

Sarcastic Meaning of the Slightly Smiling Face Emoji from Chinese Twitter Users: When A Smiling Face Does Not Show Friendliness

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Abstract—In most cultures, the Slightly Smiling Face (😊, SSF) icon indicates friendliness and niceness. However, this SSF symbol in emoji may also indicate a negative meaning of sarcasm and irony to some Chinese social media users.

This research analyses the sentiment reflected in the use of the SSF emoji as used by Chinese users on Twitter and applies quantitative methods to investigate the linguistic and social constraints of the SSF emoji's negative variable from 2016 to 2020.

Results show that positive or negative emotional expression of SSF emoji is highly dependent on the content of the sentence and its context. Therefore, the SSF emoji has no semantic value as a word for expressing emotions but acts as an emotive anaphora or a modal particle. Simplified Chinese users from mainland China use the SSF emoji with a negative sense more than Traditional Chinese users from Taiwan. These differences may reflect the users' media preference and cultural identification through the use of emoji, a global language for the digital age.

Most Chinese users use a single SSF emoji, which can convey either emotion, at the end of the sentence, but when the SSF emoji is used in a repetitive manner, it is more likely to indicate a sarcastic emotion. Both variables, (single use / repetition) and Chinese types (Simplified / Traditional), significantly correlate with the use of the negative variant of the SSF emoji ($p < 0.05$). The change in the meaning of the SSF emoji from the expression of positive to negative sentiment demonstrates that emojis may change through time in ways similar to other forms of language.

Index Terms—Emoji, auto-antonym, semantic change.

I. INTRODUCTION & BACKGROUND

At the turn of the twenty-first century, Japan developed a series of graphical icons for internet and mobile communication. These icons, known as emojis, later reached the global community in 2010 via smartphones and are encoded on software keyboards as fonts [1], [2]. As a recent global phenomenon, emojis have raised academic interest in different research fields and have become a hot topic for cross-disciplinary studies [3]. These symbols communicate human feelings, ideas, and entities that people can easily use within a sentence for others to have a better understanding [1]. After five years of global application, in 2015, the Oxford Dictionary selected one of the emojis, 😊 (crying tears of joy), as the Word of the Year that “best reflects the ethos, mood, and preoccupation of the year”, and illustrates the massive increase in the use of the emojis on the Internet [4]. Among all the emojis, facial representative ones that express

positive emotions and feelings, like smileys, are the most popular categories [5], [6]. These emotive emojis are the most consistent in meanings because they represent the facial expressions of basic emotions like in the face-to-face conversation [7].

Some consider emojis have a potential to become the future lingua franca, a global language for the digital age [1], [7]. Others may disagree that emojis are actual words, let alone consider them as a language [8]. Nonetheless, emojis still demonstrate some linguistic properties in their patterns of usage. Schlobinski and Watanabe note in their early explorative study of Japanese text messaging that emoji can serve two major linguistic functions – modality and referentiality [9]. The modal function of emoji, which is like modal particles in languages, can give a subjective perspective to the speech or enhance or weaken the illocutionary force of a statement [6]. Furthermore, the occasions that people use emojis are in informal communication for annotating the conceptual content of an expression with a ‘visual tone’ [7]. The use of emojis on social media complements the sentimental insufficiency of text-based communication [2], [7], [10], [11].

Another similarity between emojis and languages is that the meaning and use of emojis or words are subject to variations in daily communication. The variation within the emoji code, shaping it along the lines of natural language, would reinvent linguistic rules and usage of words over time [7], [12].

One facial emoji in China has recently gained a new semantic variant in practice: the slightly smiling face emoji (😊, SSF). SSF is among the most used emojis on Twitter [13]. With open eyes and a closed smile on a yellow circle face, it is generally considered to demonstrate a friendly expression. However, in China, this smiling face emoji may no longer express positive sentiment but imply sarcasm and distrust; this is a good indicator that emoji use is not universal, cultural contexts would differ the interpretation of emoji meaning [14]. This negative variant of the slightly smiling face emoji is also disseminating to other parts of the world. The latest definition on Emojipedia, the world's leading site about emojis and their definitions, notes that the slightly smiling face can have positive sentiments and negative tones [1], [5]. In many popular cultures, the ideogram of a slightly smiling face generally conveys the positive meaning of friendliness, happiness, and niceness. However, in contemporary practice, the SSF emoji on social media may also signify a negative sense of sarcasm, irony, and contempt. The negative connotation of SSF emoji is common among Chinese users, especially in the social media environment

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within mainland China, which has a unique etiquette for this emoji use [15], [16].

The SSF emoji may not always be sarcastic for all Chinese users and may still indicate its original positive meaning of happiness for them [17]. The users' understanding and the usage of the SSF emoji may vary geographically, e.g., between mainland China, Taiwan, Hong Kong, or Malaysia, or according to the different versions of Chinese characters, Simplified or Traditional Chinese. Such practice also gives the SSF emoji a feature of auto-antonym, a word with two self-contradicting meanings. The original positive meaning of showing happiness is still present, while the new negative sense of being sarcastic is increasing in use.

Both meanings of SSF emoji represent the smile of facial expression; the positive one is generally considered as a genuine smile, while the negative one is treated as conveying hostility [16]. Besides the two semantic variations of SSF emoji, there is another type of SSF emoji in use. Since SSF emoji, along with other emojis, are relatively new to the Internet community. People may need to learn the meaning and use of this symbol in online communication. In the theory of second language learning, beginning learners often face words and usage with uncertainty, for the correct representation or correctness of utterance, due to a lack of knowledge; but such uncertain use of language will reduce over time with successful learning [18]. Similar to this language learning process, people may also use the SSF emoji with uncertainty at the early stage, which means SSF emoji could be hard to interpret the sender's emotion, or the users did not express themselves clearly with this emoji.

There are three main research questions for this study:

- 1) As each use of this emoji among Chinese users is distinct, in each case, by evaluating the content and context, what emotion did the user intend?
- 2) Is there any connection between the meaning attributable to the emoji and a) its position in the sentence, and/or b) whether it is used single or multiple times?
- 3) This negative implication of the emoji is mainly found in Simplified Chinese users from mainland China. Does the use differ significantly according to the different provenance of the Chinese user, or is it more closely connected to the form of Chinese characters, Simplified Chinese versus Traditional Chinese, that they use?

II. RELATED RESEARCH

There are few publications on emojis compared to other linguistic items. For example, for 2015-2019, Bai et al. found that only ten articles, or 5.92% of all emoji-related publications, were linguistic [3]. Current research on emojis focuses on their language function, the sentimental semantic, and how users from different media and cultural context may interpret and use emoji differently [2], [10], [19]-[21]. Chui suggests that Chinese users may interpret positive facial expressions with negative feelings more often than those from the United States, perhaps because the Chinese are sensitive to negative emotions that may lead to a survival advantage [20]. Ge-Stadnyk finds the collocation of emoji sequences demonstrates significant creativity between East and West; the Western users on Twitter use emoji in sequence as a combination of 'stance and action', whereas this type of

use of emojis functions as 'concept' on Weibo for the Eastern users [21]. Such cross-cultural variations of emoji interpretation and preference reflect culture-specific meanings and attitudes that retaining within the linguistic and cultural backgrounds [7].

Compared to other studies on emojis and linguistic variation and change, there is not much related literature on emoji variation within a linguistic community. Moreover, it is a topic of interest to study how people from the same speech community perceive the meaning of emojis and apply them in use. Researchers used a survey and questionnaires in previous studies to ask for the user experience and understanding [22], [23]. There is little research on the way that users learn to use emojis in practice.

Therefore, this study on Slightly Smiling Face (😊, SSF) emoji provides an opportunity to probe into the semantic variation of a symbol with two possible and contradictory meanings. SSF emoji ranks 77 in Twitter Emoji Popularity [13]. The emerging variant is a negative sentiment of being sarcastic and ironic. This study will also examine if the SSF emoji is ever associated with an uncertain meaning that could be either of two contradicting meanings.

III. METHODOLOGY

Qualitative methods are applied to analyse the content to understand the meanings of the SSF emoji. The study is also a quantitative assessment of the SSF emoji's meanings according to various linguistic and social factors. A multi-variant statistical analysis of these factors is undertaken using the software Goldvarb (Version 3.0b3).

A. Variable and Variants

The dependent variable is the meaning of the SSF emoji. The variant of interest is 'sarcasm'; the other variant is 'happiness'. The phenomenon of SSF emoji use with a uncertain meaning will be analysed in the year-to-year comparison alone.

There are several possible constraints for the variable emoji from linguistic and social perspectives.

B. Linguistic Constraints

1) Chinese character type (SC, TC)

There are two different types of Chinese characters, Simplified Chinese (SC) and Traditional Chinese (TC), within the Chinese community on the Internet. Although people use different types of Chinese characters, SC or TC, they can still mutually understand each other most of the time. The difference between SC and TC is in the choice of word, which may vary slightly. Furthermore, many Chinese input method editors provide SC-TC converting solutions. Some SC users can type in TC occasionally. Thereby, SC and TC users are viewed in the same speech community, and the Chinese character type is considered a linguistic constraint. The nuanced differences between the usage of SC and TC may influence the use of SSF emojis.

The types of Chinese characters also correlate with the provenance of speakers and social media preference. Mainland Chinese users use SC primarily and prefer using China's social media like Weibo and WeChat; there is a set of etiquette on these platforms that the SSF emoji is an

unauthentic and insincere smile which should not use it in the context of friendly conversations [24], [25]. In comparison, users from Malaysia can use both SC and TC interchangeably, and people from Taiwan and Hong Kong dominantly use TC alone. These people use international social media, like Facebook and Twitter, more often than those from mainland China, and they have another set of etiquette for emojis. There will be a separate social constraint to analyse the difference by geographical location.

2) *Position in the sentence (f, m, e)*

There are a few possible positions where the emoji can be in the sentence: the front (f), the middle (m), and the end (e) of the sentence. The position of the emoji in the sentence may influence the sentiment being expressed, which means the more the emoji is intended to express a strong emotion, the more likely it is to occur towards the end of the sentence [10]. These authors discovered that both negative and positive emojis tend to appear towards the end of the sentence, and the sentiment strength increases with the distance of the emoji's occurrence from the text on which it comments. Similarly, Na'aman et al. consider that when emojis perform as a marker of sentiments, they tend to occur towards the end of the grammatically complete sentence [2].

3) *Repetition (s, m)*

The same emoji may be repeated several times in online communication. This kind of emoji usage is common in casual chatting on the Internet [26]. Authors have provided various different explanations for the function served by this repetition. Santamaría-Bonfil and López consider that the repetition of identical emojis emphasises the meaning of the single emoji [27]. McCulloch and Gawne argue that the repeated emoji mimics the co-speech beat gesture to emphasise the rhythm of the speech [28]. Arafah & Hasyim consider such repetition of emojis as an interpersonal function to show intimacy with the interlocutors and promote interaction [29]. The repeated emojis might be similar to how repeated words in speech show either their original literal meaning or an intensified meaning [30], [31]. Thereby, the repetition of emoji occurrence in the sentence, whether single (s) or multiple (m), may serve different functions, according to the writer's particular style.

C. *Social Constraints*

1) *The provenance of speaker (C, H, T, M)*

People from different geographical locations may have different cultural and media contexts, thus influencing the interpretations and applications of SSF emojis. Weibo and WeChat are dominant in mainland China; Users from the mainland would use the SSF emoji in accord with the etiquette on these social media. At the same time, it is less common to find SSF emoji with sarcastic meaning in the international social media environment. This research studies the Chinese users from major Chinese-speaking regions in East Asia, such as China (C), Hong Kong (H), Taiwan (T) or Malaysia (M), where have different access and preference on social media, to see if they would use the SSF emoji similarly or differently from each other.

2) *Gender (M, F)*

As mentioned in many sociolinguistic studies, females are more likely to use an innovative form than males and usually

lead to a change in linguistic variation [32]. This study will also consider the user's gender in observing the use of the SSF emoji with negative meaning.

The research will build an emoji corpus from Twitter, one of the most popular international social media platforms used in other emoji related studies. According to Twitter's policy, information posted (tweets) on Twitter can be seen by anyone with a Twitter account unless they are protected [33]. People tend to use emojis with disambiguated and consistent meaning on Twitter so that other readers, who use the same language, can interpret them. However, they also show creativity in the casual discourse on the Internet, so new meanings or uses of emojis may emerge. Twitter has a further advantage for linguistic studies such as this as the platform provides a search function that makes it possible to find a specific emoji icon in the message (tweets, posts on Twitter). Although mainland Chinese users cannot directly connect to Twitter due to political blocking, it is estimated that the region still has 3 million Twitter users, who might have used various methods to bypass the regulations and log onto the website [34].

IV. DATA COLLECTION

A. *Longitudinal Study of the Variable Development*

The situation on the Internet changes rapidly, and the date of the post is crucial to understanding how people are learning and using the new meaning of the variable. This study will examine the semantic use of the SSF emoji on Twitter for five years, from 2016 to 2020. The SSF emoji is one of the icons in Emoji Version 1.0, published in August 2015 [5]. One year after its universal appearance, it could be expected that users would have sound knowledge to communicate with each other on social media platforms using this pictorial icon. Tweets with SSF emoji sent at the end of the year are taken to reflect knowledge users gained about using this emoji in communication in the preceding year. Thereby the tweets at the end of the year are collected for analysis in this study.

B. *Tokens in the Corpus*

This study collects all the available data from the search result of the year to exceed the minimum number of 30 tokens. If there are much data – over 50 tokens or more – per by the end of the year, it uses at least the first 25 tokens for each of the two character types, SC or TC. In a language variation and change study, 30 tokens per variant and constraint are considered preferable for modelling statistically, but any tokens over 10 are acceptable [35].

C. *Building the Corpus*

This study uses the Twitter Advanced Search function to generate the search keywords for consistent analysable results, using the SSF emoji - '😊' - as the sole keyword in the Twitter search. The search is limited to Simplified Chinese language only, and the results will also have both SC and TC tweets (probably because Twitter cannot differentiate the nuance between two types of Chinese writing characters). The search date ranged from January 1st to December 31st of each year.

Only the stand-alone tweets are collected in the corpus.

This study aims to understand the general intention of the sender from analysing their original tweets to discover how they use the SSF emoji in an independent context. Replies on Twitter are purposely filtered out. Since the interpretation of replies is contextual, it depends on the interlocutors' relationship and the events or experiences they shared. It is hard to understand the sender's meaning without the given context. The complete search keywords on Twitter appears as follows: [😊 lang:zh-cn until:2016-12-31 since:2016-01-01 - filter:replies] for the search results in 2016. All related tweets are recorded in chronological order from the search result along with all the provided constraints, including the date of the post and the attached media, and are contextually translated for the semantic analysis of the SSF emoji.

D. Analysing the Corpus

The search results were analysed to determine the emoji's positive or negative semantic value within the tweet. However, it is generally considered that an emoji conveys a meaning independent of the written words and expressing the similar emotional content as cued in the language [1]. Therefore, if the linguistic content of the sentence and surrounding context generally show friendly and happy sentiments, then the SSF emoji, in that case, would also indicate the positive emotion. Likewise, when the context and content are generally sarcastic and ironic, the SSF emoji is interpreted as registering a negative sense. However, when the emoji annotates a sentence with two possible and contradictory meanings, the semantic value is interpreted as depending on the sentiment of the grammatically complete sentence that immediately precedes it.

Comparative analysis is employed to compare the data by year, and multi-variant statistical analysis of various linguistic and social factors is undertaken using the software Goldvarb (Version 3.0b3) to ascertain each constraint's factor weights on the variable.

E. Exclusion of Tokens

In selecting Twitter tokens, sensitive information has been omitted, including but not limited to pornography, meaningless content, hashtag games, political commentary, and disclosure of personal information.

Only the tweets from Chinese speakers are collected to limit the research to a study of this variant in the Chinese context. Other language users may use Chinese phrases in their tweets for various purposes, but they may not have noticed changes in the emoji's use. For example, Japanese users may use Kanji, almost identical to Chinese characters in appearance, but the usage is grammatically different; other language users may use Chinese phrases or words to attract and engage with Chinese users on Twitter. These other language users who used Chinese may not be aware of the semantic variable of the content or context that SSF emoji occurs in. They may fail to notice the nuance of semantic variation as Chinese users do. Thereby, their use of SSF emoji is not taken into consideration in the study.

V. DATA ANALYSIS

Based on the data collection method mentioned above, the corpus comprises 225 tweets and 229 tokens in total. The

number of tokens is greater than the number of tweets because some users used the SSF emoji to annotate several sentences in a single tweet, with various meanings or different repetitions. Each case is counted as a separate token.

The following types of SSF emoji were excluded for the reasons given:

- 1) Only emoji tokens that annotate complete sentences with sentimental intentions were analysed. For example, the SSF emoji tokens in sentences that do not express explicit emotions or attitudes were excluded.
- 2) This study would exclude the emoji presents with other emojis, as in a sequence of emojis, the single emoji's meaning may take on a rhetorical function to form a new meaning in the sequential group [19], [27].
- 3) If the emoji refers to a real-world object, it functions as a referent with definitive referential meaning instead of implying the emotive semantic. Thereby, such use of SSF emoji will be excluded.
- 4) Emojis that occur independently in the context are also excluded. The emoji may be able to substitute for words in expressing the meaning of the message rather than acting as the complementary sentiment of the sentence [36]. If an SSF emoji token is used alone without any other sentences precede or follow it immediately, it is hard to interpret the speaker's true intention.

Therefore, this study of emoji semantic variants includes only the three types of tokens of SSF emoji with emotive intention: negative meaning, positive meaning, and uncertain uses. In the end, 201 tokens in the corpus from 2016 to 2020 meet the criteria for analysis. Of these, 95 tokens are attributed negative meanings, 94 tokens positive meanings, and 12 are of uncertainty.

The number of cases in the corpus is not of a significant amount, with 201 valid tokens, because this research only studies one emoji used by a group of users on Twitter from 2016 to 2020, when emojis are first introduced to the global online community. However, this dataset is still sufficient to outline the development of SSF emoji's negative variable in the first five years of its use.

VI. RESULTS

A. Content Analysis of Typical Usages of SSF Emoji

Like other observations on how people use emojis in casual conversation on the Internet, Chinese users also put the SSF emojis after the grammatically complete sentences [2], [10]. Three types of SSF emoji uses are found in the corpus: positive, negative, and uncertain.

The first three letters of username are coded in the examples to keep privacy for individual users while maintaining their separate identities. SC and TC indicate the original post is in Simplified Chinese or Traditional Chinese. The year of the post is also coded to identify when the tweet was posted. The original Chinese tweets are translated into English to aid the reader. Although not present in the original content, the words in square brackets are necessary to make sense in translation. After the content translation, the contextual translation for the attached media or related information within the original tweet is provided in brackets.

1) Example 1: Positive uses (most popular)

- a) LOL, TC, 2016 – You girls kept smiling to the end. You were great 🙌. Thank you for your hard work. Have a good rest 😊. (Retweet of a photo of a Korean girl band).
- b) BUL, TC, 2017 – Puppet figure external tripod, [does] anyone need [it]? 😊. (A group of photos of puppet figure external tripod).
- c) PUI, TC, 2018 – [This is] a very rubbish association, and [a] very rubbish meeting. But this suits rubbish like me. 😊. (A photo of a pile of empty beer bottles).
- d) PIN, SC, 2019 – Let's eat together 😊 [here] has grilled chicken, red onion greens (baby kale), and kimchi. (A photo of a meal with food described in the content).
- e) XIN, SC, 2020 – Today is Winter Solstice [festival], everyone remembers [do not forgets] to eat dumplings... 😊. (A photo of a cat holding fish in its mouth).

The SSF emojis in Example 1 are all considered a kind of positive use. They all annotate a friendliness to the sentence. Users express an apparent amicable attitude towards others in the examples of 1a, 1b, 1d, and 1e. In the example of 1c, the sentence contains negative words as calling others rubbish, but at the end of the sentence, the user also identifies themselves as rubbish. Therefore, the SSF emoji in Example 1c shows as a gesture of intimacy. Using SSF emoji to show friendliness is popular among Chinese users on Twitter when using SSF positively. Such practice can be found in many positive cases from 2016 to 2020 and is the most popular positive usages in the corpus.

2) Example 2: Positive uses (other)

- a) QIT, TC, 2016 – The book my sister gave me has arrived 😊. I will finish this book. Thank you, sister 😊. There is still so much to do... #Walk with him further. (The hashtag is the title of the book)
- b) SOO, TC, 2016 – Keep working hard to grow up and make yourself outstanding and valuable; in the future, you will be grateful for the hard work you are doing now 😊.
- c) KLI, SC, 2016 – Maybe I am [the one] being possessive, [for I] have a hard time controlling [my bad] temper, sorry 😊.
- d) HRM, SC, 2016 – I may really fall in love with him 😊. This is perhaps it's the first time that I'm in love 😊.

The SSF emojis in Example 2 are used positively but with more nuanced happiness and motivation than the friendly ones from Example 1. For example, the SSF emoji in Example 2a, is placed immediately after the sentence that expresses gratitude towards the sister. Thus, the emoji shows a thankful smile. Similarly, in Example 2b, the emoji is used right after a motivational statement, giving the SSF emoji a feeling of self-inspiration or encouragement. The content of Example 2c seems to be a neutral expression, which can be interpreted as a sincere or passive-aggressive apology. A passive-aggressive apology usually conveys a hostile message in a tone of offensiveness [37]. The message in 2c does not give any impression of rudeness but empathy for how others may view the user's temper. Hence, the content is a genial apology, and the annotation of a single SSF emoji in Example 2c gives the content a friendly feeling, as giving an apologetic smile when people are apologising rather than a sarcastic one. Unlike other positive SSF emojis used as a gesture of intimacy and friendliness, Example 2d expresses apparent happiness for the state of falling in love. Thereby, the emoji annotating 2d reflects the user's emotion when posting the tweet, instead of being simply friendly. These types of positive SSF emoji are mostly found in 2016, and the positive SSF emoji annotates mainly as being friendly in the later years.

3) Example 3: Negative uses

- a) SHU, SC, 2017 – Everyone is striving for their dreams. But I don't have a goal 😊.
- b) CUI, SC, 2018 – The joy of adulthood is written all over the face. [My] work makes me happy, that is great 😊😊😊. (A photo of an expressionless face).
- c) YIX, SC, 2016 – [I] dislike (in a manner of euphemism for profanity) this person 😊😊😊.
- d) MSJ, SC, 2018 – [It] turns out the greeting [with] me is fake. Trying to sell [me] Amway is real 😊. (Amway is a direct selling company that provides many health, beauty, and home-care related products [38]).
- e) JES, SC, 2018 – To put it bluntly, he just doesn't like you enough 😊.
- f) XTH, SC, 2016 – If I didn't care, I would never cry 😊.
- g) SEL, TC, 2016 – If a man loves you, he will not let you be alone, hungry, be angry with you, or say and do anything that you don't like. [Neither will he] make you unhappy, angry, nor lash out at you. He will not make you cry because of him. Then does he love you? 😊.

In contrast with the positive SSF emoji, the negative, and therefore antonymous use is of various situations with different meanings. The negative use of SSF emoji can be categorised into three groups: sarcasm, disapproval, and negation.

The sarcastic use of SSF emojis is one of the most popular usages among Chinese users who annotate their messages negatively. In Example 3a, the user belittles themselves as a means of humour. Example 3b is also considered as ironic because the attached media is contrary to the content about being happy.

When the emoji appears as disapproval, users tend to express an unfavourable judgement in the content towards a person or an event. Example 3c is a direct disapproving sentence and uses euphemistic profanity to strengthen the feeling in the statement. While the sentiment of disapproval is not apparent in Example 3d, others can still interpret the user's attitude from the comparison in the content.

An SSF emoji can also be used with a negative sentence, such as in Example 3e, 3f, and 3g, which asserts the situation is not true but false. Example 3e is a simple negation, where the message is straightforward. Example 3f is a counterfactual conditional statement, which emphasises a negative feeling. Example 3g is an interesting example for the negative use of SSF emoji. The statement in 3g negates the things a man will do if he loves someone, and the question is a positive question without negation not expecting an actual answer. The SSF emoji appears right after the question in Example 3g. This type of positive rhetorical question has the illocutionary force of the opposite meaning [39].

4) Example 4: Uncertain uses

- a) CAR, SC, 2016 – [I] had a Saturday, which is like Sunday 😊.
- b) JAS, SC, 2016 – Let the heavens decide everything 😊.
- c) JIF, SC, 2016 – Travel, determines a ball player 😊.
- d) MAC, TC, 2017 – A corner where the sun cannot shine 😊. (a manga-style drawing about a rabbit in a shaded alley, two rabbits playing volleyball under the sun).
- e) NAL, SC, 2017 – The body of this figure model really is 😊😊😊. (a set of photos of a manga themed figure model).
- f) ANN, SC, 2018 – [I] wrote a long article today 😊.
- g) LLL, SC, 2018 – Official Account what on earth... Suddenly posted an article (. [It] turns out dark priest has a name 😊. (a snapshot of a WeChat official account article).

There are only 12 cases found with uncertain meaning of SSF emoji in the corpus. Unlike the various cases shown for the positive and negative use of SSF emoji, the cases for uncertainty of SSF are similar. It is hard to interpret the

sender’s meaning or sentiment within the content and context. Perhaps because of the highly contextual content, the message cannot be interpreted from the words alone, as in Example 4a, 4b, 4d, and 4f. Example 4c is a grammatically correct sentence, but it makes no sense. The sentences in Example 4e and 4g are incomplete. The speakers’ intentions are not delivered in the unfinished illocutionary acts. Thus, the sentiment of the SSF emojis in these two examples cannot be determined.

In the content analysis, it is clear to see that the SSF emoji does not express any emotions of friendliness or sarcasm by itself. The emoji’s meaning is decided by the semantic of the content or the context it is annotated with. Such interpretation of the SSF emoji is similar to anaphora, whose meaning depends on another expression in the same sentence [40]. When the SSF emoji annotates a sentence with a friendly, thankful, inspiring, or apologetic sense, the emoji has a positive meaning as a gesture of intimacy. The SSF emoji can also annotate the sarcastic, negative, or disapproving sentences, which give the emoji a negative sense. If the content is vague, it is not possible to tell what sentiment the SSF emoji indicates.

B. Year-to-Year Comparison



Fig. 1. Year-to-Year Comparison of SSF Emoji with Positive (P) and Negative (N) meanings and Uncertain (U) Uses from both SC and TC Users.

Fig. 1 demonstrates the token counts and the percentage of SSF emoji with positive and negative meaning and uncertain use from 2016 to 2020. The percentage represents the proportion of separated SSF emoji uses in all the counted tokens of the year. Although the percentage for the positive and negative meaning of SSF emoji fluctuates over the years, there are 94 tokens of positive uses and 95 tokens of negative uses. The negative use of the SSF emoji has one token more than the positive one, and it could tell that the Chinese users slightly prefer the negative SSF emoji on Twitter. Some tweets in this study used the SSF emoji with contradicting semantics. Moreover, some Chinese users of SC or TC would use the same emoji to annotate different feelings in various contexts. Such practice on Twitter makes the emoji an auto-antonym among Chinese users.

In the social media environment, emojis convey the meaning of the sender's emotion and thoughts to express an attitude or, what would be, a gesture, in face-to-face speech [2], [10]. The feeling expressed in the content or context determines the meaning of the emoji. The receiver interprets the auto-antonymous SSF emoji by evaluating the sentiments within the content and context. When the content or context indicates a sarcastic or ironic sentiment, the annotating SSF

emoji is interpreted to correlate with emotion. There are two examples in the dataset (one in 2017 and 2020) where the single user employed two SSF emojis in a single tweet with both negative and positive meanings. In these cases, the emoji's semantics depended on the sentiment of the immediately preceding sentence.

There is an interesting phenomenon we can see in this chart. In the early application of the SSF emoji, the emoji with was frequently used with ambiguity. However, it is unclear if this is intentional. The interpretation of uncertainty is made because it is impossible to interpret the user's intention of the emoji use, given the content and context. Such indeterminable sentiment of the SSF emoji reflects the fact that some Chinese users did not use the emoji with straightforward content or context in the early stage. Eight tokens in 2016 - account for about 17% of total sentimental tokens in that year, are considered uncertain. Such uses of ambiguity drop in the following years—only two tokens found in 2017 and 2018 respectively, and accounted for around 4% of tokens of the year.

In 2019 and 2020, there are no such uncertain representations of SSF emoji in use among all the tokens. The meaning of the SSF emoji increases in certainty when the sentiment of context and content, becomes more apparent. The practice of uncertain SSF emoji demonstrates that Chinese users adopt a more certain understanding of the emoji’s semantic value over time.

C. Logistic Regression of Linguistic Constraints

The relative roles played by the different constraints in the positive and negative meanings of the SSF emoji are shown in Table I.

TABLE I: LOGISTIC REGRESSION OF THE LINGUISTIC CONSTRAINTS CONDITIONING NEGATIVE SENTIMENT OF THE SSF EMOJI IN CHINESE USERS ON TWITTER

Total N: 187
Input: 0.509

	FW	%	N
Repetition			
Multiple [m]	0.79	82.4%	17
Single [s]	0.46	47.1%	170
Range	.33		
Position in Sentence			
Middle of Sentence (m)	[0.69]	75.0%	4
End of Sentence (e)	0.49	49.7%	183
Chinese Type			
Simplified Chinese (SC)	0.59	59.2%	100
Traditional Chinese (TC)	0.39	39.3%	87
Range	.20		

As described in Tagliamonte, the factor weight (FW) in the table represents the probability of the occurrence of each factor in the group [35]. Those factors not selected as significant (usually due to the low number of tokens) are shown in square brackets. The range is a nonstatistical measure of the relative strength of the factor, determined by subtracting the lowest factor weight from the highest factor

weight in the factor group. The higher the number, the more significant the contribution of that factor in determining the overall distribution of the form.

Table I displays the linguistic constraints of the SSF emoji with negative meaning. The linguistic constraints determining the likelihood for the SSF emoji to indicate negative sentiment, are (in order of importance): 1. repetition, 2. position in the sentence, and 3. Chinese type. When the emoji occurred more than once in the content, most users used it with consistent meaning. When a user used the emoji a single time, the following emojis within the same tweet, if there are any, tended to be single as well, likewise for the repetitive emojis. There are only two exceptions (one in 2018 and 2019) in the entire dataset that uses the emoji with different repetitions in the same tweet: in these instances, the user used repetitive SSF emoji and a single SSF emoji to annotate two different sentences. The repetition is the crucial linguistic constraint that attributes the SSF emoji negative meaning. Although the single use for the SSF emoji in tweets is more common than the multiple use, the negative sentiment is more commonly seen with the repetitive uses.

We can see a significant difference between the SSF emoji with single use and repetition with the range value of 33, which is the highest in linguistic constraints. The meaning of the repeated SSF emoji is different to the single emoji. The repeated emoji does not demonstrate its original positive meaning in the same way as the repeated word in natural language emphasises its literal meaning [30], [31]. Such repetitive use of SSF emoji tends to signify the new meaning of sarcasm and negative sentiment. The repetition of the SSF emoji may imitate the facial expression in face-to-face dialogue. Repetition two or three times are the most common in all the repetitive uses, perhaps for some rhythmic purpose, as suggested by McCulloch and Gawne [28]. Nonetheless, we cannot determine from the data whether the users used repeated SSF emoji to intensify the feeling or promote interaction, as Arafah and Hasyim suggest, by lowering the offence of the sarcasm [29].

Among all the tokens, there are only five tokens where the emoji occurs in other positions in the sentence, one (with positive meaning) at the front and four (one with positive meaning and three with negative meaning) in the middle. Even though the percentage of negative SSF emoji in the middle of the sentence is more significant than at the end of the sentence, the effect is statistically insignificant due to the low number of tokens, as indicated by the square brackets.

Both SC and TC users use the SSF emoji to show negative emotion as sarcasm and irony. As we can see from the table, it is more likely for SC users to use the SSF emoji than TC users. The range value for the Chinese type is 20, which has fewer effects than the linguistic constraint like repetition. In stepwise regression, both repetition and Chinese types showed a significant correlation with the negative meaning of the SSF emoji ($p < 0.05$).

D. Logistic Regression of Social Constraints

Table II describes the social constraints that attribute SSF emoji with sarcastic or ironic use, where they are available. It is also worth noting that not all users on Twitter provide their provenance and gender information. The range calculations for the provenance of user and gender exclude tokens with

unknown information.

As shown above, in Fig. 1, the frequency of use of the negative meaning fluctuates over time. The values are not in chronological order in Table II as well, and they cannot tell that the SSF emoji with negative meaning is gaining popularity among Chinese users on Twitter over the years, despite the overall range value for the year 27. The sarcastic practice of the SSF emoji can be found in 2016, soon after the emojis' publication. It perhaps has to do with the SSF emoji becoming an auto-antonym, with the positive and negative meaning, for Chinese users in early practice on Twitter.

TABLE II: LOGISTIC REGRESSION OF THE SOCIAL CONSTRAINTS CONDITIONING NEGATIVE SENTIMENT OF THE SSF EMOJI IN CHINESE USERS ON TWITTER

Total N: 188 Input: 0.424			
	FW	%	N
Year			
2020	0.64	58.6%	29
2018	0.64	68.2%	44
2016	0.43	47.4%	38
2019	0.38	37.1%	35
2017	0.37	38.1%	42
<i>Range</i>	27		
Provenance of User			
Malaysia	[0.81]	75%	12
China	0.53	56.1%	41
Taiwan	0.43	38.7%	31
Hong Kong	[0.21]	16.7%	12
<i>Range</i>	10		
Gender			
Female	0.63	62.3%	77
Male	[0.36]	33.3%	9

As suggested in many other studies, mainland Chinese users often use the SSF emoji with negative sentiment on Twitter [15], [16], [24], [25]. The probability and percentage of Taiwan users, who dominantly write in TC, to use the negative SSF emoji is lower than those for mainland China users. The difference between these two provenances of Chinese users may reflect the user's media preference and cultural identification through emoji, the new language of the digital era. The result of users' provenance is consistent with the result from the linguistic constraint of the Chinese type. Nonetheless, the tokens from Malaysia and Hong Kong are insufficient to draw any concrete conclusion on the effect of variation from these locations. The significance between China and Taiwan will be distorted because the stepwise regression takes the insufficient data into account.

More Chinese females use the SSF emoji with negative meaning on Twitter than males. This result is consistent with other linguistic findings that females are more likely to adopt innovative variation and lead in language change [32], [35], [41]. However, it is also important to note that the tokens for gender are disproportional. In all the tokens of the SSF emoji with positive and negative meanings, there are 93 tokens from female users whilst male users have only 9 tokens. There are only 3 male users who used the SSF emoji to annotate negative emotion, and the data is not adequate for comparing the range value or the significance between female and male

users. It is also worth noting that more than half of the tokens are with unknown provenance and gender. Due to insufficient data, the analysis cannot appropriately determine the correlation between the negative SSF emoji and the social constraints.

VII. CONCLUSION

Chinese users on Twitter used the SSF emoji with a new negative meaning of sarcasm and irony as early as 2016, but the original friendly implication of the emoji was still in use in 2020. The SSF emoji does not express any emotions of friendliness or sarcasm by itself but is interpreted by evaluating the sentiment intended in the content and context. Such dependent interpretation gives SSF emoji an anaphoric feature or acts like a modal particle, of which the meaning relies on the expression within the same sentence [6], [9], [40]. It is easy to interpret the semantics of an emoji that annotates a grammatically complete sentence with a clear sentiment intention. This content-dependent feature of SSF emoji can also be seen in an auto-antonymous situation, which means different people may use the emoji with two contradicting meanings for either friendliness or sarcasm. In the corpus, there are some cases where the same users used the SSF emoji to mean friendliness or sarcasm in different tweets. However, there are two extreme cases (one in 2017 and 2020), the SSF emojis in the same tweet can indicate different meanings, depending on the sentiment of their preceding sentences. When the SSF emoji is used as a positive symbol, it serves as a gesture of intimacy or expression of happiness. If SSF emoji is of negative use by Chinese users on Twitter, it usually annotates sarcasm, negation, or disapproval.

Most Chinese users use the SSF emoji at the end of the sentence and only once, as matched with other observations on how other people usually use emojis online [2], [10]. The repetition of the emoji and Chinese types are the major linguistic factors contributing to the SSF emoji's negative variant. Both factors demonstrate a significant correlation with the negative use of the emoji ($p < 0.05$).

SC users, mainly people from mainland China, use the SSF emoji to express sarcastic or ironic emotions slightly more often than the TC users, who are mainly from Taiwan. The difference may reflect the user's media preference. The conclusion on social constraints matches the linguistic constraint analysis of Chinese types. However, such negative use of the SSF emoji by SC users may have influenced TC users on Twitter; it may also have to do with the linguistic identification through emoji use. With this emoji variable, as with other linguistic variables, the new use is led by females. In the corpus, it is clear that more female Chinese users use the SSF emoji with negative implications than males. However, the number of male users in the corpus is not enough to further analyse the significance.

It is important to note that users' provenance and gender data is not always obtainable on Twitter. Moreover, some tokens in both linguistic and social constraints in the current corpus are yet to have enough data to infer the effect on the variant of interest.

Chinese users on Twitter use the SSF emoji with both a negative meaning of sarcasm and irony and a positive meaning of friendliness and niceness. Such practice of

obviously opposing semantics gives this emoji an auto-antonymous feature. These two contradicting meanings of the SSF emoji will probably continue to be used simultaneously among Chinese users on Twitter and possibly also on other international social media. Language contact within the global community is easier and more extensive than ever before. Moreover, language is changing rapidly on the Internet these days. There will be no surprise to see, in the future, that a user other than Chinese uses the SSF emoji to indicate sarcasm, negation or disapproval in different languages on the Internet.

VIII. LIMITATION

The research is based on data from Twitter, which may not have a lot of Chinese users from mainland China, although it is one of the preferred social media for other Chinese users. Twitter provides an accurate emoji search function compared to other social media, enabling this study to look for the tweets with the SSF emoji. Furthermore, this platform also provides a brief insight into how mainland Chinese users would use the SSF emoji within an international social media environment and compare their usage to other Chinese users.

In the study on Twitter, the age constraint cannot be analysed for the SSF emoji with a negative meaning because such user information is not available on Twitter. Moreover, some social constraints are not always accessible for every user. Only 50.5% and 56.5% of tokens have user's provenance and gender information, respectively. There are constraints in this study, for example, the linguistic constraint of the position of the sentence, not enough for determining the effects. The social constraints for Malaysia and Hong Kong users likewise have insufficient tokens for the variant of interest.

IX. FURTHER STUDY

The limited data in this study suggests that when the SSF emoji is placed in positions other than the end of the sentence, it may indicate a different meaning. Similarly, people from Malaysia may be more likely to use the SSF emoji with different a semantics than those from Hong Kong. A further thorough study of the SSF emoji with a larger corpus or across platforms may determine the effects of current insufficient constraints.

The negative meaning of SSF emoji has a synonym in the emojis that express a similar sentiment. The Upside-Down Face (🙄, UDF) emoji, the flipped version of the SSF emoji, can also convey the same sarcasm and irony [42]. It would be worthwhile to study the semantic of semiotics for understanding how people use these two synonymous emojis of sarcasm in practice and what constraints affect the choice of synonym; and language influence and identification behind the use of these two sarcastic emojis.

CONFLICT OF INTEREST

This is independent research. The author declares no conflict of interest.

AUTHOR CONTRIBUTIONS

The research and data are conducted, collected, and analysed by Shiwei Wang.

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