

## Survey Paper

### TexEmo- Text Based Emotion Recognition System

#### BACKGROUND

Definitions about emotion, its categories, and their influences have been an important research issue long before computers emerged, so that the emotional state of a person may be inferred under different situations. Since the concept of affective computing was proposed in 1997, the role of emotions in human computer interactions has been gradually established and today this domain attracts interdisciplinary researchers from computer science, biology, psychology, cognitive science and so on. Much work has been done to detect a person's emotion states from multimodal sources such as audio, gestures, facial expressions and eye gazes over the last decade. While multimodal interactions with computers have shown to be appealing, the most common way for people to interact with computer systems is via texts. As a new trend emerges on the web world, more and more people have blogs to share their feelings with unspecified public. Though sharing pictures and videos has becoming popular, texts and blog articles still stand as an important role for expressing emotions.

Text based emotion recognition has still not received much attention as it should have. The little work done in this area requires a lot of improvements. Better understanding about newly evolved vocabularies, incorporation of psychological theories to infer emotion behind texts, utilization of contextual knowledge and developing more advanced emotion detection methods that allow more categories of emotions and inference.

#### LITERATURE SURVEY

Text based emotion recognition can be classified into 3 types based on information retrieval:

- Keyword based detection: Emotions are detected based on the related set(s) of keywords found in the input text.
- Learning based detection: Emotions are detected based on previous training result with respect to specific statistic learning methods.
- Hybrid detection: Emotions are detected based on the combination of detected keyword, learned patterns, and other supplementary information.

Keyword-based emotion detection methods have three limitations described below:

### 1) Ambiguity in Keyword Definitions

Though using emotion keywords is a straightforward way to detect associated emotions, the meanings of keywords could be multiple and vague. Except those words standing for emotion labels themselves, most words could change their meanings according to different usages and contexts, and it is just not feasible to include all possible combinations into the set EL. Moreover, even the minimum set of emotion labels (without all their synonyms) could have different emotions in some extreme cases such as ironic or cynical sentences.

### 2) Incapability of Recognizing Sentences without Keywords

Keyword-based approach is totally based on the set of emotion keywords. Therefore, sentences without any keywords would imply they do not contain any emotions at all, which is obviously wrong. For example, “I passed my qualify exam today” and “Hooray! I passed my qualify exam today” should imply the same emotion (joy), but the former without “hooray” could remain undetected if “hooray” is the only keyword to detect this emotion.

### 3) Lack of Linguistic Information

Syntax structures and semantics also have influences on expressed emotions. For example, “I laughed at him” and “He laughed at me” would suggest different emotions from the first person’s perspective. As a result, ignoring linguistic information also poses a problem to keyword-based methods.

In summary, keyword-based methods should also detect not only the existence of keywords, but also their linguistic information to detect emotions more accurately.

Unlike keyword-based detection methods, learning-based methods try to detect emotions based on a previously trained classifier, which apply various theories of machine learning such as support vector machines and conditional random fields to determine which emotion category should the input text belongs. However, comparing the satisfactory results in multimodal emotion detection, the results of detection from texts drop considerably. The reasons are addressed below:

### 1) Difficulties in Determining Emotion Indicators

The first problem is, though learning-based methods can automatically determine the probabilities between features and emotions, learning-based methods still need keywords, but just in the form of features. The most intuitive features may be emoticons, which can be seen as author’s emotion annotations in the texts. The cascading problems would be the same as those in keyword-based methods.

### 2) Over-simplified Emotion Categories

Nevertheless, lacking of efficient features other than emotion keywords, most learning-based methods can only classify sentences into two categories, which are positive and negative. Although the number of emotion labels depends on the emotion model applied, we would expect to refine more categories in practical systems.

Since keyword-based methods with thesaurus and naïve learning-based methods could not acquire satisfactory results, some systems use a hybrid approach by combining both or adding different components, which help to improve accuracy and refine the categories. The most significant hybrid system so far is the work of Wu, Chuang and Lin <sup>[1]</sup> which utilizes a rule-based approach to extract semantics related to specific emotions, and Chinese lexicon ontology to extract attributes. These semantics and attributes are then associated with emotions in the form of emotion association rules. As a result, these emotion association rules, replacing original emotion keywords, serve as the training features of their learning module based on separable mixture models. Their method outperforms previous approaches, but categories of emotions are still limited. Also, rule based approaches are not scalable in nature. Any language has infinite grammatical rules. Certain rules will be apt for only specific sentences.

Hence the approach proposed in [1] poses a number of limitations:

1. Categories of emotions studied are limited.
2. Rule based approach will produce satisfactory results for only a specific dataset.
3. It does not take into account newly evolved vocabularies.

Researchers have used techniques such as keyword spotting, assigning probabilistic affinities to various emotions, use of learning based methods and knowledge based artificial neural networks <sup>[2]</sup>, rule based system to extract semantics related to specific emotions <sup>[3]</sup>, detecting emotions based on the cause triggering them <sup>[4]</sup> and development of situational personalized emotion model <sup>[5]</sup>. However, all the present researches do not take into account explicit emotions and analyze only a specific part of the psychological reason that leads to emotion in texts.

In [2], the authors have explained a number of approaches that can be adopted to detect emotion from text. In addition to that they have described an algorithm that can be used for the same purpose in which scores are calculated for emotion words by considering their frequency and ontology depth. Though the ontology depth explores specific emotions but the frequency of occurrence of a specific word cannot define the emotion expressed by that word as in each occurrence of the word the context and the helping words around it may express a different form of emotion.

In [4], the authors have again developed a rule based system which finds out the cause in order to detect emotions. As said previously, a rule based system will produce satisfactory results for only a specific corpus.

The system proposed in [5] takes care of sentences which do not consist of an emotion keyword as it is a situation based model, however it does not take care of a lot of other important requirements. It does not take into account complex

sentences, embedded sentences, substitutes, irony, omission, ambiguity and a number of remained natural language processing issues.

In [6], the authors explore the field of sentiment analysis. According to them domain-specific corpus gives better results than working on the domain-independent corpus. There is still lack of research in the field of domain-specific SA which is sometimes called context-based SA. This is because building the domain-specific corpus is more complicated than using the domain-independent one

## **SUMMARY**

Much research has been done over the past several years, utilizing linguistics, machine learning, information retrieval, and other theories to detect emotions. Their experiments show that, computers can distinguish emotions from texts like humans, although in a coarse way. However, all methods have certain limitations, as described above. In our work we will try to overcome all these limitations and also explore other methods such as use of topic distribution model (LDA). Also, we will employ the use of vector semantic analysis using word2vec tool [7]. The availability of a dataset has also posed a lot of problems to previous other researches as well. The closest field related to our research is sentiment analysis. Though, sentiment analysis is attracting a lot of researchers, but there is lack of benchmark data sets in this field as well. We will prepare a dataset of our own which will be crowd-sourced. We will make the general public classify different types of sentences into various emotions. This will help us to also consider the human psychology which is a huge factor in determining the emotion expressed.

## **REFERENCES**

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