

Humor detection in short English phrases using NLP

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Abstract—The present document describes a project of a Subject Data Science in the masters degree of computer Science Engineering. In this paper, a research about humor detection is carried out, the methodological steps are described and a case of study and a dataset are presented. The objective is to develop an strategy for humor detection and assess its potential in a database of short texts in English Language. For this purpose, several machine learning techniques and methods from the literature like transformers, decision trees and neural networks are considered and some will be applied in the actual data. A discussion about the advantages and problems and possible improvements of our strategy for humor detection will be developed throughout the semester and the principal conclusions and found difficulties will be pointed out in further submits of this document.

1. Introduction

Humor is a daily concept for a lot of people, it provokes laughter and happiness, and yet it remains a complex matter, some researchers found that humor leads to enhance the human's health and mood [1]. Humor is an illustrative example of how humans use creative language devices in social communication. Humor not only serves to interchange information or share implicit meaning, but also engages a relationship between those exposed to the funny message. Besides, humor is also a distinctive quality of humans, which is considered a figurative language; where the person can express his feelings through social media once entertainment media have existed or if he faces a funny event. It is important to mention that there is no objective consensus of what humor is and what defines a funny person, thing or even sentence. Nevertheless, the fact of analysing the aspects of the language that evokes humor is essential for understanding the conditions and thoughts of people. Automatic humor detection in texts has interesting use cases in building human-centered artificial intelligence systems such as chatbots and virtual assistants. There are a lot of possible applications of this kind of development, for instance to identify whether an input text should be taken seriously or not, which is a critical step to understand real

motive of users' queries, return appropriate answers, and enhance the overall experience of user with the system. There are also interesting applications can be addressed in a short and middle time future like emulates humor and sarcasm in IA devices.

1.1. Main goal

Further discover and learning in Natural language processing techniques and creating a methodology for applying machine learning models capable of detecting whether a sentence is humorous or not and apply it to our chosen dataset.

1.2. Scope

We want to take into account the methodologies in the literature for detecting humor and then be able to run and test a model with good properties. The chosen/designed model will be trained with short texts in English language and tested in a fraction (*test set*) of the dataset. We expect to be able to apply the trained model to other data sets and see how its performance varies by setting different conditions and compared with different criteria.

2. Literature review

2.1. Methodology

This topic was planned, conducted and documented using the Systematic Literature Review (SLR) process, that was proposed by [2]. The SLR includes some stages: research questions, search process, inclusion and exclusion criteria, quality assessment, data collection and data analysis.

In the next paragraphs each stage will be explained:

2.1.1. Research questions. In this stage the research questions that addressed this project were defined:

- 1) What are the main characteristics in texts that let support the humor detection?

- 2) Which natural language processing techniques have been used to detect humor in texts?
- 3) Which case study of humor detection would use as reference in this project?

2.1.2. Search process. The answers to the research questions must be investigated in the scientific literature through a search process. In order to focus the search, in this stage is necessary to define a search equation and specific bibliographic sources.

Search equation: The terms "natural language processing", "humor", "feelings", "detection", "computation" were selected to build the equation. In order to limit the search was selected the language *English* and the publication year *after 2015*. So the search equation was defined as:

(TITLE-ABS-KEY (natural AND language AND processing AND (humor OR feelings) AND (detection OR computation)) AND LANGUAGE (English)) AND PUBYEAR > 2015

Source of information: The primary searches where based upon the *Scopus-Elsevier*, the *IEEE Xplore* and the *Google Scholar* bibliographic resources.

2.1.3. Inclusion and exclusion criteria. Using the last search equation in the selected databases resulted in 110 candidates for relevant papers. Considering that many papers do not provide useful information to address the research questions, it's paramount to select the most convenient papers. The following inclusion and exclusion criteria which refined the selection was implemented:

Inclusion criteria:

- The publication must have a complete literature review or detailed explanation about techniques of humor detection or a comparative study with tables/figures.
- The most complete publication will be included in case of similar or redundant studies.

Exclusion criteria:

- Informal papers will be excluded.

After this state, there are 33 studies selected.

2.1.4. Quality assessment. The strategy for quality assessment is leading by the following questions:

- 1) The literature review is consistent and is based in a good bibliography?
- 2) If the document has more than one year: Has been cited?

2.1.5. Data collection. Finally, the papers were collected and selected according to the before aspects and in this stage there are 16 studies selected.

2.1.6. Data analysis. Some figures are elaborated about the data that were collected using SLR. In the first term, in the Figure 1 from *Scopus-Elsevier* a progressive increase in scientific interest is shown from the initial year of the search to the present.

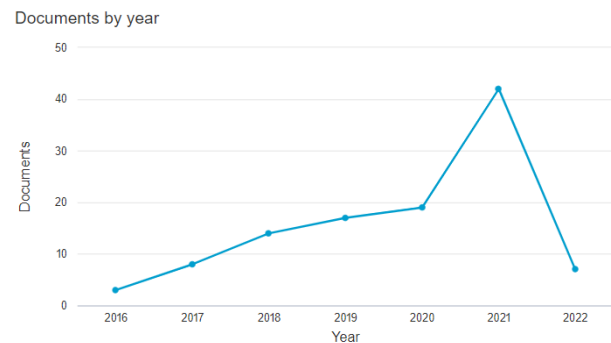


Figure 1. Scientific interest: Papers by year

A keyword analysis performed using VOSViewer shows in the Figure 2 draw the co-occurrence of words in the documents found. It's possible identify two clusters (in different color: red and green), the first one is close to natural language, semantic and ontology, and the second one, more recent that refers to artificial intelligence: machine learning and deep learning.

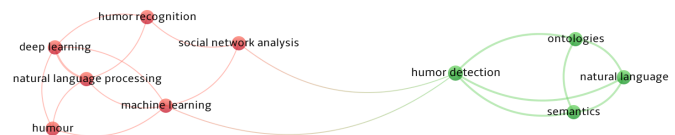


Figure 2. Co-occurrences of keywords in papers

2.2. Basic concepts

Humor is a essential element of all verbal communications and it may be described as "a cognitive experience to provoke laughter and provide amusement" [3]. Understanding humorous language is a easy task for humans, however, classification of humor is a challenge in the real life, because the sense of humor varies from person to person.

Classification of Humor detection is a task in which we distinguish between humorous and non-humorous instances. However it's important to note that the researchers have identified many different theories of humour and also, many different types of humour such as [4] :

- **Sarcasm**, that may be described as an ironic or ambivalent way to convey mockery.
- **Pun**, humour is created using wordplay and ambiguity.
- **Irony**, is a rhetoric literary artifact that expresses the opposite in meaning of what is conveyed via language to create humour.
- **Exaggeration**, It is a way of expressing something in proportions ridiculously exceeding the actual range of that entity affecting amusement .

Researching in humor detection is an important task to improve the human- machine interaction. One of the main researches on it was developed by a branch of artificial Intelligence known as *Natural Language Processing* (NLP): *"is an area of research and application that explores how computers can be used to understand and manipulate natural language text or speech to do useful things"* [5].

2.3. Background

One of the first humor detection models was proposed by [6], they used support vector machines ¹ to separate one-liners from other types of texts . Other implementation was developed by [7], one of the best characteristics was the building of a dataset using laughter markers from TED talks as cues to determine which parts lead up to a punchline, and which do not, and then trained multimodal neural networks improving the humor detection accuracy. Actually, one of most impressive models in terms of out-performance are the BERT-like (which stands for Bidirectional Encoder Representations from Transformers) models proposed by [9] that had an accuracy close to 98 percent.

3. Case of Study

Having consulted diverse sources, we find a challenge associated to a dataset about humor detection that we will describe in detail in the next section. The quest can be found in the following site: <https://paperswithcode.com/sota/humor-detection-on-200k-short-texts-for-humor-1> . Multiple papers propose different methods to solve this problem. So one of the approaches taken in the literature is our case of study of the present document [9], the winner of that challenge, or at least the paper whose model's score metric (F1)² was higher (over 0.982). It employs an approach uses BERT model [8] to encode text into a few sentence embeddings which enter into an eight-layered neural network. On the other hand, the final layers of the network combine the output of all previous lines of hidden layers in order to predict the final output. In theory, these final layers should determine the congruity of sentences and

1. are supervised learning models with associated learning algorithms that analyze data for classification and regression analysis. Developed at AT&T Bell Laboratories by Vladimir Vapnik with colleagues in the 90's.

2. The F1 score is a machine learning metric that can be used in classification models, it can be defined as the harmonic mean of precision and recall.

detect the transformation of reader's viewpoint after reading the punchline. There are similar papers that use BERT model to humor detection task as we can see in [10] but in this case Reddit Data is used.

4. Data Set

Our principal dataset for this work is the same that is proposed in the aforementioned case of Study paper and it is available on: <https://www.kaggle.com/datasets/deepcontractor/200k-short-texts-for-humor-detection>. It is a single file called "dataset.csv" of about 15MB, it has two columns: "text" and "humor". The former one is where the phrases potentially containing humour are, so its type is "string", on the contrary the latter is a boolean Column (where the possible values are "True" or "False"), indicating for each row if the sentence present in the **text** variable is humorous. In total there are 200.000 rows without repeated values. A mayor detail is that exactly 50% of the entries have True and the other half have False. A figure with an example of some entries of the dataset will be presented next:

Text	Humor
Why do native americans hate it when it rains in April? because it brings mayflowers	True
Obama's climate change legacy is impressive imperfect and vulnerable	False
My family tree is a cactus we're all pricks	True
Donald trump has found something mysterious for rudy giuliani to do	False

TABLE 1. EXAMPLE ENTRIES OF THE DATASET

We intend to use a similar BERT model and test it on this dataset and probably it will exhibit reasonably good performance. Besides, one could consider also other Machine Learning architectures or mixed methods as in [11]. In addition, we could try our model in another dataset with similar characteristics, such as the ones available here: <https://github.com/orionw/RedditHumorDetection> and determine how much our model can generalize its results to a completely new data.

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