A Hybrid Model for Emotion Detection from Text

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ABSTRACT

Emotions can be judged by a combination of cues such as speech facial expressions and actions. Emotions are also articulated by text. This paper shows a new hybrid model for detecting emotion from text which depends on ontology with keywords semantic similarity. The text labelled with one of the six basic Ekman emotion categories. The main idea is to extract ontology from input sentences and match it with the ontology base which created from simple ontologies and the emotion of each ontology. The ontology extracted from the input sentence by using a triplet (subject, predicate, and object) extraction algorithm, then the ontology matching process is applied with the ontology base. After that the emotion of the input sentence is the emotion of the ontology which it matches with the highest score of matching. If the extracted ontology doesn’t match with any ontology from the ontology base, then the keyword semantic similarity approach used. The suggested approach depends on the meaning of each sentence, the syntax and semantic analysis of the context.

KEYWORDS

Emotion Detection, Ontology Extraction, Ontology Matching, Ontology, Semantic Similarity, Text Mining, Word Sense Disambiguation, WordNet

INTRODUCTION

Natural Language Processing (NLP) techniques have long been applied to automatically identify the information content in text. Applications such as topic-based text categorization, summarization, question-answering systems, and information retrieval systems typically focus on the information contained in text. This work is an endeavour to apply NLP techniques to identify emotions expressed in text which is a very important area of text mining and human-computer interaction.

Being able to detect emotion text has many advantages. One of the proposed applications is the capability to gather the overall emotion of a specific text. If the computer could tell a person’s emotional state, it would be able to switch to an accommodating form of interaction. So detecting the emotion in text can increase human-computer interaction. Other useful tools that can benefit from emotion recognition from text include recommender systems that aim to personalize recommendations based on the user’s emotions. Consider also an emotion-based search engine that ranks documents according to the emotion requested by the user. Such an engine could prove to be very beneficial to users in and can improve the effectiveness of the information retrieval process.

Detecting emotional state of a person by analyzing a text document written by him/her appear challenging but also essential many times due to the fact that most of the times textual expressions are not only direct using emotion words but also result from the interpretation of the meaning of
concepts and interaction of concepts which are described in the text document. The main objective of this research is to propose a new approach which depends on ontology to recognize emotions from text to eliminate the current limitations.

This paper is structured as follows. The second section presents our proposed method. The third section is a case study. The fourth section discusses our results. The fifth section is a conclusion.

RELATED WORK

Currently there are three approaches dominating the emotion detection task; keyword based, learning based and hybrid based approach.

The limitations of current emotion detection approaches from text are: ambiguity in keyword definitions, incapability of recognizing sentences without keywords, lack of linguistic information, difficulties in determining emotion indicators, and over-simplified emotion categories. These limitations lead to an open problem in emotion detection from text.

Keyword Based Approach

This approach depends on the presence of keywords and involves pre-processing with a parser and emotion dictionary. It is easy to implement and straightforward since it involves identifying words to search for in text.

This approach has been applied in chat systems by (Chunling, Prendinger, & Ishizuka, 2005). Their chat system displays emotion using an avatar. It is also applied by (Hancock, Landrigan, & Silver, 2007). They introduce a laboratory controlled online chat experiment to enact sadness and happiness and reporting strategies that people employ to express emotions in text. (Li, Pang, & Guo, 2007) also applied this approach. They introduce the emotion detection incorporating personality factor in chatting system to improve accuracy.

Learning Based Approach

Learning based approach can be divided into supervised and unsupervised learning (Jain & Sandh, 2015).

Supervised Learning

This approach uses a trained classifier for emotion detection task by using keywords as features. The supervised learning algorithm analyses the training data and infers a function. A labelled corpus is a large and structured set of text that it is necessary annotated with emotional tags. The annotation process becomes a tedious and time-consuming task, so it considered as one of their most important disadvantages.

(Hasan, Agu, & Rundensteiner, 2014; Wang et al., 2012; Roberts et al., 2012; Suttles, & Ide, 2013) are proposals that are related with emotion detection in twitter messages, where the training examples are automatically labelled through hashtags and emoticons contained. Moreover, (Hasan, Agu, & Rundensteiner, 2014) confirms that hashtags are indeed good emotion labels.

Concerning works that apply supervised learning algorithms, both the categorical and the dimensional approaches can be found to base their emotional models.

Supervised Learning with Categorical Emotion Model

Categorical approaches are the most commonly used in emotion detection. One of the works based on this model is introduced by (Yang, Lin, & Chen, 2007). They introduced an emotion classification method from training at sentence level and applying at document level with sentence level contextual). Z. Teng, F. Ren, and S. Kuroiwa presented a recognition of Emotion method with SVMs (support vector machine) (Teng, Ren, & Kuroiwa, 2006). Strapparava, C., & Mihalcea, R applied Naïve Bayes classifier trained on the blog entries from LiveJournal.com. They used a collection of blogposts
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