" (example given by P6); here, the sentiment in the first sentence is positive whereas it is negative for the second sentence. As P7 gave us an example, "Terribly terrific", such phenomena can be observed at word level as well.

3) Wrong Use of Punctuation: All of our participants agree that wrong use of punctuation is a usual clue for identifying a sarcastic post. They say that this clue often occurs in sarcastic remarks as a part of a conversation. Our participant P19 gives his opinion with an example.

"Suppose, you are surprised and want to say "wow", what mark will you use? You will use exclamation mark with that. But "wow" with a period after that just says that you are not much impressed, rather you might be annoyed and are trying to show your annoyance or callousness with a cold wow."

However, they also agree that though it is a usual clue, it is not a very reliable clue. They think users generally want to use social media with minimum effort. If they mistakenly use wrong punctuation with a sentence, they often do not care too much to edit the post to correct a single punctuation mark. They might rather explain that it was a mistake and correct later only if someone else pointed out at the wrong punctuation.

B. Usual Structures/Patterns of Sarcastic Posts

Participants said that they look for clues in different parts of a post. Some participants reported that the users who have been on social media for a certain amount of time notice the following things as notions of sarcastic posts: (1) exaggeration of usually necessary emotions in writing, (2) popularly used patterns of sarcastic posts that users learn with time, and (3) opposing emotions/sentiments in different parts of a single post.

1) Reference to Recent Objects: Our participants agree on a very interesting aspect of sarcastic contents on social media. They think there is a temporal factor to the pattern of sarcastic posts on SNSs. As our participant P1 said,

"You know when Star Wars is a very popular movie. But when a new Star Wars movie comes you can expect to see a lot of sarcastic comments referencing to famous quotes from the movie. Like, people might try to use "May the force be with you."

We were curious to know whether it is the repetition of what we explored as "reference to iconic object" earlier. Therefore, we asked the participants about this. However, they think these two are related but different factors. P1 clears up this in this way:

"... No, you see, there are obviously some fans who can tell you the movie's name and what happened in a particular scene when they hear a quote. But most people are not like that. They watch, enjoyed, and may re-watch before a new movie in that

franchise comes. That's when the craze is revived, and it will make sense to use these reference only at that time. But sure, if I am talking with my friends who, I know, lives in Star Wars like me, hahaha! Then sure! I can use those reference anytime."

P17 shares a different perspective about the temporal factor of sarcastic posts' pattern. He thinks recent events that get popularity online may impact what users refer to for being sarcastic. He thinks the frequency of these references are maximum a little after when the original event got popularity. With time, users are posed more new events that might be referenced for sarcasm, and the earlier ones are not used as many times as when they were first seen; however, regular users might recognize and use those at times. When we asked for example, P17 said,

"Few years ago, there was a live telecast of an interview with general people in Rajshahi or Rangpur, I don't remember exactly, somewhere in northern Bengal during winter. The reporter asked how the people felt about the winter. So, one of them told that he did not like it and could not work for winter in local dialect, and a particular word in that dialect means something bad in proper Bengali. People in Central Bangladesh made fun about that part of the interview a lot. It became a popular sarcastic clue at that time. Every year when winter comes, you will see some people to refer to that; not as popular as before, but still it's used."

This shows a periodical pattern in temporal factor of sarcastic posts' structure. Several other later participants agreed with him. For example, P18 said it is usual to use some particular reference periodically "every four years during the world cup".

2) Association of Popular Memes/Meme-like Contents: A major clue that our participants reported is association of "meme-like" contents with the posts. Meme is usually an image or short video (sometimes GIF) that is taken directly or with slight variation from some popular media (e.g., TV series, movies, etc.), and spread rapidly among the internet users. For example, as many of our participants mentioned about the presence of photos of Matthew Perry (who played the character of Chandler Bing in popular TV series "Friends") in some special postures (as shown in Figure 1(a)) in inset of images help them to identify the sarcastic intention of the post. Discussion with our participants also gave us an idea about other widely used images that are perceived as clues of sarcasm in form of images. Use of hand-drawn meme-faces, as shown in Figure 1(b), came as another example of such categories of visual cues. Thus, while quite different from each other with respect to the visual representation, all of them depict the same sentiment of "sarcasm".

3) Capitalization: All of our participants agree that capitalization of words in an SNS post denotes emphasized effort from the composer for expressing his/her emotion. As we have discussed earlier, participants agree that extra effort for exaggerating sentiment might be a clue to sarcastic post. Participants also agree that capitalization might also be used to reverse the meaning or sentiment in a sentence. Our participant P13 gave us an example of what he thinks is a popular form of sarcasm of this pattern:

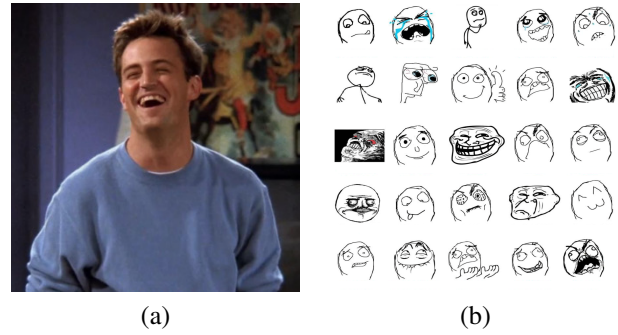*"If I say, the book is SOOOOO good that if you close it once*

Fig. 1.   Qualitative study participants contributed/suggested samples of images with sarcastic visual cues: (a) Matthew Perry in his popular posture that work as indication of sarcasm for many participants. Thanks to Participant P14 for providing us with the sample. (b) Samples of hand-drawn meme faces, collected from: http://bit.ly/memefacesample

you wouldn't want to open it again. It obviously has opposing sentiments in a single sentence, but when I am using this type of sentence in a conversation, I don't want others to miss that I made a sarcastic remark. So, it makes sense to emphasize to catch their eyes."

In this step, we know how "unusual style of sentiment expression" in a sarcastic post is achieved through a usual pattern of posts.

4) Use of Arcane Style of Writing: We observed an interesting way of conveying sarcasm among our participants from Bangladesh. There are two forms of Bengali written language – *Sadhu* (more formal, used to be in practice until twentieth century) and *Cholito* (less formal, currently is in practice). Both use the same fonts, however, they vary in their preferred use of words. Most of our participants from Bangladesh agreed that Bengali sarcastic posts on social media are often written in the arcane form. As one of our participants, P12 said,

"You know, no one in general, nowadays write in Sadhu form. So, when you see a piece of text on Facebook that is in Sadhu language, if it is not from some old books or something, you instantly know there is something the person is trying to do. I often find that posts written in Sadhu, are actually sarcastic. At least the person is trying to say something funny, if it's not exactly sarcasm."

In this context, participants P14, P15 presented a related insight. P14 opines that writing in this arcane form is not easy for all as it has not been in practice for a long time. Therefore, it is not often seen in quick sarcasm that comes as reply in a conversation. Rather, it is seen in well-written satire posts that took considerable effort from the writer of that post. Though P15 agrees with P14 about the fact that this clue is not usually seen in sarcastic comment in middle of a conversation, P15 has a different reasoning about this. P15 thinks the reason it is not seen in "quick sarcasm" is less for the extra effort needed, rather more for the fact that most people will not understand the less-used words of this form of writing. According to P15,

"Who uses Facebook nowadays? Mostly young generation. ... They do not know this writing. Even many people of our age do not know it very well. So, if you write that in middle of conversation, they will either miss the sarcasm or ask for explanation. It will lame if I have to explain myself after making a sarcasm."

As we can see, though our Bengali speaking participants agree that posts written in arcane form of Bengali writing might be clue for the post to be sarcastic, it is often applicable only for long and satirical posts for very concentrated audience.

5) Wrong Spelling: This pattern of sarcastic posts was very common among our participants from Bangladesh. They said that it is a strong clue of Bengali sarcastic posts that they see on social media. In Bengali, there are some pairs of letters with very close sounds. In these pairs, one is softer than the another for very similar sound. According to our participants, using the hard sound in place of the soft one, and vice-versa are clues of a piece of text to be sarcastic. However, they agree that users do not do the same with text written in English.

Soft sound	Hard sound	English sound
র	ড়	r
ত	ট	t
দ	ড	d
স	শ	s

Fig. 2. Examples of pair of soft and hard Bengali sounds for corresponding single English sound. The list is not exhaustive.

In this context, most of our participants agree that this pattern of sarcastic posts emerged recently. Though first Bengali keyboard was published in 1988, it was fairly complicated for users to learn. This limited the use of Bengali language on digital media. In 2014, a phonetic Bengali keyboard named Avro was released. This made it easier for users to write Bengali on computers, and eventually, helped increase the presence of Bengali online. After that, it was possible to distinguish 50 letters of Bengali alphabet easily that could not be done with 26 letters of English alphabet. Each Bengali letters pair having similar sounds often has only one corresponding letter in English (as shown in Figure 2). Since before 2014, most of the Bengali users wrote Bengali using English fonts online, it was not possible to use this hint for conveying sarcasm.

Participants P15, P16 raised another concern about this clue to sarcasm. They said, as less educated people are not often aware about the distinction about those sounds, they spell words wrong unknowingly. Therefore, wrong spelling in Bengali text can be thought as a clue to sarcasm only if the post was composed by a person with schooling proper enough to learn spellings of usually used words.

6) Use of Similar Sounding Words: Participants agree that use of similar sounding words having different meanings is a major clue for sarcastic posts on SNSs. They also think that mashup of two words is also often deemed as sarcastic among their audience. The reason they think it as a better clue for sarcasm on social media is that posts are written and audience have more time to put attention to details to understand the hint themselves, unlike for in-person communication, it is difficult to put such subtle hint on the go.

7) Reactions and Emojis: Our participants have commented that reaction buttons and emojis often reverse the meaning of

a post. They described this dynamic in a bidirectional manner. First, the post composer can associate the post with emojis that are often used to joke on the internet. This might change the tone of the post, in other words, make the post sarcastic by creating a difference between surface sentiment and intended sentiment of the post. This aligns with the theme of opposing sentiment that we discussed earlier. As participant P2 said,

"If I see a friend to write something very serious, and put a wink emoji at the end, I'll know this person is being sarcastic about his comment."

Second, all participants agree, in a sarcastic post, the received reactions from the audience is always very mixed. While some of the audience react to the intended meaning after understanding the sarcasm, some might want to play along with the sarcasm. Our participant P2 said,

"Suppose, you posted a sarcastic post about something that annoys you, but you sarcastically said that you loved it. Many of your peers will show annoyance as their reaction if they understand the sarcasm. But many, specially my friends do it, might want to keep the flow going by being positive about it in their reactions and comments. Some might be just totally lost."

Thus, a sarcastic post receives a mix of emojis and reactions both from the composer and the audience that our participants think as a usual pattern of sarcastic posts.

V. Sarcasm Use and Non-use on Social Media

We identified four kinds of SNS users with respect to their use of sarcasm 3. This use comprises two functionalities – detecting sarcasm and expressing sarcasm. (1) *Non-users* of sarcasm means the users who cannot detect and use sarcasm on social media. Mostly new SNS users fall into this category. (2) *Detectors* are users who gain the experience needed to detect sarcasm on SNS, but are not experienced enough to compose sarcastic posts on their own, i.e., their sarcastic posts are often misinterpreted by the audience. These users gain the ability to detect sarcasm over time, though they cannot sarcasm very effectively. (3) *Consistent* users are who can detect sarcastic posts, and express sarcasm in their posts without much misinterpretation in most of the cases. (4) *Disenchanted* users are experienced SNS users who can detect sarcasm in most of the cases, and capable of composing such posts, however, chose not to do so for some reasons like misunderstanding of sarcasm from him/her among his/her peers (explained later in this section).

A. Use of Sarcasm on Social Media

Some of our participants displayed enthusiasm for sarcasm on social media. They think that people on social media in general, should take social media lightly where they can make small jokes about the happenings of their daily lives. They believe sarcasm is a way to do that. Thus, sarcasm may work as a driving force for making a content popular on SNSs. According to our participant P10, this force works behind popularity beyond online platforms as well. He describes SNS as the place for him to get popularity, and sarcasm as the driving force behind it. As he says,

Use		Understand	
		No	Yes
	No (involuntary)	Non-users	Detectors
	No (voluntary)	N/A	Disenchanted
	Yes	N/A	Consistent

Fig. 3. Different levels of sarcasm users on SNSs.

"I am one of the very first people in Bangladesh who were regularly active on Facebook. There were some groups at that time where I mostly wrote. I think my main strength is that I write about things like politics, or day-to-day life using humor or sarcasm. People like that. That actually made me popular."

Besides, several of our participants agree that with sarcastic contents that refers to a recent event or that can be understood with little or no context get a lot popularity.

B. Non-use of Sarcasm on Social Media

Unlike what we discussed earlier, some participants also reported their reasons of non-use of sarcasm on social media. Our participants present mainly two factors in this respect. First, inexperience of using social media might present the users a challenge while understating and conveying sarcasm on social media. Our participants think older people are a large part of this group. Our participant P1 says,

"It often happens that I am being ridiculous with my friends on a sarcastic post, and my aunt comments in a serious tone. Then, I have to explain that we are joking."

Second, previous bad experience of using sarcasm might demotivate a user from using sarcasm on social media. Most of the examples that our participants discussed had a common pattern. They used a sarcastic remark, that was criticized earlier. Or the flow might be opposite – where they were being serious about something, and their audience did not take it in the intended way staying under the hood of sarcasm. Either way, it belittled the intention of the post, and that experience demotivates the use of sarcasm.

VI. Design Implications

In this section, we discuss implication from our findings for making space for more engaging interaction among users. SNS developers can consider these implications while designing their system and customize their algorithms to organize newsfeed.

A. Organizing SNS newsfeed

Our participants' reasoning behind using sarcasm on SNSs provides a design implication for SNSs. While the algorithms social media platforms use to organize content is not known,

they might use some insights from this study. For example, they can consider to show few sarcastic contents to new users at first with a notification about those posts being sarcastic and then slowly increase the amount of such contents in one's newsfeed if he/she likes those and as he/she becomes more familiar with SNS sarcastic posts.

B. Checking on tempering of SNS algorithms

As we found out, sarcastic content can gain popularity on SNSs. Thus, it is safe to assume that content having a pattern similar to usual sarcastic contents might intrigue users. However, clickbaits (a form of advertisement which uses hyperlink text or a thumbnail link, and is designed to attract attention and entice users to follow that link) might use this insight to temper with SNS algorithms to achieve their own objectives and trick users for that. SNSs might want to have a check on such tempering-like activities.

C. Assisting users according to their preference

This provides another direction to the design implication we mentioned earlier. While we proposed that SNSs can introduce new users with sarcasm on SNSs over time, that might seem to be an overhead to the experienced users. Thus, instead of making that a feature of an SNS, web-browser based extensions can be designed to help users to check whether a particular content is sarcastic or not.

For the design implications we mentioned so far, machine learning-based models to detect sarcasm on SNSs, as done by [5], [8], [24], have to be made more robust and they can benefit from the findings of this qualitative study.

VII. Discussion

While using sarcasm on SNSs, users want to gain attention from their targeted audience by making it clear instead of doing it subtly. It becomes evident through both unusual style of sentiment expression and usual patterns of posts. For example, exaggeration of sentiment in statements, writing style (e.g., capitalization, wrong spelling, arcane written form), and association of usually sarcastic contents (e.g., memes, emojis). This intention of making sarcasm clear to audience can be driven by two factors–first, making it understandable to inexperienced users, and second, targeting an engaging interaction among users of various mix.

The temporal factor associated with sarcasm is quite intriguing. As we found from our study, recent events are often referred to while making sarcasm-containing posts since it helps many users understand that sarcastic remark. This again relates to the strategy of users making sarcasm clear to a large audience. Temporal factors of sarcasm on SNSs also showed a periodic nature. As indicated by our study, while an event like world cup, or release of new episode of a popular movie takes place, sarcasm related to those during those times intrigue non-followers to check out those and motivates a new larger group of people to join the existing followers group. Thus, it achieves an engaging interaction by motivating inexperienced users (in

this case, non-followers) with easy to follow content at first and eventually including them into the community.

With the inclusion of more modes of data, users can make sarcastic contents dividing the context and comment in different modes (e.g., opposing sentiments in text and image) or establish a usual pattern of sarcastic posts over time (e.g., memes, reaction emoticons). We also found the impact of availability of technology with respect to languages as well. As our non-English (Bengali) speaking participants reported their way of expressing sarcasm changed with the invention of easy-to-use phonetic keyboard. It differs from both the ways of expressing sarcasm in English and how Bengali speaking people used to do it before the introduction of the phonetic keyboard.

Our qualitative study ended in thematic analysis of user sarcasm behavior on social networks. Our data analysis resulted in two models. First, the sarcasm expression model discusses how users detect and express sarcasm on social media providing valuable insights for building sarcasm detection model/system. Second, the sarcasm use-non-use model discusses why users choose to or not to use sarcasm on social media platforms that help identify design implications for SNS platforms with respect to user sarcastic content sharing. Being the first qualitative study on construct of sarcasm on SNSs, this paper can serve to guide future sarcasm detection system based research.

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