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A web-based tool for Arabic sentiment analysis

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Abstract

Sentiment analysis can help analyse trending topics such as political crises and predict it before it occurs. Yet, analysing sentiments in Arabic texts has not been explored much in the extant literature. In this paper, we present a new tool that applies sentiment analysis to Arabic text tweets using a combination of parameters. Those parameters are (1) the time of the tweets, (2) preprocessing methods like stemming and retweets, (3) n-grams features, (4) lexicon-based methods, and (5) machine-learning methods. Users can select a topic and set their desired parameters. The model detects the polarity (negative, positive, both, and neutral) of the topic from the recent related tweets and display the results. The tool is trained with 8000 randomly selected and evenly-labelled Arabic tweets. Our experiments show that the Naive Bayes machine-learning approach is the most accurate in predicting topic polarity. The tool is useful for intermediate and expert users and can help guide them in choosing the best combinations of parameters for sentiment analysis.

Keywords: Arabic Sentiment Analysis, Web-based Tool, Arabic Opinion Mining

1. Introduction

The social media platform Twitter contains rich and important information. It is often used by its users as an outlet to express sentiment. Indeed, Jansen et al. [19] identified Twitter as an online word-of-mouth branding due to the vast amount of opinions. Twitter is multi-domain and contains a broad set of topics including: politics, education, and products. One way to analyse the large amount of opinions in Twitter is to apply sentiment analysis to it. Sentiment analysis is an application of natural language processing, computational linguistics and text analytics that classifies text into polarity (i.e., positive, negative, neutral) and emotion (e.g., angry sad, happy).

Sentiment analysis is dependent on the language of the text, as the sentiment analysis models will be trained using text from the same language. Moreover, some words could infer a certain polarity in one culture and a different one in

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another. For example, the word white (i.e., as in colour) in Eastern Asian cultures represents death which is associated with a negative polarity, however in Western cultures it usually represents peace and weddings which is a positive polarity [9].

Research in sentiment analysis for Arabic language is limited and most of the previous research has been focused on English. Arabic contains linguistic features that are opposing to the English language. The structures and grammar of the language differ in the two languages. Arabic is a complicated language and includes several different dialects including: Egyptian, Moroccan, Levantine, Iraqi, Gulf, and Yemeni [12].

In this paper, we create a tool for Arabic sentiment analysis. This tool allows users to apply sentiment analysis to an given topic. It will allow users to select parameters including the time of the tweets, preprocessing, features and machine learning techniques. This tool can educate users in choosing the best combinations of sentiment analysis parameters for a given topic.

Related research about Arabic sentiment analysis is presented in section 2. The dataset used to train the sentiment analysis models is outlined in section 3. The Arabic sentiment analysis tool is presented in section 4, followed by the experiments and results in section 5. Lastly, we discuss our findings in section 6 and future work in section 7.

2. Related Research

Web based tools in sentiment analysis can serve many purposes. One study by Al-Subaihin [5] created a web-based tool that allow users to determine the polarity of Arabic words as a game. This is useful for researchers to create a lexicon. Existing research that explored Arabic sentiment analysis is limited to a few studies, specifically when applied on Twitter. Related research includes: Shoukry and Rafea [26], Duwairi [14], Al-Ayyoub et al. [3] and Al-Kabi et al. [4]. These will be discussed in detail in the following paragraphs.

Arabic sentiment analysis has been explored on a sentence-level basis [26]. Two human annotators labelled tweets based on their polarity. They found that 500 of the tweets were positive and 500 were negative. Different preprocessing methods were used including: removing user-names, pictures, hashtags, URLs and non Arabic words. They experimented with two features: unigrams and bigrams and two classifiers: SVM and Naive Bayes. Two experiments were implemented: one which included removing the stop words and one without removing them. Removing stop words led to slight improvement in the performance. This suggests that stop words are valuable to the sentiment or that other stop words needed to be removed. The results show that SVM led to a greater performance than NB giving a 4-6% increase in accuracy. The best model was SVM with unigrams, which accuracy was 72%.

Different Arabic dialects were explored recently in sentiment analysis research [14]. The dataset used was 22550 tweets which included: positive-8529, negative-7021 and neutral-7000. Twitter API was used to collect the data and the Crowdsourcing Tool was used to label it. The preprocessing methods used included: tokenization, removing stop words (not including negation), and converting emoticons to their corresponding words. They applied two experiments using two datasets, one which consisted of the tweets without removal of dialectical words. In the other dataset, they replaced dialectical words with their corresponding Modern Standard Arabic words. The classifiers included Naive Bayes (NB) and SVM classifiers. Their results show that NB was the best classifier for their application leading to a F-score of 88% with dialect lexicon and 84% without it. SVM F-score was second best achieving a 87% accuracy with dialect lexicon and 84% without it.

An example of a study that applied lexicon based sentiment analysis on tweets is Al-Ayyoub et al. [3]. They created a lexicon with 120 thousand Arabic words. This included a previous lexicon created by Abuaiadh [1]. They analysed Arabic news opinions from various websites including Twitter. Distinct Arabic stems were extracted, translated, and then searched for in the lexicon. They used 300 tweets for each positive, negative and neutral classes as training data. The preprocessing methods included: removing repetition of vowels, fixing spelling mistakes, fixing mistakes caused by sound similarities. Two experiments were implemented: 1) lexicon-based sentiment analysis using the lexicon they created; 2) keyword-based approach, selecting the most frequent words in the tweet. Consequently, their results revealed that the lexicon-based approach led to the highest performance with an accuracy of 87%.

An Arabic sentiment analysis tool was developed by Al-Kabi et al. [4]. For training data, they used 1,080 Arabic reviews from social media and news sites. They used preprocessing methods including removing the transliterated Arabic words like momtaz (i.e. meaning excellent in English) and Arabizi (Arabic chat alphabet). Punctuation and