An Event-comment Social Media Corpus for Implicit Emotion Analysis

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Abstract

The classification of implicit emotions in text has always been a great challenge to emotion processing. Even though the majority of emotion expressed implicitly, most previous attempts at emotions have focused on the examination of explicit emotions. The poor performance of existing emotion identification and classification models can partly be attributed to the disregard of implicit emotions. In view of this, this paper presents the development of a Chinese event-comment social media emotion corpus. The corpus deals with both ex*plicit* and *implicit* emotions with more emphasis being placed on the implicit ones. This paper specifically describes the data collection and annotation of the corpus. An annotation scheme has been proposed for the annotation of emotion-related information including the emotion type, the emotion cause, the emotion reaction, the use of rhetorical question, the opinion target (i.e. the semantic role in an event that triggers an emotion), etc. Corpus data shows that the annotated items are of great value to the identification of implicit emotions. We believe that the corpus will be a useful resource for both explicit and implicit emotion classification and detection as well as event classification.

Keywords: Corpus, implicit emotion, explicit emotion

1. Introduction

Emotion has long been extensively studied across various disciplines, including philosophy, psychology, sociology, computer science, and linguistics. In the fields of linguistics and natural language processing (NLP), the identification of emotion in text has been a great challenge to researchers as reflected by the poor performance of existing emotion classification models. This can be attributed to the fact that emotions are frequently expressed in an implicit way without using any emotion keywords. Despite the importance of implicit emotions, most previous studies have been dedicated to the examination of explicit emotions and not much work has been done on investigating implicit ones.

The term explicit emotion refers to emotion-related information denoted by the presence of emotion keywords. For instance, the emotion keyword "*delighted*" in "*I was delighted by the news*" explicitly indicates the emotion of the experiencer. Implicit emotion refers to emotion-related information which is inferred by the readers, instead of being conveyed through emotion keywords. An example of such a sentence is "*You shut your mouth!*" which connotes an anger emotion with none of the individual words in the sentence expressing such an emotion.

Given that there is a clear gap in existing emotion research, this paper aims to construct a Chinese event-comment emotion corpus which allows users to explore the characteristics of implicit emotion with annotated emotion-related information such as emotion type, emotion keyword, emotion expression, the use of rhetorical question, opinion target, emotion cause (i.e. pre-event) and emotion reaction (i.e. post-event). Regarding emotion causes, most emotion theories generally regard them as an integral part of emotion elicitation (James 1884, Plutchik 1980, Wierzbicka 1999). Although an emotion cause may not be explicitly expressed in all cases, an emotion is inextricably elicited by an event(s). Therefore, we extracted both posts and comments from the social media platform, with the posts being annotated with event information and the comments being annotated with emotion information. It is believed that event information also provides contextual information that help infer implicit emotions.

2. Related Theoretical Issues

2.1 Explicit Emotions vs. Implicit Emotions

Regarding the relations between emotion and language, scholars generally agreed that there are two perspectives one can adopt, though named with different terms. Bamberg (1997) differentiated between emotion talk/ talks about emotions and expression of emotion. Grondelaers and Geeraerts (1998) adopted the terms language about emotion and language as emotion. Kövecses (2000) classified emotion words into descriptive and expressive emotion words. Bednarek (2008) put forward the two terms emotion talk and emotional talk. Although different terms are used, one refers to emotion terms that are used to talk about emotions, and the other refers to emotion expressions through expressive speech acts or behavioral acts that have emotive value. The classification is consistent with the term explicit and implicit emotion we proposed. Lee (2015: 186) defined explicit emotion as "the presence of emotion-related information denoted by emotion keywords", and implicit emotion as "the emotion-related information that requires inference or connotation instead of being conveyed by emotion keywords". By explicit emotion, it refers to emotion terms that directly denote one's emotional state as what Pavlenko (2008) termed emotion words. As for implicit emotion, it refers to emotion that are expressed without the presence of any emotion words. Implicit emotion includes but is not restricted to emotion-related and emotion-laden words in Pavlenko's work (2008).

Although it is well known that most emotions are expressed implicitly, not much work has been done to examine implicit emotions. From the linguistic perspective, Greene and Resnik (2009) proposed an approach to classify implicit emotion based on grammatically relevant semantic features that characterize the interface between syntax and lexical semantics. They found that the *transitive* form of headlines was significantly lower in sympathy ratings than the *nominalized* and *passive* ones. Lee (2015) attempted to investigate implicit emotions at the semantic level by proposing linguistic cues that connote emotions implicitly.

From the computational perspective, implicit emotion can be detected by different approaches, such as statistical approach (Kozareva et al. 2007), lexical-based

approach (Lei et al. 2014), and knowledge-based approach (Chaumartin 2007). In addition to these traditional approaches, emotion detection can also be done with the aid of the collection of emotion-eliciting events (Tokuhisa et al. 2008, Vu et al. 201, Ding and Riloff 2016).

More recently, SemEval-2018 Task 1 (Mohammad et al. 2018) considered implicit emotions in the emotion classification task (Subtask E). Participants were and asked to choose options from 11 emotions that best described the emotional state expressed in each of the given tweets. The tweets are in English, Arabic and Spanish. Various affective lexicons in the three languages were employed. However, the detection of implicit emotion in Chinese is challenging due to the lack of resources. For example, although the Linguistic Inquiry and Word Count (LIWC) is considered a de facto standard tool for emotion analysis and the core lexicon has been translated into Chinese, it roughly classifies words into positive and negative emotions (can be further classified as anger, anxiety or sadness), and some words are emotionally ambiguous without contextually information. For example, "*I feel really ugly today*" will be perceived as sadness but as anger in "*he is as ugly as sin*". Moreover, implicit emotions are often expressed at the syntactic level. Therefore, an implicit emotion corpus with manual annotation is necessary for the studies of implicit emotions.

SemEval-2019 Task 3 (Chatterjee et al. 2019) provided textual dialogue for participants to infer the underlying emotion of the utterance. As emotional states expressed in an utterance may be ambiguous when no emotion keywords are found in text, it is proved that contextual information is helpful in the detection of emotion. Therefore, we do not only extract comments for emotion analysis but also posts which provides contextual information for the annotation of implicit emotions.

2.2 Linguistic Events vs. Real-world Events

Rosen (1999) suggested that events can be discussed in two ways, namely linguistic events and real-world events. The former refers to the linguistic representations of things that happen in the real world, and the latter refers to things that happen in the real world. We discuss linguistic events in terms of verb classification, and real-world events in terms of some existing language resources.

In early work on event classification, researchers have developed the idea that verbs can be decomposed into a structured representation of an event (Aristotle 1984, Vendler 1967, Dowty 1979). Vendler (1957, 1967) suggested that verbs can be categorized into four types, namely states, activities, accomplishments, and achievements. Smith (1991) added another class called semlfactives. Huang et al. (2000) proposed another method called the module-attribute representation of verbal semantics (MARVS) to represent event structures with five primitives, namely boundary [·], punctuality [/], process [/////], state [____], and stage [^^^^].

Previous work discussed events using a small number of primitives or features, not many attempts have been made to categorize concrete events in a fine-grained way. ACE 2005 (LDC 2005) defined an event as something that happens, and it can frequently be described as a change of state. However, not all but only certain kinds of events were included in the ACE model. As the number of real-world events may be rather large, WordNet (Miller 1995) seems

to be a more appropriate resource for event annotation due to its extensive coverage. WordNet is a lexical database which groups lexical words into sets of synonyms called synsets. Members of a synset are presented in a hierarchical structure.

Time Markup Language (TimeML) (Sauri et al. 2009) defines events as "situations that happen, occur, hold, or take place". Events can be punctual or last for a period of time, they can also be states or circumstances in which something holds true. TimeML classified events into 7 types in TimeML annotation scheme, namely reporting, perception, aspectual, i_action (i.e. intentional action), i_state, state, and occurrence. The classification is designated mainly to address event-event relation. It may be inadequate in dealing with all kinds of real-world events, but it does provide a standard guideline for the markup of events in English.

3. Event-comment Emotion Corpus

3.1 Corpus Data

The data is taken from Sina Weibo, one of the most popular social media sites in the Mainland China. Sina Weibo provides a good source of data for emotion studies as it allows users to disseminate all kinds of information and to instantly respond to events in which they are interested. The comments mostly convey emotions evoked in individuals to some kinds of events.

The Chinese event-comment corpus was made up of 200 trending Weibo posts on news created by digital journalisms from April 2018 to June 2019. After extraction, we removed garbled comments, duplicated comments, comments that users made to respond to another comment, and short comments that contain less than 4 words in Chinese. Each post includes 150 comments, which adds up to 30,000 comments for the entire corpus. Of the 30,000 comments, 10,000 were manually annotated with emotion information. The 10,000 annotated comments consist of 245,651 words including punctuations.

4. Event Annotation

4.1 Event Markup – TimeML

For the event annotation, only the headings of the 200 posts are annotated as the heading generally summarizes the focus of the event. TimeML (Sauri et al. 2009) is adapted for the event markup but not for event classification as the seven types proposed by TimeML seem to be inadequate for the study of event types and emotions.

According to TimeML, events can be denoted by verbs, nouns, adjectives, prepositional phrases, or other elements such as locative adverbs. However, the guidelines are compiled based on English data. It is observed that rarely does a prepositional phrase or an adverb in Chinese denote an event. Thus, we only consider events denoted by verbs, nouns, and adjectives.

4.1.1 Events Denoted by Verbs

As for events denoted by verbs, all verbal predicates excluding the copula verb 是 are considered to express an event, and they are marked up as such. According to Vendler (1967), verbs can be classified into four types, namely activity verbs, stative verbs, achievement verbs, and accomplishment verbs. An example of each type is exemplified as in (1) - (4).

(1) 小伙無故**踹打**八旬老太
  *'A lad **beat up** an 80-year-old lady without any reasons.'*
(2) 大巴上**有**殺人嫌犯
  *'A murder suspect **got on** a bus.'*
(3) 車**丟**一個多月終於找著了
  *'the car was **lost** for over a month. Now I finally got it back.'*
(4) 雙 11 後快遞遭暴力分棟：有的被亂踢、扔飛，有的被**踩碎**
  *'After Double 11, packages are sorted in an immensely chaotic order: some packages were kicked and hurled; some **stormed by foot and smashed**.'*

In the present work, the four types of verbs in (1) - (4) are considered and marked up as an event. Moreover, verbal compounds such as the parallel verb compound 踹打 'beat up' in (1) and the resultative verb compound 踩碎 'stormed by foot and smashed' in (4) are marked up as a single event. This is also applied to other compound verbs including verb-object compounds, adverb-verb compounds and noun-verb compounds.

4.1.2 Events Denoted by Nouns

As mentioned in Section 4.1.1, the copula verb 是 'to be' is not regarded as an event in general cases. However, when 是 'to be' is followed by a predicative complement that expresses a sortal state, it should be marked up as an event. According to Sauri et al. (2009), sortal states are generally expressed by agentive nominals who participate in certain activities or actions and by nouns that denote professions, roles or positions, or terms that refer to the same entity across the world. Therefore, 是 'to be' is marked up only if the noun following it meets the requirements of a sortal state. Consider (5) and (6).

(5) 男子持刀行兇他第一個站出來... 他，曾**是**軍人！
  *'A man held a knife committing an assault. He was to first to stand up. He **was** a soldier!'*
(6) 這名交警執法硬氣，網友怒讚：他不就**是**"李雲龍"嘛！
  *'This traffic police officer boldly enforcing the law. Netizens offered huge praise, saying, "**Isn't** he Li Yunlong"?'*

是 'to be' in (5) is marked up as it is followed by a sortal state expressed by the role 軍人 'soldier'. However, it is not marked up in (6) as the agentive nominal 李雲龍 'Li Yunlong' does not indicate any activities or actions that the traffic officer participated in. As for event-denoting nouns, Sauri et al. (2009) proposed 4 rules and claimed that a noun should be compatible with at least 2 of them to be regarded as an event-denoting one. Since the rules are compiled based on English data, we revise the rules as follows:

(a) NOUN 持續了數秒/ 分鐘/ 日/ 年/……
  'NOUN lasted for several seconds/ minutes/ days/ years/…'
(b) NOUN (將)在 TEMPORAL EXPRESSION 發生
  'NOUN took/ takes/ will take place in TEMPORAL EXPRESSION'
(c) NOUN 在 TEMPORAL EXPRESSION 開始/持續/結束
  'NOUN began/continued/ended in TEMPORAL EXPRESSION'

If a noun satisfies at least one of the conditions, it is regarded as an event-denoting noun. Some examples found in the corpus include 暴雨 'rainstorm', 家暴 'domestic abuse', 亂象 'chaos', 事故 'accident' and so on.

Event-denoting nouns acting as prenominal modifiers are not marked up as an event. Consider (7).

(7) 日本向中國提新大熊貓租借**請求**
  'Japan made a proposal to China regarding renting a new panda.'

In (7), 租借 'rent' is a noun that can be regarded as an event-denoting noun. However, it acts as a prenominal modifier which modifies another noun 請求 'proposal'. In that case, the prenominal modifier should never be annotated as an event, and only the noun should be.

4.1.3 Events Denoted by Adjectives

As for events denoted by adjectives, they usually denote a stative event. An adjective can be classified as an attributive one or a predicative one, in which the former acts as a pre-modifier of a noun, whereas the latter functions as a predicative complement of a verb. Consider the phrases in (8) and (9).

(8) 最**安靜**的守護
  'The quietest protection.'
(9) 外賣小哥滿臉**委屈**
  'The delivery guy looked as if he was wronged.'

In (8), the adjective 安靜 'quiet' is in an attributive position which will never be annotated as an event, while the adjective 委屈 'grievance' is in a predicative position and will be marked up as an event. According to TimeML, only predicative adjectives which denote a non-persistent property of the noun they modified should be annotated as an event, that is, the change of state. For example, the deliveryman in (9) changes its emotion state from not feeling aggrieved to feeling aggrieved. Sauri et al. (2009) suggested that for an adjective to be annotated as an event, it should satisfy at least one of the following conditions: (1) the adjective should denote a non-persistent property of the noun it modifies, (2) the adjective should be a state that is temporally bound to a particular point or a period of time, (3) the adjective should indicate an opinion, knowledge, someone's belief, or a matter under discussion. Therefore, we follow TimeML and only annotate those adjectives that satisfy at least one of the three conditions.

4.1.4 Exceptional Cases

There are cases that an eligible verb, noun or adjective may not be marked up, such as subjective evaluations in the post, or informative questions. Consider (10).

(10) **暖心**！民工路邊暈倒,路過女孩上前施救還抹淚：擔心自己沒做好
  'Heart-warming news! A worker passed out on the

street. The by-passing girl came to rescue. She was wiping her teardrops, stating that she feared she didn't do well enough.

(10) is the writer's own subjective evaluation which does not provide further information about the event. Therefore, the adjective 暖心 'heart-warming' in (10) is not annotated.

A question in a heading should be deal with more carefully. Some questions are raised in the headings as a thought-provoking question as in (11), some function as an information-seeking question which has yet to be revealed as in (12), and some are rhetorical questions which do not aim to elicit an answer but to make a statement as in (13).

(11) 女子寫淫穢小說賣錢被判入獄 10 年，**對還是錯？**
*'A woman was sentenced a 10-year imprisonment for writing and selling obscene novels: **is this right or wrong**?'*

(12) 重慶高空項目安全繩突然脫落官方：正調查**是營銷還是疏漏**
*'Safety rope of a high attitude facility in Chongqin broke off without warning. Official is investigating the incident. **Is this a marketing stunt of an oversight?**'*

(13) 中學生午休上廁所違反校規被處分？教育局：由紀檢牽頭調查核實
*'**Were Secondary school students punished for going to the bathroom during afternoon break?** The Education Bureau stated that the disciplinary forces were leading the investigation to validate the incident.'*

The event-denoting words are not marked up in the thought-provoking question in (11) and the information-seeking question in (12). However, the rhetorical question in (13) does indicate the subevents that happened. Thus, 午休 'afternoon break', 上廁所 'go to the bathroom', 違反 'violate', and 處分 'punish' should be tagged.

4.2   Event Classification – WordNet

After marking up all the events, the events are then translated from Chinese to English in order to map to WordNet categories (Miller 1995). The mapping can be done by searching for an appropriate category using the word translated from Chinese to English or using its synonyms. It is observed that some of the mappings contain more than one potential category due to the polysemous nature a Chinese word may have. For example, the Chinese word 丟 can be understood as the act of "throwing" or "losing someone or something". Moreover, the classification in WordNet is rather fine-grained. There may be several categories representing similar concepts with just a slightly difference in meaning. Thus, the mappings should be done manually. For example, by searching the word "throw", there are already five items containing the word "throw" in the name of the WordNet categories, and annotators should opt for the most accurate one.

The total number of events marked up in the 200 posts is 732. Of the 732 events, some belong to the same category

in WordNet, and thus the total number of WordNet categories (i.e. event types) identified is 596.

4.3   Semantic Role Labeling - FrameNet

After event classification, FrameNet (Baker et al. 1998) is employed to label the semantic roles of the arguments or adjuncts mentioned in the event, which is named as frame elements in FrameNet. That is, the basic unit of a frame is composed of frame elements which are frame-specific defined semantic roles of an event.

First, we translated all the events and did a search for the most suitable frame for each event through FrameNet Search[1]. For example, we used the word 'born' to search for a frame that represents the event 出生 'born'. The result is shown in Figure 1.
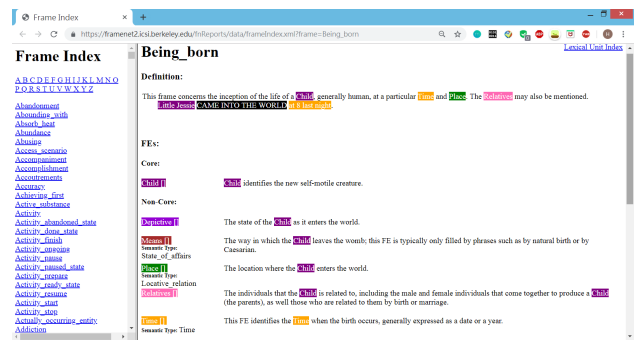

Figure 1. The Frame "Being_born" in FrameNet

Figure 1 shows that FrameNet provides the definition of a frame and different frame elements that involved in that specific frame. They are mainly classified into core and non-core frame elements. Core frame element refers to elements that are important to the meaning of a frame, such as the *child* in the event of 'being_born'. Non-core frame element refers to some peripheral elements, such as time, place, means etc. In the present work, all the core frame elements are annotated if they can be found in either the heading or the content of a post. As for non-core elements, only those that appear in the heading are annotated. It is believed that a peripheral element may be of great importance to the event if it does appear in the heading. An example is exemplified in Table 1.

<Text>
【佛門淨地 [e1-出生] 108 個"羅漢娃"，住持說：做好事不要怕別人說】十年前，汶川地震發生時，四川什邡市婦幼保健院成危房，經當地政府協調，大批臨產孕婦被轉移至隔壁古剎羅漢寺，在這裡，108 個娃誕生了。十年後, 108 個「羅漢娃」重聚在羅漢寺，共同慶祝同一個"生日"。???05 月 06 日 09:37

(1)- Being_born_e1: 108 個"羅漢娃": Child
(2)- e1: 四川什邡市古剎羅漢寺: Place
</Text>

Table 1. An example of Semantic Role Labeling

Figure 1 shows that the frame "being_born" is composed of one core element 'child', and five non-core elements, namely 'depictive', 'means', 'place', 'relatives', and

'time'. Table 1 shows that the core element 'child' is tagged, and 'place' is the only non-core element being tagged. This is because the place 佛門淨地 (i.e. 四川什邡市古剎羅漢寺) is the only non-core elements mentioned in the heading.

4.4 Emotion Annotation

4.4.1 Annotation Tool

Each of the 200 posts in the corpus is saved in a txt file encoded by Extensible Markup Language (XML). For the event annotation, the markup of events and the annotation of frame elements are inserted in the post of the txt files as shown in the annotation tool in Figure 2.
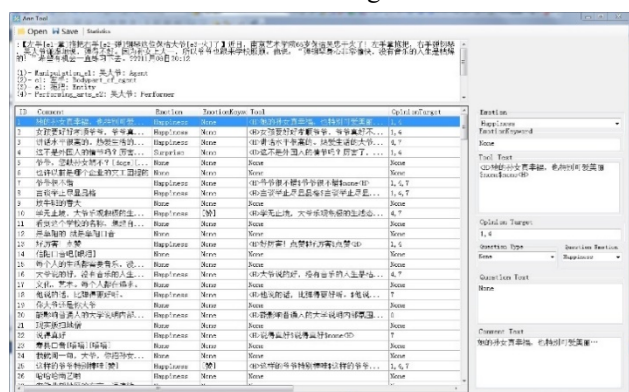

Figure 2. Annotation Tool

Figure 2 shows the annotation tool for emotion annotation. The post annotated with event information is on the top of the tool and the comments are placed below. The events in the post are directly marked up in the heading of the post in the form of [e1-event-denoting phrase], such as [e1-砍伤]. The number indicates the event it represents. The frame elements are placed under the content of the post which can be shown to annotators when doing emotion annotation.

When users click on one of the comments, the entire comment will be displayed in the text box of "Comment Text" on the bottom right of the tool. On the right side of the tool, there are several text boxes. The emotion type, emotion keyword, emotion expression, pre-event, post-event, opinion target, rhetorical question, question type, emotion expressed by a rhetorical question can be entered through this tool.

4.4.2 Emotion Type and Emotion Keyword

For the annotation of expressed emotions, five basic emotions are classified, namely *happiness*, *sadness*, *anger*, *fear* and *surprise*. Regardless of the emotion types, emotions can be expressed either in an explicit or implicit way. Explicit emotions are expressed by means of emotion keywords such as 開心 'happy', and implicit emotions refers to the emotion-related information conveyed through inference or connotation without any emotion keywords.

The annotation of explicit emotions will be done automatically based on the Chinese emotion taxonomy proposed in Lee (2010). The automatic annotation is manually checked by the annotators to ensure the accuracy. As for implicit emotion, it is loosely-defined in the present work as the expression of an implicit emotion may not be as evident as an explicit one. Before the annotation, annotators were asked to go through the taxonomy (Lee

2010) to familiarize themselves with the classification of emotions. For example, 感動 '*moved*' is a complex emotion that is composed of *happiness* and *sadness*, but it should be tagged as *happiness* only as it is the major emotion of '*moved*'. There are several points that the annotators should follow. First, an emotion can be expressed and interpreted at clause level, sentence level, or even document level. In the present study, emotions should be interpreted at clause level if two clauses convey different emotions as in (14).

(14) 雖然有點可憐，但是好想笑啊😂
'It's a bit pitiful, but (I) want to laugh so badly'

In (14), the first clause expresses a *sadness* emotion as hinted by the adjective 可憐 'pitiful', and the second one expresses a *happiness* emotion as indicated by the post-event 笑 'laugh' as well as the emoticon. Annotators should tag both the *sadness* and *happiness* in that single post.

Second, emotions expressed can either be the writer's emotion(s) or the others' emotion(s). Annotators should only annotate the writer's emotion(s). Third, annotators should tag all the writer's emotions in a single comment. Fourth, emotions can also be expressed by means of emoticons. Annotators should not only focus on the text but also the emoticons that may drop a hint. For emoticons that are mostly associated with a particular emotion, the emoticon should be entered as an emotion keyword in the annotation tool so that the comment will then be counted as a comment that expresses an explicit emotion. Last, if annotators are unsure about the emotion expressed in a comment, they should skip that and go to the next one.

4.4.3 Emotion Expression, Pre-event and Post-event

This section introduces the annotation of three parts, (1) sentence(s) that expresses emotion, (2) pre-event that triggers the emotion (i.e. emotion cause), and (3) post-event that is evoked by the emotion (i.e. an action or reaction of the experiencer). It should be labelled in the form of "*<emo>Sentence(s)$Pre-event$Post-event<emo>*". The instructions are as follows:

a. Each annotated emotion should have its own line of code, i.e. "*<emo>Sentence(s)$Pre-event$Post-event<emo>*". The emotion tag <emo> refers to the annotated emotion, the label should be as in Table 2:

Emotion	Emotion Label (<emo>)
Happiness	<H>
Sadness	<S>
Anger	<A>
Fear	<F>
Surprise	<U>

Table 2. Emotion Labels

For example, if a comment is tagged as *happiness*, annotators should put <H>*Sentence(s)$Pre-event$Post-event*<H>.

b. Some emotions are expressed explicitly (i.e. with emotion keywords), and some are expressed implicitly (i.e. without emotion keywords). Annotators should identify the sentence(s) and emoticon(s) that express emotions implicitly and put it right after the first

c. Pre-event is loosely-defined in this work. It refers to the immediate cause of the emotion which can be the actual trigger event, the perception of the trigger event or even an evaluation made by a writer regarding an event as in (15).

(15) 多一些這樣普及歷史的紀錄片會更好! 雖然**很殘忍**😬

*'It's good to have more of these documentaries for general history. Though (history) **can be cruel**…😬'*

The evaluative phrase 很殘忍 'can be cruel' in (15) explains the reason for the emotion triggered (i.e. *sadness*). It should therefore be marked as a pre-event.

d. For the markup of pre-events, annotators should use a dollar sign "$" to mark the beginning and the end of a pre-event.

e. A pre-event may be expressed by means of perception verbs, nouns, verbs, rhetorical questions, and anaphoric expressions as illustrated in (16)-(20) respectively.

(16) 我不管他們道不道歉，罵就完事了，我**看到"日本"倆字**就上火🌍

*'I don't care if they have apologized or not. I'm done scolding them, but I just got so furious every time when I **see the word "Japan"**🌍'*

(17) 我們必須送**日本人**去見上帝

*'We must send **the Japanese** to God.'*

(18) **掃射的那麼多人**　睡得安穩嗎！

*'How can they even get to sleep when they are **shooting this many people?**'*

(19) 掃射的那麼多人　**睡得安穩嗎**！

*'**How can they even get to sleep** when they are shooting this many people?'*

(20) 不敢看**這片子**

*'I dare not to watch **this video clip**.'*

f. Post-events can either be a physical reaction or an action that is triggered by the emotion. It does not necessarily need to be a past or present event; it could also be a future action that the experiencer will or will not take because of the emotion, such as 不買日貨 'not buying Japanese products', 不去日本旅遊 'not traveling to Japan'.

g. Only concrete actions that the writer can really carry out should be annotated as post-events, such as 呼籲 'urge', 要求 'request', 決定 'decide', etc. For abstract action that no actual action can be carried out such as 希望 'hope', it should not be marked.

h. Apart from textual information, a post-event can also be expressed by means of an emoticon, but only actions/ reactions that experiencers would actually do in daily life should be considered as a post-event.

4.4.4　Opinion Target

Opinion target refers to a (frame) element by which an emotion is triggered. The goal of the annotation is to see whether an emotion is highly related to a particular person/element who has conducted an event/ some events. In the dataset, each post consists of at least one subevent, and they are marked with [e1], [e2] etc. Each subevent contains a set of frame elements that provide information to the sematic structures of an event. To figure out the opinion target(s), annotators need to read the subevents and see which subevent(s) does trigger the annotated emotion(s). Consider the event and comments in Table 3:

Event: 【日本士兵[e1-承認]南京大[e2-屠殺]CG[e3-還原]槍殺現場】日本電視台於 5 月 14 日播出了南京大屠殺的調查紀錄片《南京事件 2——檢驗歷史修正主義》。在紀錄片中，日本士兵描述了 1937 年 12 月 16、17 日如何殺害中國俘虜，承認當時殺死數萬中國人。並用 CG 動畫還原了令人心痛的槍殺現場。???05 月 15 日 19:52 (1)- Reveal_secret_ e1:日本士兵: Speaker (2)- e1: 南京大屠殺: Topic (3)- e1: 紀錄片: Medium (4)- e1: 殺死數萬中國人: Information (5)- Killing_ e2: 日本士兵: Killer (6)- e2: 中國俘虜: Victim (7)- Duplication_ e3: 槍殺現場: Original (8)- e3: CG 動畫: Copy	
Comment:	Opinion Target:
1.　<A>日本有我們學習的地方，但是性質是真壞，會為他們的行為付出代價的$他們的行為$none<A>	5
2.　<H>只能說很欣慰$日本終於肯承認自己犯下的罪行$none<H>	1
3.　<A>他們真的敢還原嗎？這算還原嗎？真實的比這些更殘忍！這隻是冰山一角！$這算還原嗎？//真實的比這些更殘忍！這隻是冰山一角！$none<A>	5, 8
4.　<A>呵，南京還不是能允許日本人進去參觀嗎？$南京还不是能允许日本人进去参观$none<A>	0

Table 3. The Annotation of Opinion Target

In Comment 1, what triggers an anger emotion is the behaviour of the Japanese which refers to the *killing* event (e2). Although the frame elements (1) and (5) both refer to Japanese soldiers, frame element (1) focuses on the *reveal_secret* event (*e1*), while (5) focuses on the *killing* event (*e2*). Therefore, only frame element (5) should be tagged. As for comment 2, the *happiness* emotion is elicited by the *reveal_secret* event (*e1*) done by Japanese soldier, thus, frame element (1) is tagged. Comment 3 is about the *killing* event (*e2*) as well as the *duplication* event (*e3*). The *anger* emotion is triggered by both Japanese soldier (i.e. frame element (5)) and the computer-generated animation (i.e. frame element (8)). As for Comment 4, the cause of the *anger* emotion is that Nanjing (Massacre Museum) still allows Japanese to pay a visit to. As none of the frame element is related to Nanjing, annotators should put a "0" to indicate that it is an external cause that evokes the anger emotion.

4.4.5　The Use of Rhetorical Question

Questions can roughly be classified into two types, namely information-seeking questions and rhetorical questions. The former generally aims to elicit an answer, while the latter expects no answer but to achieve a pragmatic goal, such as to emphasize, to persuade, or to show emotions. Therefore, we only annotate the rhetorical ones. For the identification of rhetorical questions, a question mark is not necessary. Once a question is identified, be it a question in a main clause or in an embedded clause, annotators should judge whether the question is seeking information or not. If it is a rhetorical question, the question should then be annotated with its question type following 14 types proposed in Lau and Lee (2018) as in Table 4.

A. Series of Questions	When more than one question appears in a single comment and that the questions are rhetorical questions, these questions should be tagged as Series of Questions.
B. A-not-A	A-not A refers to questions that form with an affirmative and its negative counterpart juxtaposed with the A-not-A pattern, such as 是不是, 有沒有
C. Alternative	Alternative questions explicitly provide two or more possible options which are mostly connected by the morpheme 還是/或者 "or"
D. Echo	Echo question refers to questions that have the form of a declarative sentence but end with a question mark in the written form.
E. Particle	Particle questions refer to questions that end with a sentence-final particle, such as 嗎, 呢, 吧
F. Others	*Others* includes questions formed with rhetorical interrogation markers, such as 難道, 豈, 何必, 何苦 etc.
G. How	如何, 怎樣, 怎麼, and 是有多
H. How many/ much	多少
I. What	什麼
J. Which	哪些, 哪個
K. Who	誰
L. Why	為什麼, 為何, 怎麼 (腫麼, 咋, 為神馬, 為嘛, 為毛, 為啥, 幹嘛)
M. Where	哪, 哪里
N. When	什麼时候

Table 4. Question Types

Some question words may belong to more than one question type as in (21)- (22).

(21) 我高考的時候怎麼沒這樣
　　'Why didn't I do this during the entrance exam for college?'
(22) 都是要做媽媽的人，怎麼忍心對孩子下手
　　'She is about to be a mother; how could she be so cruel to a child'

怎麼 in (21) expresses the meaning of *why* while it expresses the meaning of *how* in (22). Therefore, the question should be tagged based on the meaning the question word conveys.

　　If a rhetorical question contains more than one question word, annotators should choose the question type

that plays a more important role in determining the question type. Consider (23).

(23) 求死勇氣那麼大，為什麼不好好活著呢
　　'(You) show great courage to die, why don't you have courage to live well'

In (23), the question contains two question words, 為什麼 and 呢. However, the question should be annotated as a *why* question but not a *particle* question because even without the particle 呢, the question is still well-formed with the meaning of *why*.

　　In addition to the question type, annotators should also annotate the emotion(s) that the question(s) expresses.

5.　Corpus Analysis

5.1　Distribution of Explicit and Implicit Emotions

After annotation, the distribution of explicit and implicit emotions is shown as in Table 5.

	Explicit	Implicit
Happiness	511	1,728
Sadness	338	1,597
Anger	402	5,664
Fear	76	519
Surprise	30	687
Total	1,357 (11.7%)	10,195 (88.3%)

Table 5. Distribution of Explicit and Implicit Emotions

As illustrated in Table 5, the total number of explicit and implicit comments adds up to more than 10,000. This is because a single comment can be classified into both groups if the comment containing at least one emotion word or emoticon also contains other sentence(s) that connotes the same emotion simultaneously. The distribution of explicit comments and implicit comments are 11.7% and 88.3%. This validates that a considerable amount of emotions is expressed in an implicit way. Given that implicit emotions do play a significant role in emotion expressions, an in-depth analysis of implicit emotions is considered a necessary component of emotion studies that should not be neglected or overlooked.

5.2　Distribution of Pre-events and Post-events

Emotion theories developed in different fields generally agree that emotion is a cognitive state that induces bodily reactions to external events (James 1884, Cannon 1927, Plutchik 1962, Ortony et al. 1988, Harkins and Wierzbicka 2001). As such, emotion is a pivot event that interacts with its associated events, namely pre-events (i.e. emotion causes) and post-events (i.e. emotion reactions). Moreover, emotion theories generally regard emotion causes as an integral part of emotion elicitation (James 1884, Plutchik 1980, Wierzbicka 1999). These studies highlight the significance emotion causes play in an emotion expression. Therefore, we believe that the annotation of pre-event and post-event of each emotion is the first step that helps unveil the interaction between emotion causes and emotions. It can be greatly beneficial to the identification of implicit

emotion in text. The distribution of pre-events and post-events is shown as in Table 6.

	Pre-events	Post-events	Total no. of comments
Happiness	1,609 (84.9%)	850 (44.8%)	1,896
Sadness	1,549 (87.0%)	355 (19.9%)	1,780
Anger	4,726 (82.5%)	489 (8.5%)	5,729
Fear	449 (78.4%)	105 (18.3%)	573
Surprise	616 (88.1%)	80 (11.4%)	699
Total	8,949 (83.8%)	1,879 (17.6%)	10,677

Table 6. Distribution of Pre-events and Post-events

In the entire corpus, 83.8% of comments contain a pre-event while 17.6% contain a post-event. That is, people tend to mention an emotion cause that triggers a particular emotion, but not often mention how they react to an emotion. As pre-events of different emotions may have different semantic or syntactic features, the markup of pre-events offers a window for researchers to study the differences between the emotion causes of various emotions. As for post-event, comments expressing a happiness emotion are more likely to contain a post-event accounting for 44.8% of all the comments expressing happiness, followed by sadness (19.9%), fear (18.3%), and surprise (11.4%). To our great surprise, comments expressing anger are least likely to have a post-event stated in the expressions (8.5%). Although post-events are not very often expressed in text, they usually associated with a particular emotion. Thus, certain post-events give researchers a hint about which emotion is expressed.

5.3 The Use of Rhetorical Questions

Previous work suggests that rhetorical questions are a rather productive means of expressing or evoking emotions, in particular the negative ones (Roberts and Kreuz 1994; Gibbs et al. 2002; Lee 2017, Lau and Lee 2018). This claim is also supported by our corpus data as in Figure 3.
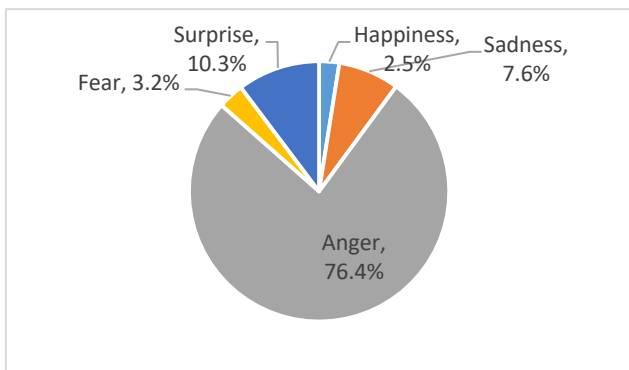

Figure 3. Emotions Expressed using Rhetorical Questions

It is observed that a lot more than a half (76.4%) of rhetorical questions express *anger*. The remaining 23.6% are used to express *surprise* (10.3%), *sadness* (7.6%), *fear* (3.2%) and *happiness* (2.5%). One may doubt whether the

strongest connection between rhetorical questions and *anger* is due to the large number of comments containing *anger*. In order to support the claim that rhetorical questions do have a tendency towards negative emotions Figure 4 illustrates the distribution of rhetorical question per emotion in all post.
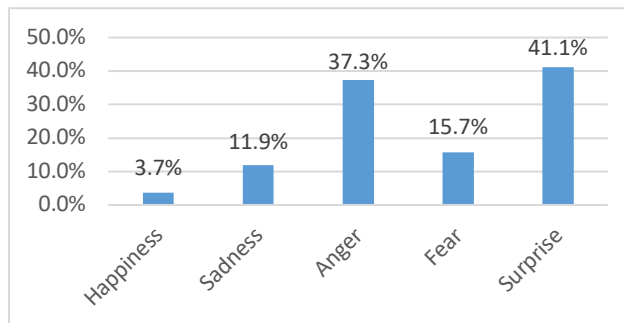

Figure 4. Distribution of Rhetorical Questions per Emotion in All comments

Figure 4 is calculated relative to the total number of comments of a given emotion type. It illustrates that rhetorical questions are rather productive in expressing emotions. Among all the five emotions, the surprise emotion has the greatest tendency (41.1%) to be expressed through rhetorical questions, followed by anger (37.3%), fear (15.7%), sadness (11.9%), and happiness (3.7%). Different from the claim proposed in previous studies that rhetorical questions are most frequently used to express negative emotions, statistics illustrate that rhetorical questions are even more tightly associated with the neutral emotion, surprise (41.1%). Therefore, rhetorical questions are not only particularly productive in evoking negative emotions such as *anger* and *fear*, but also in evoking the neutral emotion *surprise*.

6. Conclusion and Future Work

In this paper, we build a Chinese event-comment corpus which can be used to design automatic emotion detection and classification models. Aiming to explore the features of implicit emotions, this paper proposed an annotation scheme for the markup and classification of events, as well as the annotation of emotions and emotion-related information, such as the emotion, the emotion cause, the emotion reaction, the use of rhetorical question, the opinion target etc. Corpus data shows that the annotated items are of great value to the identification of implicit emotions.

In our future work, we intend to conduct an in-depth analysis of the features of explicit and implicit emotions. As for the identification of implicit emotions, we note that different items may serves as an indicator for a particular emotion. Therefore, we will attempt the uncover more linguistic devices or cues that can help with the identification of implicit emotions.

7. Acknowledgements

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