NLP Applications as Cloud Based Services in Understanding Human Emotions

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Abstract: This paper aims to throw light on the purpose of natural language processing applications and their future scope as cloud based services. It highlights certain features of cloud, along with a unique model of cloud hosted natural language processing application concept, to make the most out of emotional expressions in a person's text or speech, which will prove effective to tackle diminishing human emotional interaction.

Keywords: Artificial intelligence, Cloud, IaaS, NLP, PaaS, SaaS.

1. Introduction

Natural Language Processing or NLP is basically the simulation of the human ability to interact with the help of language. In other words, giving an artificial intelligence the ability to understand human language and put it to meaningful use. NLP maybe divided broadly into two aspects, one being the understanding of the language and the other being the generation.

The introduction of cloud has significantly tackled the limitations of physical servers, like high cost, tedious troubleshooting and underutilization of servers in low traffic scenarios. It basically connected data hubs in a network, while giving the user the control for its management. Cloud has made it possible for users to host and manage their applications remotely from one place while using an infrastructure located at some other place.

Due to the fact that cloud has made it easier to manage all resources required for an application, making NLP services available for use by individuals connected to the internet has become significantly easier as well. Using artificial intelligence to understand human language and the ability to extract the mood and emotion expressed through a language is one aspect of NLP. This aspect can be utilized in a significant manner to understand an individual personally and aid him in his difficulties and challenges. This can be developed into a cloud based service as discussed in subsequent sections of this paper.

2. The Progress of NLP

A. Fields in which NLP has found its application

From the most obvious fields of computer vision, robotics and sentiment analysis to the not so obvious field of health care assistance, NLP has found its way in almost every sector, as a helping hand in order to improve accuracy and speed of execution of the task at hand [1].

Recent advancements in deep learning algorithms used in design of NLP models has resulted in the models to drastically outperform the human abilities to cope with similar tasks [2].

B. Influence of NLP in the industrial sector

NLP models have had a great impact on the industrial sector. Virtual assistants in automotives, automated determination of worthiness of individuals for credits in the financial sector, virtual educational aids and a lot more models in which NLP is the driving force [1] proves its importance.

3. The Components of NLP

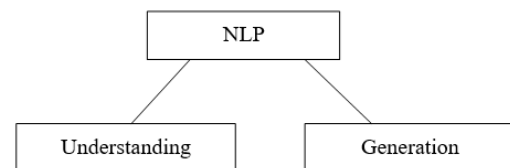Natural Language processing can be broadly categorized into two components, understanding and generation.

Fig. 1. NLP Components

Understanding refers to the breaking down of the language to simpler parts in order to extract meaningful information by rigorous analysis of the broken down bits.

Generation on the other hand, refers to the process of generation of the language as response by the intelligent system. For a successful interaction between humans and the intelligent model, two-way communication is important and both understanding and generation make it possible.

4. Impact of Cloud

Cloud has had a significant impact on the way data is handled. Cloud is basically a culmination of networks. All infrastructures can be handled by the cloud service provider and the user can direct his focus only to the working of his application or model that is deployed in cloud. Most importantly, cloud has made it possible to manage traffic dynamically, and hence has eliminated resource underutilization or overutilization, which existed in case of physical servers [3].

Cloud services can be of three different types,

A. Infrastructure as a Service (IaaS)

This is the type of service, in which the complete underlying infrastructure is managed by the user of the cloud service. This is very advantageous from an organizational point of view. Infrastructural elements, from servers to storage units can be managed and hence, eliminates need of office hardware.

B. Platform as a Service (PaaS)

In this service category, the infrastructural framework is handled by the provider of the service and the users can deploy and manage their applications by using those resources.

C. Software as a Service (SaaS)

In this case, the software or application is deployed by the service provider and is available for use by different business organizations as per their requirement. The maintenance of the software will be handled by the service provider.

5. Developments in the Field of NLP as Cloud Service

A. Conversational bots for customer engagement

This cloud based service provides chatting bots for interaction with clients visiting business websites. Engaging customers can be automated when it comes to restaurants or other such business houses, with the use of these NLP bots [4].

B. Spam detection in product reviews

This cloud based service has made it possible to detect the legitimacy of customer reviews on online products or services and hence serves as an important tool of NLP to help the customer make the right choice online [5].

C. NLP for generating quick summaries

Services for generating quick summaries out of long passages or articles are common in use and are very useful when it comes to people needing an overall gist of some material, especially to get a quick idea of the content. NLP becomes useful in such cases.

6. Problem Statement

The modern hectic world has made it difficult for individuals to engage at a level, in which they can share their emotional views and challenges with each other. The emotional aspect of the human mind is given the least importance nowadays, because people are occupied with their professional issues. As a result of such ignorance, most people refrain from discussing their emotional challenges and end up neglecting them. This subsequently causes the emotional stress to pile up and can result in various adverse effects, some of them being drug addiction, alcohol addiction, depression and even suicidal tendencies. This signifies the need and importance of existence of some platform, in which this emotional interaction of people can be made possible.

7. The Solution

With the progress of NLP, analyzing human language from different aspects has become possible. One such aspect is the emotional aspect. The solution to the problem described in the previous section lies in developing a unique conversational assistant hosted as a cloud service. The assistant will basically be the emotional interactive friend of the user, which will also aim in analyzing specific parts of speech to intelligently detect any kind of trauma or emotional challenge being faced by the user. The user may not reveal such things directly, but the assistant will still be able to detect emotional problems based on initial training through relevant algorithms, analyzing datasets based on input by mental health experts.

8. Detailed Description of Proposed Model

The NLP model proposed will act like a living personal diary of the user. The user may use it to express his/her daily personal events or occasional special events and the model will respond accordingly. The model will be designed to initially learn the behavioral characteristics of the user, in order to establish a proper understanding of the individual. It will respond to casual queries while simultaneously analyzing sentiments and emotional elements of the user's speech or text. The responses of the model will be based on a continuous process of analysis of conversations, to aid the user in the best way possible, for instance,

1. Customizing responses to uplift mood of user, in case his texts seem to depict dejection.
2. Coming up with trending news suggestions based on user's interest, as for example, a football match score for a football fan.
3. Sharing feelings on user's personal experiences in a positive way.
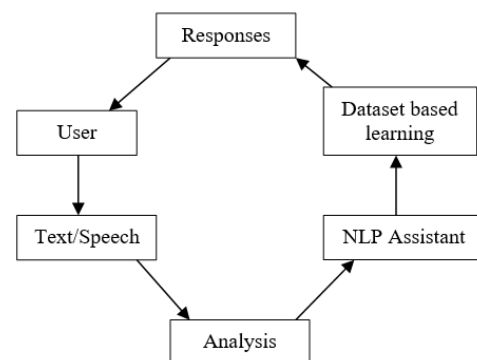4. Connecting with the user from the perspective of a mental health expert.

Fig. 2. Cycle of working of proposed model

A. Relevant dataset contents

The dataset for training of the NLP model should comprise of 2 main aspects,

1. Data for understanding and generating natural language for the conversational part.

2. Data for gaining the ability to detect specific texts or speech for possible emotional breakdown.

B. Relevant resources for design of model

1) Multinomial Naïve Bayes algorithm

This algorithm is effective in classification of text. It follows a simple probabilistic approach to determine whether a text segment belongs to one category or other. This algorithm also can be used to train the model to analyze sentiments in text, by classifying words based on positivity and negativity. Hence, Naïve Bayes algorithm will prove effective in the implementation of the proposed model [6].

2) Language of Development

Python is the most effective language for development of NLP applications, especially when it comes to Naïve Bayes based text classification, primarily due to the availability of inbuilt libraries supporting the functioning of this algorithm and also the training of the NLP model.

3) Cloud Platform

Many cloud service provider platforms are available today for hosting NLP services. A PaaS cloud service provider, will prove effective in the case of this model. The model will be deployed in the cloud platform and maybe accessible by any user with access to the internet. The user may create his own profile and personalize his experience with the model to suit his needs.

9. Conclusion

Natural Language Processing has proven to play a pivotal role when it comes to bridging the gap of understanding between artificial and human intelligence. Using the flexibility and hardware independence features of cloud, NLP can accomplish a wide range of goals in utilizing artificial intelligence for the greater good.

This model will definitely prove to be significantly effective in bringing back the emotional and sentimental conversations at the personal level and also help in tackling mental health issues. The model's availability as one open cloud service will make it more accessible for the general people surfing the internet, which happens to be the primary crowd for such applications.

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