Yay…, ☺, and #Sarcasm: Exploring How Sarcasm is Marked in Text-based CMC

Bronte G. Gordon
Portland State University

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by

Brontë Gordon

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Abstract

Sarcasm is a complex phenomenon of indirect speech, when we intend a meaning different from that of the literal words we use. In face-to-face settings (FtF), facial expressions, body language, and prosodic cues can be helpful indicators of sarcasm. It becomes even harder to decipher when these physical cues are removed as in any written setting. This paper explores what text strategies are used to mark sarcasm in text-based English language communication online. Through a systematic literature review, the similarities and differences of irony and sarcasm were explored, as well as the issues these parallels and distinctions create in delineating one from the other, the broad theories associated with them, the shared features of spoken and written sarcasm, and the novel features of text-based CMC sarcasm. It is found that sarcasm in text-based CMC is marked in three primary ways: explicit (author labeled as in hashtags or tone indicators), suggested (emojis and contrasting contexts), and ambiguous (formatting and unmarked, broad contexts), although the rapidly changing nature of social media and other text-based CMC indicates that the specific strategies used to convey sarcasm will continue to change.

Keywords: sarcasm, verbal irony, CMC, text-based, markers

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I never thought I would be discussing emojis and hashtags in a university course, and yet, that is exactly what I found myself doing. During this course, which was on Language and the Internet, we discussed many types of internet speak and common uses of internet language features, like emojis and hashtags. While these are interesting topics, they are not the focus of this paper. The focus is on sarcasm and how it is marked in language on the internet (hint: hashtags and emojis are a good start). Sarcasm is a natural and organically occurring tool of language and communication. It has likely been around since the very beginning of language itself and has changed along with language over time. Sarcasm is a complex phenomenon in which the actual words used (locution) do not match up with the intended meaning (illocution) of the speaker. In face-to-face settings (FtF), facial expressions, body language, and prosodic cues – like vocal inflection and rate of speech – can be helpful indicators of sarcasm. It becomes even harder to decipher when these physical cues are removed as in any written setting. In literature, an author can easily indicate sarcasm by using a phrase like "he said sarcastically." But these kinds of dialogue tags are not used in day-to-day computer mediated communication (CMC) like email, text messaging, social media posts, or video comments. Authors of text-based CMC must find other ways to convey their sarcasm or risk miscommunication.

For several reasons, this paper explores what text strategies are used to mark sarcasm in text-based English language communication online. The focus is on text-based CMC because CMC is a very new phenomenon itself, only becoming more common around the early 1980s with personal computers being promoted by large corporations like IBM, and then the development of the World Wide Web in the later 1980s (Stidham, 2014). Through the extreme growth rate of CMC use over the last four decades, we are able to observe an evolution in the English language. This could be used to examine Language change in real time. The research

that is referenced in this paper investigated language data from the social media platforms

Twitter and Reddit although some data sets are from Amazon product reviews and YouTube

comments. This paper finds that sarcasm in text-based CMC is marked in three primary ways:

explicitly, by suggestion, and ambiguously, although the rapidly changing nature of social media

and other text-based CMC indicates that the specific strategies used to convey sarcasm will

continue to change.

Methods

I became curious about sarcasm, due in part to a series of miscommunications of

sarcastic comments I had recently, and because of a class I was taking on language and the

internet where we discussed humor (as well as hashtags and emojis) in detail. The

miscommunicated comments occurred in FtF settings where both conversational participants

were wearing masks during the post-quarantine Covid era. I intended a comment to be

sarcastic, but the person I was addressing did not interpret my comment as sarcasm because I

had not used any of the vocal qualities associated with sarcasm and facial expressions were

mostly obscured by my mask (this happened a number of times with different addressees). I

saw a clear connection between a lack of physical and audible cues in FtF settings with text-

based CMC. A quick Google search showed a large body of work in linguistics on sarcasm. I

noticed that many of the articles looking at CMC discussed sarcasm and emojis or hashtags,

but very few discussed the variety of other methods I had seen used. So, I decided to explore

more systematically what text strategies are used to convey sarcasm in text-based English

language communication online.

I began my research by working to narrowly define sarcasm. I did this by searching for

keywords in articles from databases in the areas of linguistics and communication like Jstor,

Routledge, and the LLBA, to find peer reviewed journals that discuss what sarcasm is in face-to-

face speech and writing, how sarcasm is different from irony, and how sarcasm is cognitively

processed. I started by searching broad terms like *sarcasm, irony, online, hashtag*, and *emoji* and limiting potential sources to peer reviewed works. I was able to find seven articles on a first pass with these parameters. After reading from the articles in this initial search and developing a better understanding of sarcasm in general, I made a list (based on my own observations and input from other digital native users) of common methods used to convey sarcasm in CMC settings, like social media platforms or video comment sections. This list included five methods: emojis, tone indicators, formatting, hashtags, and context. After compiling this list, I did another search through the previously mentioned databases with new search terms and also gleaned research from the reference lists of articles I had already read. I looked for articles that specifically explore sarcasm use in each of the ways I had listed and found another common method for conveying sarcasm: a positive reaction to a negative situation (Riloff et al., 2013). I organized each of these methods into one of three larger groups: explicit, suggested, and ambiguous sarcasm. In total, I was able to find 60 sources related to the topic of this paper through many iterations of this type of systematic search.

   The remainder of this thesis will be structured into a section for general discussion of the relationship between irony and sarcasm, and sections for each of the three broad types of sarcasm marking in CMC: explicit, suggested, and ambiguous.

The Relationship Between Irony and Sarcasm

   The first issue one will encounter when doing research on sarcasm is that there is no predominantly agreed upon definition of sarcasm. Some scholars view irony and sarcasm as subsets of figurative language, so they are different but nearly synonymous (e.g., Bryant, 2012; Clark & Gerrig, 1984; Gibbs, 1986; Grice, 1975; Pexman, 2008; Sperber & Wilson, 1981; Wilson & Sperber, 1992). Others believe sarcasm is a subset of irony (e.g., Bowes & Katz, 2011; Hancock, 2004; Skalicky & Crossley, 2018) while others look specifically to define and explore the differences between them (e.g., D'arcey & Fox Tree, 2022; Dynel, 2017; Filik et al., 2019;

Lee & Katz, 1998; Taylor, 2017; Wang, 2013). Dynel (2017) provides a particularly interesting discussion of a shift in the colloquial definitions of both sarcasm and irony, where "sarcasm" is taking over the definition of rhetorical irony (something people do or say) and "irony" is primarily being used to describe situations or occurrences (something that happens to people). This shift has made its way into the academic realm and has caused the definitions of sarcasm and irony to blend even further which contributes to the ambiguousness of the distinctions between them.

How Sarcasm and Irony are Similar

First, it is important to note that this paper discusses verbal or rhetorical irony as opposed to situational or dramatic irony. Dramatic irony is a literary device used where the audience knows more than the characters of a story, like in *Oedipus Rex* where the audience knows the cause of Thebe's crisis is Oedipus himself. Situational irony is when a situation is the opposite of what is expected, like the Titanic, "the unsinkable ship," sinking. However, situational irony may lead to verbal irony being produced. Verbal irony refers to utterances, like in *Hamlet* when Mercutio says, "No, 'tis not so deep as a well, nor so wide as a church door; but 'tis enough, 'twill serve," in reference to the fatal wound he receives. The focus is on the written structures used to represent the language used in both verbal irony and sarcasm.

Taylor (2017) proposes three reoccurring features found in the literature of irony and sarcasm research: language that is evaluative, language that affects self-respect (facework), and a mismatch between language and intention; whether a person's statement assesses a situation or characteristic – like saying, "wonderful weather" in the middle of a snowstorm in April – or is being used to disparage another person – for instance, "I thought you were good at this game," said to an opponent who lost by a large margin. The first example would evaluate the situation at large, and the second would evaluate the opponent's prowess, or even how truthful the speaker now believes them to be. These evaluations, whether explicit or implicit, are usually the opposite of what is actually said (Attardo, 2000; Taylor, 2017).

Facework is discussed as face-saving and face-enhancing for the speaker/author, other or mutual face-enhancing, and face-threatening or face-attacking for the addressee (Attardo, 2000; Taylor, 2017). Irony and sarcasm are shown to be face-saving because when a sarcastic/ironic statement is made criticizing the speaker's friend, and non-sarcastic/ironic criticism is also given, the sarcastic/ironic remarks were rated as less harsh or critical by the target of the criticism (Jorgensen, 1996). Sarcasm and irony can also be face-threatening, however, when used to convey criticism.

Finally, Taylor's mismatch feature of sarcasm is the inherent incongruity between what is said and what is the sentiment contained in both sarcastic and ironic statements. Taylor (2017, p. 10) states, "we can see that mismatch is presented as a shared, not distinguishing, feature of irony and sarcasm." Semantic and pragmatic theories of irony and sarcasm also highlight a mismatch between what is said and what is meant (the difference between locution and illocution, e.g., Austin, 1962; Grice, 1975) The echoic-mention and the pretense theories posit mismatches between what is said and how the speaker views that utterance or concept (e.g., Clark & Gerrig, 1984; Sperber & Wilson, 1981; Wilson & Sperber, 1992). These theories will be explained in detail in a later section. For now, it is only important to note the shared characteristic of some type of mismatch in both irony and sarcasm. This, and the other characteristics outlined by Taylor, are why much of the research on the topic of irony and sarcasm do not distinguish between the two concepts.

Differences Between Irony and Sarcasm

In conceptualizations that distinguish irony from sarcasm, sarcasm is solely a verbal phenomenon. Unlike irony, sarcasm has no literary counterparts. There is no such thing as situational sarcasm, or dramatic sarcasm. If an author wants to use sarcasm in their writing, they must have a person say something sarcastically. This fact is apparent in the noticeable shift between the colloquial definitions of sarcasm and irony as presented by Dynel (2017).

Dynel states that "in opposition to (many) researchers, lay people seem to perceive sarcasm as a linguistic device (i.e., something people do) and irony as a matter of fate (i.e., "unexpected or surprising events that happen to people" (Creusere,1999, as quoted in Dynel, 2017, p. 70)). This distinction is particularly relevant to studies of the way sarcasm is expressed in CMC.

Irony and sarcasm can also be distinguished by considering facework. Taylor (2017) discusses how sarcasm has been found to be a more face-threatening act for the speaker because, when speaking sarcastically, their negative evaluation or attitudes are less masked, that is, more direct. For example, "As graceful as the lead ballerina in Swan Lake," said to someone who has just tripped over nothing is a fairly direct criticism of the addressee's coordination, which could be interpreted as the speaker being mean. Sarcasm is also often distinguished from irony because it requires the presence of a target – a specific person, group, or idea – of criticism (Taylor, 2017; see also Bowes & Katz, 2011; Lee & Katz, 1998). In the previous example, the target is the addressee. Another example would be, "I love people who just change lanes, no warning" said to the passenger after the speaker is cut off while driving by another driver. In this example, the other driver is the target of the sarcastic comment. The evaluation of other people's behavior is, thus, also a matter of facework.

Although the workings of sarcasm have illustrated how it is expressed linguistically, research shows that there are internal effects as well. Some research has shown how different brain activity may correlate with irony and sarcasm. In their fMRI study, Filik, Țurcan, Ralph-Nearman, and Pitiot (2019) found activation in regions of the brain typically associated with Theory of Mind and the mentalizing process, also called metarepresentation (Bryant, 2012), for both irony and sarcasm comprehension. This mentalizing process "include[s] attributing mental states to other people, understanding their intentions, understanding that they can hold either true or false beliefs about reality, and being able to predict their future behaviour based on their beliefs" (Filik et al., 2019, p. 113). They also found that areas of the brain responsible for affective or emotional processing were activated during sarcasm comprehension, but not during

irony comprehension. This additional processing is likely due to the need to understand the

speaker's own feelings about their sarcastic comment in order to comprehend the intent behind

it, suggesting that sarcasm more directly targets an individual's emotions than irony.

A Brief Overview of Theories of Sarcasm

The earliest concept of indirectness in speech (irony, in this case) is largely attributed to

Roman rhetorician Quintilian over two thousand years ago as "the opposite of what is actually

said" (Camp, 2012; Sperber & Wilson, 1981). This was the prevalent view of irony until research

from natural language philosophy in the 20th century (Austin, 1962; Grice, 1975). Grice (1975)

proposed his theory of Implicature and the Cooperative Principle, a view of irony that is more of

an addition to the traditional, Quintilian definition. Grice describes irony as follows:

> [W]hat [the speaker] has said… is something he does not believe… [the speaker] must
> be trying to get across some other proposition than the one he purports to be putting
> forward. This must be some obviously related proposition; the most obviously related
> proposition is the contradictory of the one he purports to be putting forward. (p. 53)

In essence, the speaker implies that what they have said flouts the maxim of Quality[1]

and the true meaning of the comment must be extricated by the addressee. Grice agrees with

the traditional definition of irony – meaning is the opposite of the semantic statement – but he

adds that this mismatch between words and meaning must 1) be implied or signaled by the

speaker, 2) must be interpreted by the addressee, and 3) the process of interpreting a

statement as ironic is ultimately a pragmatic one as opposed to a semantic one. It has been

thought that the addressee is able to reach the ironic interpretation by first understanding the

literal meaning of the statement, and if that does not match a logical conclusion for

interpretation, an ironic interpretation is instead understood (Gibbs, 1986; Grice, 1975).

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[1] Grice introduces four maxims of his Cooperative Principle: quality, quantity, relation, and manner.
Quality requires a statement to be truthful; quantity requires that just enough is said, but not too much;
relation requires that a statement is related to the current topic of conversation; and manner requires
clarity and order. These maxims can be flouted as a method of implicature. For further discussion, see
Grice (1975).

In contrast to Grice, Sperber and Wilson (1981) proposed the Echoic Mention theory of irony. They first describe the Use-mention Distinction. Any word or utterance may be *used,* or it may be *mentioned.* When an utterance is *used,* it is intended in its usual meaning. When an utterance is *mentioned* the thing or concept it refers to is brought to attention. Sperber and Wilson (1981) provide these examples, quoted and formatted exactly as they appear on page 303:

(9)   These examples are rare and marginal.

(10)   a. "Marginal" is a technical term.

          b. Who had the nerve to call my examples marginal?

In their analysis, in (9), *marginal* is being used. In both (10a) and (10b), *marginal* is mentioned. (10a) shows that *marginal* is being mentioned through use of quotation marks and through the reference to the actual word. (10b) references what another speaker has said previously in order to mention *marginal.* Throughout this discussion, I have indicated any mentioned content in italics for clarity. The distinction between use and mention in many ways mirrors Saussure's conceptualization of the linguistic sign. The sign is made up of a signifier (the spoken or written word) would be equivalent to mention; and the signified (the mental concept of the thing) equivalent to use. Sperber and Wilson (1981) argue that irony is referring to, or echoing, a mentioned proposition. The proposition being echoed may be either a direct reference to something someone has said – as in (10b), or it could be a reference to a largely held belief (e.g., a person caught in a downpour saying, "What lovely weather" is echoing the common proposition that a downpour is not lovely weather). This echoic mention shows the speaker's attitude to the proposition. So, the addressee must understand both that the speaker is mentioning a proposition rather than using it and they must infer the speaker's attitude toward the proposition in order to comprehend an ironic interpretation of the utterance. They argue for this view of irony over the traditional semantic or pragmatic definitions because it works to

explain how the addressee actually comprehends an ironic utterance and why irony is used at all (Sperber & Wilson, 1981; Wilson & Sperber, 1992).

In response to Sperber and Wilson, Clark and Gerrig (1984) proposed the Pretense Theory of irony. They argue that Sperber and Wilson have misinterpreted Grice's comments on irony; Grice was not arguing that the speaker was actually *using* a proposition (in a way that breaks the maxim of Quality), but rather the speaker is "*pretending* to use that proposition" (Clark & Gerrig, 1984, p. 121). So, speaker S who talks to addressee A, pretends to be another person (or type of person as fits the situation) S' speaking to A' (an addressee in agreement with the statement of S'). If Sally is speaker S and Anna is hearer A, when Sally says, "What lovely weather," during a downpour, she is pretending to be another speaker S' (in this instance, perhaps a weather reporter who often makes poor forecasts) speaking to another addressee A' (someone who always believes the bad weather reporter). Anna, "as part of the "inner circle"…, is intended to see everything — the pretense, S''s injudiciousness, A''s ignorance, and hence [Sally]'s attitude toward S', A', and what S' said" (Clark & Gerrig, 1984, p. 122).

Now moving away from how a speaker may signal irony or sarcasm, to the comprehension on the addressee's part, Pexman (2008) discusses the Parallel Constraint Satisfaction process as a framework for comprehending irony. In this framework, both the literal meaning of a statement and any ironic interpretations are processed simultaneously. All possible interpretations are activated, that is, the neurological pathways receive stimulation early on and remain activated until further input causes that interpretation to stop being logical. The interpretation that remains most active (other interpretations may retain low levels of stimulation if the input is too ambiguous) is the most likely or logical interpretation of an utterance, and that is when the addressee can comprehend that statement as intended by the speaker (Pexman, 2008).

As discussed previously, Filik et al.'s (2019) fMRI study found that the cognition of irony and sarcasm both make use of the mentalizing process while sarcasm also activates the

emotional processing center of the brain. While not a theory of how an addressee comprehends

irony and sarcasm, these are particularly important findings because they describe what

neurological processes a person must undergo to understand irony and sarcasm. Additional

theories of production and comprehension have been proposed, but they are not vastly

accepted or discussed in the literature of irony or sarcasm. These include sarcasm as a

breaking of felicity conditions (Dynel, 2017; Gibbs, 1986), and the Defaultness Hypothesis of

sarcasm (Becker & Giora, 2018).

      Up until this point, I have been discussing both sarcasm and irony. D'arcey and Fox Tree

(2022, p. 289) undergo a similar discussion and provide this reason, "[t]he goal in doing this is

not to agree on the term[s] so much as to show that it is difficult or perhaps impossible to do so."

Bryant (2012, p. 673) comments – rather sarcastically – that defining irony and sarcasm is, "a

multidisciplinary effort lacking extensive interdisciplinary exchange." It is my firm opinion that

sarcasm and irony are separate concepts although they are related and often interact. However,

most of the following works do not make much of a distinction between the two, or they look at

both in tandem. Therefore, I follow Gibbs (1986, p. 3): "given that sarcasm and irony are closely

related, much of the following will include discussion of irony." But I will refer to all such forms of

mismatches of locution and illocution as sarcasm unless otherwise specified.

Spoken Versus Written Sarcasm

      When sarcasm is spoken, the speaker is able to make use of a broad range of

communicative features to ensure their comments are understood as sarcasm. Hancock (2004,

p. 448) states that there are three primary categories of cues used in the production of spoken

sarcasm: contextual, verbal, and paralinguistic. Contextual cues make use of the shared

situation of the speaker and addressee. These types of comments are often comments on the

situational irony the group is experiencing. Verbal cues are particular to the words chosen by

the speaker to convey sarcastic intent, like *gosh, gee*, or adverbs and adjectives that make the

statement disproportionate to the circumstances (Hancock, 2004; Kreuz & Caucci, 2007).

Finally, the paralinguistic cues used in sarcasm are nonverbal – like prosody, facial expression, or gesture.

To show how people use prosodic resources to interpret sarcasm, Rockwell (2000) conducted a study where sentences were recorded in one of three conditions; non-sarcastic, spontaneous sarcasm, and posed sarcasm. The recordings were filtered so that no words were distinguishable, essentially leaving only the prosodic contours of the sentence. Rockwell found that participants were able to distinguish between non-sarcastic sentences and posed sarcastic sentences based only on the slower rate of speech, higher intensity, and deeper pitch to the overall sentence (see also Bryant & Fox Tree, 2009). Aguert (2022) used videos of people reading short accounts of an imaginary day's events. These videos were then altered to block input from one or more parts of the face or to remove the sound from the video. They were then judged on a 7-point scale for how likely the videos were ironic. Ultimately, Aguert finds that facial expressions – especially expressive mouth movement and eyebrow flashes – are reliable markers for conveying sarcasm.

In written contexts, two of the three categories of cues for sarcasm are missing or severely disadvantaged; paralinguistic cues disappear, and contextual cues are limited to broadly relatable contexts, but verbal cues remain useful (Hancock, 2004). As previously mentioned, in literature this can be remedied by using dialogue tags (e.g., he said sarcastically) or in descriptions of co-occurring paralinguistic cues (e.g., "the weather is great," he said frowning). Although it is a written form, CMC has been shown to exhibit linguistic and textual features of spoken conversation (Biber & Conrad, 2009). Therefore, text-based CMC does not make use of these literary methods. Instead, sarcasm is conveyed explicitly by the author through other methods, or with a number of methods that are either highly suggestive of the presence of sarcasm or nearly ambiguous. Use of adverbs and adjectives (Carvalho et al., 2009; D. Ghosh & Muresan, 2018; Hancock, 2004; Kreuz & Caucci, 2007) and interjections like

gee, yay, etc. (Attardo, 2000; Carvalho et al., 2009; D'arcey & Fox Tree, 2022; D. Ghosh & Muresan, 2018; Kreuz & Caucci, 2007; Vandergriff, 2013) are recognized methods of signaling sarcasm, but they lie outside the focus of this paper as they are not limited to text nor to CMC.

The next three sections of this paper will be structured as follows: I give an overview of the broad methods of marking sarcasm and how they relate to the theories previously discussed. I introduce each marker of sarcasm with a description of what it is and examples of how it is used. Then I summarize a few sets of research on each topic and relevant findings.

Explicit Markers of Sarcasm

As discussed in Hancock (2004), sarcasm may be expressed more implicitly (suggested) or more explicitly (see also Carvalho et al., 2009; Davidov et al., 2010; Joshi et al., 2015). This relates back to the theories of sarcasm. The degree of explicitness is directly dependent on how well the speaker is able to implicate the flouted maxim of quality (Grice, 1975), echo a proposition (Sperber & Wilson, 1981; Wilson & Sperber, 1992), or convey their pretense of an opposing view (Clark & Gerrig, 1984). If the speaker tells the addressee that their comment is sarcastic, following the Parallel Constraint Satisfaction framework described by Pexman (Pexman,2008), any literal interpretations of the statement would lose most, if not all, activation early on in the comprehension process, and a non-literal interpretation would instead be the final interpretation.

Explicit markers of sarcasm are where the author tells the addressee that their comment is meant to be taken as sarcasm. Explicit marking can occur in off-line written sarcasm (as in dialog tags, "he said sarcastically") or in FtF contexts (by overemphasizing physical and vocal cues or as a repair for miscommunication where the speaker may say something like "just kidding"). There are two text-based CMC markers that will be focused on in this paper, hashtags and tone indicators, although there may be others that have not yet begun to be researched.

Hashtags

Hashtags are words or phrases preceded by a pound (or hash) symbol, #. They typically occur appended to the end of a post[2] (e.g., "You're so smart #genius") although they may appear as part of the actual message of the post (e.g., "I love #Oregon;" or "#Oregon is beautiful this time of year") and any number of hashtags can be added to a post. Hashtags do not appear in italics in actual use, but I have done so here to denote mention of these forms and for ease of readability. They are formulaic in themselves (# + word or phrase) and in their use as categorizing tools. The most common form used for marking sarcasm appears as #sarcasm, although #irony, and #sarcastic are also used.

An overview of hashtag conventions is provided by Caleffi (2015). Hashtags were originally introduced on Twitter as a system for categorizing and searching messages (or tweets on Twitter) in the expansive public online space although they are now used on most social media platforms. Hashtags are not case sensitive, so #sarcasm, #Sarcasm, #sArCaSm, and any other variant of capitalization would be recognized as the same phrase. Spelling is the most important aspect of a hashtag so any variation in spelling creates a separate category. Therefore, #color would be a separate category from #colour. A hashtag may be any length but is limited to alphabetic and numerical symbols and the underscore (_). Each unit "ends" at a space (e.g., #hashtagscanbereallylong would be counted as one unit, but #hashtags can be really long only counts #hashtag as a single unit). Hashtags are created by the users, rather than the designers or administration of Twitter (Caleffi, 2015).

Due to hashtags being explicitly marked posts by the authors, no interpretation is necessary from the audience. For this reason, many sarcasm researchers use hashtags as a gold standard in their data collection (Barbieri et al., 2014; Caleffi, 2015; Davidov et al., 2010; Dynel, 2017; A. Ghosh & Veale, 2017; D. Ghosh et al., 2018; D. Ghosh & Muresan, 2018; Joshi

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[2] The word after the pound symbol links the entire post to an archive of all posts containing the same hashtag. Each hashtag acts as a topic marker allowing users to contribute to a large-scale public discourse, as well as provide clarification of the author's intent.

et al., 2015; Kumar & Garg, 2019; Maynard & Greenwood, 2014; Riloff et al., 2013; Wang, 2013). Many of these studies removed the hashtag from the post before using the remainder of the post (i.e., a post that originally read "You're so smart #sarcasm" would be shown to participants as "You're so smart"), as in a number of the computational models, but some researchers have decided to look at hashtags themselves.

In a computational analysis, Davidov et al. (2010) experimented on a dataset of 5.9 million tweets ranging from sarcastic to not at all sarcastic. Their algorithm used a two-part system: "a semi supervised pattern acquisition for identifying patterns that serve as features for a classifier, and a classification stage that classifies each sentence to a sarcastic class" (Davidov et al., 2010, p. 108). In this first iteration, the hashtag was removed from each post to test how accurately their system could detect sarcasm without explicit markers. They found their framework had accuracy of 94.7%, precision of 79.4%, recall of 86.3% for detecting sarcasm, and an overall F1 score of 82.7%. They then ran another test using a gold standard of 1500 explicitly marked tweets and a sample of non-sarcastic tweets. This test resulted in 89.6% accuracy, 72.7% precision, 43.6% recall, and an F1 score of 54.4%. They note three primary uses of #sarcasm which cause the data to be noisy, lowering recall: 1) used as expected to mark sarcastic intent when few other indicators of sarcasm are present, 2) 'misused' in a tweet that does not contain sarcasm itself but may be referring to a previous tweet that was unmarked (e.g., "I think she meant to add #sarcasm"), and finally 3) as a search term used regardless of actual presence of sarcasm. This systematic test matched a human annotated analysis of the same data, so the lower recall was not surprising. Between these two tests, Davidov et al. were able to show that the presence of #sarcasm in a post is useful for clarifying the intentions of the author. However, computational algorithms still need to account for noisy uses of the hashtag (e.g., misuses, clarifying previous comments, or as an unrelated search term). Overall, hashtags were found to be reliable markers of sarcasm.

Maynard & Greenwood (2014) explored hashtag tokenization as a method for determining the overall sentiment of a post and how sarcasm affects the post sentiment. They split each hashtag into its separate words, or tokens, so that these tokens could be processed as part of the overall post, ultimately altering the sentiment of the post. This allows long, multi-word hashtags to be broken down. For example, *#hashtagscanbereallylong* would be retokenized as *#hashtags|can|be|really|long* where "|" indicates token boundaries. Out of 2,010 hashtags and 4,538 tokens, their system achieved 98.12% precision, 96.41% recall, and an F1 of 97.25% (p. 5). This works toward accounting for some of the noise discussed in Davidov et al., and functions as a better comparison of how human authors and addressees interpret these posts.

Tone indicators

Tone indicators are additions to the end of a post or comment used to explicitly and directly indicate the tone or emotional state the author wants to convey. They take the form of a slash followed by an abbreviation for the desired tone like */s* to mark sarcasm, */j* for joking, */gen* for genuine (tone indicators are not usually put in italics. I have done so here to denote mention of these forms and for ease of readability, the same as I have done for hashtags). There is a large list of tone indicators that have been conventionalized by the communities they are most often used in, enough so that there is a (user-generated) dictionary for them (*A Guide to Tone Indicators*, n.d.). Tone indicators can also be used to indicate particular qualities of the message rather than the tone: */c* means the message was copied and pasted and */nbh* stands for "nobody here" indicating that the potentially aggressive content is not a comment directed at a particular individual in the conversation. A typical message that uses tone indicators may look like, "I had a wonderful day /s" or "I hate when people don't return things they borrow /gen /nbh." Multiple tone indicators can be used, although the standard is generally only two. Like hashtags and emojis, tone indicators do not usually have punctuation following. They function as the

message final punctuation, although there are instances where tone indicators do occur with punctuation like in, "You're just too smart, huh? /s." Tone indicators are relatively new phenomena, and their use is often isolated to particular communities (e.g., neurodivergent people) or specific platforms (e.g., Reddit or Twitter).

Tone indicators are so new that research is only just starting on them. However, Christanti, Mardani, and Fadhila (2022) conducted a study over a one-month period of Twitter users who regularly utilized tone indicators. Of the seven Twitter users they subsequently interviewed, all of them were part of the neurodivergent community. Christanti et al., (2022) found three themes that were given in response to the question "What are tone indicators?" These themes include: "a tool for clarifying the tone/context of the message, a tool for emphasizing expression in text, and a tool minimizing misinterpretation of messages" (Christanti et al., 2022, pp. 10-11). Where hashtags may be used to clarify author intent (e.g., #sarcasm) or to contribute to a public discussion (e.g., #color), tone indicators are used only to clarify author intent or relevant information about the context of the post (e.g., /c copy and paste). Tone indicators were regarded as a helpful tool for clear communication because they removed any of the guesswork that often accompanies CMC, but little other research has been done on this topic.

Suggested Markers of Sarcasm

In contrast to explicit markers, where the author tells the addressee their intention, suggested markers of sarcasm require some level of interpretation by the addressee. Suggested sarcasm markers are used by an author to indicate that the literal interpretation of their statement is not their intent, but they do not make any outright comment about how it should be interpreted. The addressee should be able to discern the mismatch between the statement and intended meaning, they just have to decipher the most likely interpretation of the statement. In these contexts, The Parallel Constraint Satisfaction framework would likely still

lead the addressee to a correct interpretation of the statement or post, but other possible

interpretations would retain extremely low levels of activation in order to rapidly reassess the

statement should additional input become available.

Emojis (and emoticons)

Emoticons and emojis are often used in similar locations within a post as hashtags, often

occurring at the end of a message, although they may also appear in the middle of a message,

or they may replace a word entirely. Emoticons are typographical icons made with keyboard

symbols, letters, or numbers that are read horizontally. Some examples include (bolded for

readability): **:)** (smile/happy), **;)** (winking smile/playful), **:(** (frown/sad), **:,(** (crying), **XD** (laughing),

:p (tongue out), **<3** (heart/love), and **@}->--** (rose). Sometimes, emoticons may be written as **:-)**

with a nose, but this is personal preference. There are also a large set of emoticons that are

"upright" **-_-** and **(^o^)**, but these are regional, preferred, for example, in Japan (Thompson &

Filik, 2016). Emojis are a newer addition to CMC, but they are largely based on emoticons.

Emojis are icons that serve a similar purpose as emoticons, but they require a specialized

keyboard or software to be used (although most phones and social media sites already have

this software available to their users). These examples parallel the emoticons: 😊

(smile/happy), 😉 (winking smile/playful), 😧 (frown/sad), 😢 (crying), 😆 (laughing), 😛

(tongue out), ❤️ (heart/love), and 🌹 (rose). Both emoticons and emojis typically convey an

emotion or corresponding facial expression, although emojis are not restricted to keyboard

characters so they can depict any number of things. There are so many different emojis that, as

with tone indicators, there are now online dictionaries dedicated to recording all of them (🟧

Emojipedia — 😄 Home of Emoji Meanings 🧙‍♂️👌🥦🍊, n.d.).

In order to test how often emoticons are used to mark sarcasm, Thompson & Filik (2016)

conducted two experiments. In the first experiment, participants were asked to make "their

intentions clear… however they could not add or remove any words" (p. 109). This did not

necessarily limit the participants to using emoticons, but it also avoided priming them in order to get a more accurate picture of how likely emoticons would actually be used. In total, 72 different emoticons were produced. They were found to occur most often in sarcastic comments, and more frequently in sarcastic praise than sarcastic criticism. The most commonly occurring emoticons were **:p**, **;)**, **:(**, **:/**, and **:)**, but it is important to note that any variations (like **:)**, **:-)**, and **:]**) were combined into one category. In the second experiment, a new set of participants were asked to produce the final comment in the imaginary conversations used in experiment 1, but they were not restricted to only altering an existing comment. Experiment 2 resulted in 50 different emoticons. In this experiment, emoticons with a tongue, **:p**, or with a wink, **;)**, were reliably used with sarcasm. The other three categories, **:(**, **:/**, and **:)**, were more common in literal uses. Both experiment 1 and 2 showed that emoticons were produced more often with sarcastic comments, and that **:p** and **;)** were the most commonly used.

Specifically looking at emojis, Weissman and Tanner (2018) conducted an experiment to measure neural responses in instances of ironic use of emojis. They used EEGs to measure neural activity while participants scored sentences followed by one of five emojis. 😊, 😉, and 🙁 were used as critical emojis, while 😂 and 😳 were used as fillers. Weissman and Tanner accounted for three conditions with the sentences and critical emojis: match, mismatch, and irony. A match occurred when a positive sentence was used with the smiling emoji, or a negative sentence was used with the frown emoji. Mismatch was the opposite of match, a positive sentence with the frown emoji and a negative sentence with a smile emoji. Any sentence that occurred with the wink emoji was considered irony. All participants showed neural activity in the P200 region of the brain. Participants who correctly identified ironic statements also showed neural activity in the P600 region. Weissman and Tanner state that this late activation of P600 shows "monitoring and/or reanalysis of processes associated with updating the conceptual or semantic meaning of the sentence" (2018, pp. 10-11) and by extension, that

emojis contribute to the overall interpretation of a statement. However, emoticons and emojis

remain open to interpretation. A winking emoji 😉 may indicate sarcasm, or it may be used as

flirtation. The correct interpretation would depend on the content of the comment and the

relationship between the author and addressee. These studies also focused on relatively basic

emoticons and emojis, rather than some of the more complex variants such as 😒,🙃,😑,🤪.

Contrasting contexts

Originally introduced by Riloff et al., (2013) this method for marking sarcasm is a

formulaic structure of a post or comment, rather than an icon or typographical marker. They

state, "sarcastic tweets often express a positive sentiment in reference to a negative activity or

state… that most people consider to be unenjoyable or undesirable" (Riloff et al., 2013, p. 704).

Some examples (positive sentiments are underlined and negative states are italicized): "I love

getting screamed at by customers," or "Thoroughly enjoyed waking up to a *flooded bathroom*."

Because no contextual knowledge is required to comprehend these comments, they are

naturally confined within one post as opposed to a conversational thread of posts. This

constraint and the formulaic nature of contrasting contexts are what separate it from other

context dependent comments which are usually parts of threads or ongoing discussions online.

In their article proposing contrasting contexts, Riloff et al. (2013) created a bootstrap

learning program that was able to identify positive sentiment phrases and negative situation

phrases. On its own, their method had a 63% precision rate. They tested another program using

the data they had collected; this program had a 64% precision rate, but both programs had low

recall (>40%). When assessed together, the combined programs had a precision rate of 51%,

but a recall rate of 44%. Their program clearly shows that contrasting contexts are a prevalent

formula for conveying sarcasm.

Joshi et al., (2015) expand on the algorithm of Riloff et al., by increasing parameters to

include larger phrases as well as explicit incongruity and implicit incongruity. Their definition of

explicit incongruity matches Riloff et al., contrasting contexts, positive sentiment and negative

situation. Their definition of implicit incongruity only required the presence of one polarized word

and includes the presence of implied sentiment. The example they provide is, "I love this paper

so much that I made a doggy bag out of it" (Joshi et al., 2015, p. 758). Through their expanded

algorithm, Joshi et al., observe a 10-20% improvement compared to Riloff et al., showing that

expanding the parameters of the algorithm from only polarized words or short phrases to longer

phrases leads to higher accuracy.

Ambiguous Markers of Sarcasm

The last type of marker, ambiguous sarcasm markers, require even more interpretation

and guess work than the other two types of markers. Ambiguous sarcasm markers are where

the author may indicate with unclear markers that the literal interpretation of their statement is

not their intent. The addressee may not be able to discern the mismatch between the statement

and intended meaning. In these contexts, The Parallel Constraint Satisfaction framework would

lead the addressee to multiple interpretations of the statement or post all having similar levels of

activation, so the possibility and likelihood of miscommunication is heightened. Because of the

ambiguous nature of this category of markers, research is limited and discussion of the two

forms will be brief.

Formatting

Formatting is a category of sarcasm markers that manifests in a number of diverse

ways: irregular punctuation (e.g., *!!, ??,* or *…*), italics or bold, laugh cues (e.g., lol, haha, heh),

scare quotes (e.g., "Really 'nice' weather we are having"), capitalization (e.g., "This weather is

absolutely WONDERFUL"), and wait signals (e.g., hm, uh, erm).

As early as 2000, researchers were starting to see common trends of formatting used to

denote sarcasm. Attardo (2000) mentions, but does not discuss, two types of markers: scare

quotes and repeated punctuation (e.g., !!, ??, or …). Carvalho et al. (2009) found scare quotes,

repeated (heavy) punctuation, and laughter expressions were productive patterns in detecting

sarcasm. Finally, Ghosh and Muresan (2018) investigate a number of irony markers including:

exclamation (this matches repeated punctuation, but it is specific to exclamation marks),

capitalization, quotation marks (or scare quotes), and other punctuation marks (this is any other

repeated punctuation). There is a general concurrence in the current literature of which features

mark sarcasm, however, more research needs to be done on the topic.

Unmarked/context dependent

Unmarked or context-dependent sarcasm is, predictably, the most difficult to interpret in

CMC. The context required for comprehension of sarcasm may span a large number of

posts/comments, or it may pull from real-world common knowledge that is not explicitly

reiterated in a single post. This type of sarcasm marker is extremely non-formulaic because it

necessarily stretches much farther than any of the other types of markers. A rough example of

this would be:

> User 1: What's so great about broccoli?
> User 2: I love it! I'll never stop eating it
> --conversation continues--
> User 2: I can't eat broccoli now. I ate too much!
> User 1: I thought you'd never stop?
> User 2: Oh no, <u>I hate broccoli.</u>

The only way for user 1 to truly understand that user 2 is using sarcasm in the

underlined final comment is from knowledge of user 2's previous comment about loving broccoli,

which happened much earlier in the conversation. User 2's final sarcastic comment echoes their

earlier comment but twists the words in order to maintain the sentiment, but also to use the

comment sarcastically.

Researchers are working to create algorithms that can accurately detect this type of

sarcasm in order to understand it more. In 2018, Hazarika et al. proposed a hybrid network

called CASCADE which was able to process the content of a post as well as contextual

information beyond the scope of a singular post, as in a discussion thread. They found that

CASCADE performed more accurately than other neural models that had previously been

proposed. For example, in a post/response pair:

>User 1: *So all of the US presidents are terrorists for the last 5 years.*

>User 2: *Whew, I feel much better now!* (Hazarika et al., 2018, p. 1846)

CASCADE correctly classified the response as sarcastic when previous models failed to do so.

Conclusion

A speaker may signal their sarcastic intent in text-based CMC through explicit,

suggested, or ambiguous marking. The particular forms that these markers may take are still

largely unstandardized, although within each type of marker, there are agreed upon uses (e.g.,

😉 to mark sarcasm), places of use (e.g., message final in place of punctuation), and forms

(e.g., #sarcasm). Some of the variation arises from personal preference, community or platform

norms, or the level of clarity needed to accurately convey the intended meaning. Explicit

markers are hashtags and tone indicators, suggested markers are emojis and contrasting

contexts, and ambiguous markers are formatting and unmarked comments. There may be other

markers in use, but they are either not used frequently, or they are very new and have yet to be

researched. Markers will likely undergo large amounts of change in a short period of time as

CMC continues to change and evolve. In this paper, I explored the similarities and differences of

irony and sarcasm, the issues these parallels and distinctions create in delineating one from the

other, the theories associated with how people interpret them, the shared features of spoken

and written sarcasm, and the novel features of text-based CMC sarcasm. This exploration is

important for providing a summary of the many ways people mark sarcasm to possibly help

avoid miscommunication in the future. It is also helpful for finding gaps in the current literature of

sarcasm.

As discussed previously, further studies should be done to clarify and separate the

definitions of irony and sarcasm. It is possible that understanding how irony and sarcasm are

each processed neurologically by the speaker before they produce an ironic or sarcastic

statement may shed light on this. Further studies on the cognition and comprehension of the

addressee are also warranted. This is especially important because Christanti et al. (2022) have

shown that more explicit markers, specifically tone indicators, are especially helpful for

neurodivergent people. Some of the specific markers for conveying sarcasm also require

additional research such as tone indicators, formatting, and unmarked context.

Future points of interest could look at combined uses of markers (e.g., the presence of

repeated punctuation and hashtags or emojis) and if they interact, if there are any identifiable

patterns (such as ambiguous markers used with explicit markers, or a high volume of suggested

markers). Memes (images usually accompanied by text inside the border of the image) should

also be explored in context. Some memes have been used so frequently to mark sarcasm that

only the associated image needs to be used in order to make a sarcastic comment.

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