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Emotion Detector and Counsellor Chatbox

Lingamgunta Nikhilesh

School of Computer Science and Engineering (SCOPE), Vellore Institute of Technology, Chennai, India
lnikhilesh1705[at]gmail.com

Abstract: ***This paper comprises of an overview of the working of the project as well as the theories used in the successful running of it. The user will engage with a virtual human created using basic neural network learning and word vector (NLP Technique). Using Cognitive Behavioral Therapy, the virtual human will advise the user and offer simple methods to improve the user's daily life. This code also features a popular sentiment analysis algorithm. Sentiment Analysis is the study of the subjective states of the text supplied combining natural language processing, text analysis, and computational linguistics. Using datasets freely available online, we can train models and then use Sentiment Analysis to find out if the user's response is positive, neutral or negative, and thus decide the virtual therapist's responses. Looking in to Cognitive Behavioral Theory. CBT (cognitive behavioral therapy) is a kind of psychotherapy in which negative thinking patterns about oneself and the environment are addressed in order to change undesirable behaviors or cure mood disorders like depression. Using transcripts of therapy sessions, we can build the virtual human so that it can provide effective counselling.***

Keywords: Cognitive behavioral therapy (CBT), Sentimental Analysis, word vector, neural network

1. Introduction

Cyber bullying, also known as cyber harassment, is a type of bullying or harassment that occurs via the use of internet means. Online bullying includes cyber bullying and cyber harassment. It has gotten more widespread, particularly among teenagers, as the digital environment has grown and technology has evolved. Cyber bullying occurs when someone, usually a teenager, bullies or harasses others on the internet and other digital environments, notably social networking platforms. Posting rumor's, threats, sexual remarks, a victim's personal information, or derogatory labels are all examples of harmful bullying conduct. Bullying and harassment can be characterized by repetitive action and a malicious intent. Cyberbullying victims may feel low self - esteem, increased suicidal ideation, and a number of negative emotions such as fear, despair, fury, or sadness.

When something bothers a teen, he or she is unlikely to confide in their parents.

Reason #1 – They don't want to stress you out. Teens can be incredibly intuitive, even when they don't appeared to be paying attention, and realize when you've reached your limit. They don't want to burden you with anything else, so they keep things within or act them out in destructive ways.

Reason #2 – They don't want you to fix it. When your child was in elementary school, maybe it was okay for you to talk to their teacher or friend's parent. Now that they're in high school, no way! Not only do they think you can't fix it, but they don't want you fighting their battles

Reason #3 – They do not want you to become enraged. Teens are aware of the kind of behavior you would not allow, and they do not want to be the ones to inform you that they have done something you will not like or agree with.

Reason #4 – You're not going to get it. That is the universal chasm between parents and their children. You might recall feeling the same way about your parents.

2. Related Works

a) Sentiment Analysis

Sentiment Analysis helps in automatically translating unstructured information of public opinions about products, services, brands, politics, or any other issue on which people can express their ideas. This data can be used for a range of business purposes, such marketing analysis, public relations, product reviews, net promoter scoring, product feedback, and customer service.

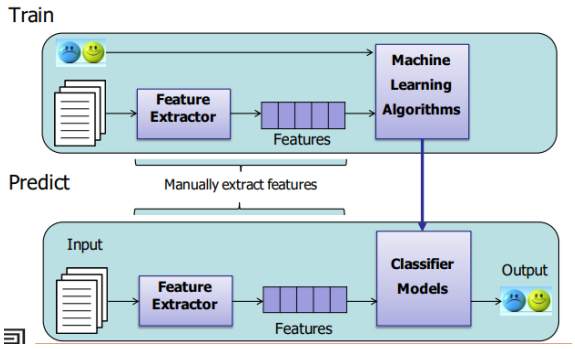

Figure 1: Machine Learning Background

b) Cognitive Behavioral Theory

Cognitive behavioral therapy focuses on modifying automatic negative thinking that can exacerbate emotional problems, sadness, and anxiety. These irrational negative ideas have a negative impact on one's mood. CBT identifies these thoughts, challenges them, and replaces them with more objective, realistic ones. According to multimodal treatment, psychological difficulties must be addressed through seven distinct but interrelated modalities: behavior, affect, sensation, imagery, cognition, interpersonal variables, and drug/biological considerations.

Cognitive behavioral therapy can be done one - on - one or in groups with family members or others who are dealing

with similar challenges. There are online services that can help you participate in CBT, especially if you reside in a region with limited local mental health resources.

CBT includes:

- Learning about your mental health condition
- Learning and practicing techniques such as relaxation, coping, resilience, stress management and assertiveness.

The purpose of cognitive behavior therapy is to teach people that, while they cannot control every part of their environment, they can influence how they understand and react with it.

c) Gensim Library and word2vec function

The word2vec algorithms include skip - gram and CBOW models, using either hierarchical softmax or negative sampling. In Gensim, there are more options for training word vectors than only Word2Vec. Word embedding through word2vec can make natural language computer - readable, and afterwards mathematical operations on words can be used to detect similarities. A well - trained collection of word vectors will cluster like words in that space. For instance, the words women, men, and human may aggregate in one corner, while yellow, red, and blue concentrate in another.

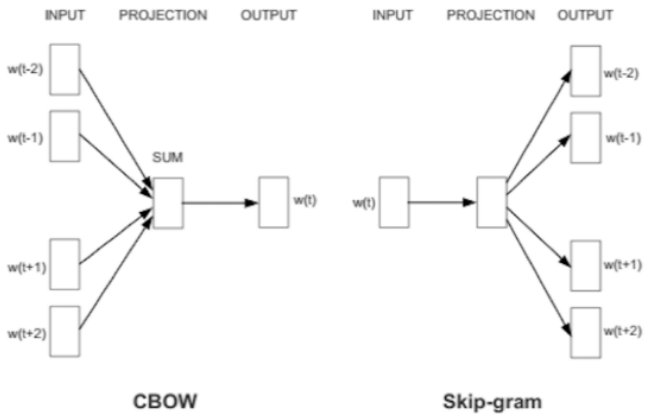

Figure 2: Overview working of Word2vec

The continuous bag of words (CBOW) and skip - gram are the two main training algorithms for word2vec. The main difference between these two methods is that CBOW predicts a target word based on context, whereas skip - gram predicts a target context based on a word. In general, the skip - gram method outperforms the CBOW method because it can capture two semantics for a single word. We could even use Word2vec to compute the similarity between two Make Models in the vocabulary.

3. Design

a) Dataset Parsing

As training data, 1.6 million tweets from Twitter were classified as positive (4) or negative (0), with 20% used as cross - validation data. As the test data, 494 tweets from Twitter were classified as positive (4), neutral (2), and negative (0). Labels have been adjusted to be in the 0 to 1 range. Hashtags, website links, and user references are removed before input tweets are preprocessed by Gensim, and preprocessed tweets with lengths less than two are removed. Words in the vocabulary were initialized with Gensim Dictionary, and words were replaced with their respective position in the vocabulary plus one. Tweets with less than 20 characters were zero - padded to 20 characters.
As training data, hashtags, website URLs, and user references were deleted before Gensim preprocessed tweets were used, with preprocessed tweets of fewer than two lengths being eliminated. Words were substituted with their corresponding positions in the lexicon plus one, using the Gensim Dictionary. Tweets with a length of fewer than 20 characters were zero - padded to a length of 20 characters. Those of length greater than 20 were split into tweets of length 20 and the last split part zero - padded, if necessary. Zero - padding done for supplying variable length sequences to the LSTM layer

b) Neural Network Architecture

- Embedding layer with zero - masking to output word vectors of 32 dimensions for each word in the vocabulary, and a zero vector for zero - padded words.
- LSTM layer with 128 - dimensional output.
- Fully connected output layer with one neuron and sigmoid activation function.
- Neural network uses binary cross - entropy loss function and the Adam optimizer with default parameters, but with Nesterov momentum.

4. Chatbox Assistant

a) Chatbox

Intelligent assistant apps commonly employ chatbots. They all use the user's input to produce answers. The chatbots should be able to understand natural language conversations. As a vital function of a digital companion, emotional intelligence is required. To accomplish so, we'll need to create a deep interaction model that can continually identify complicated and long - term emotions in diverse discussions. Just as a human counsellor must learn from a variety of interactions and communication in order to respond appropriately to a client, the emotional intelligence assistant must communicate and learn from a variety of individuals. It is important to build a system that firmly learns common aspects and improves oneself by continually learning the individual's features and emotional condition.

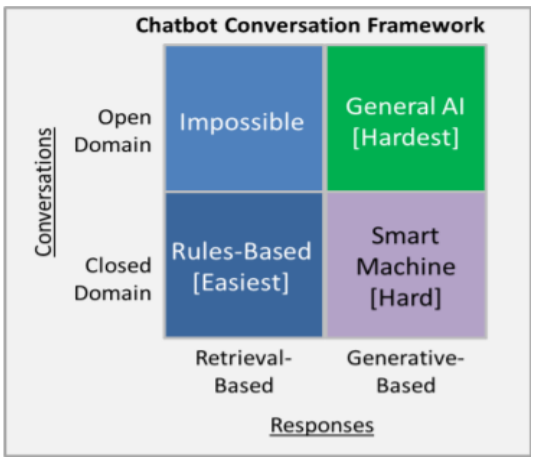

Figure 3: Chatbox Frameworks

b) ***Decision Trees used for Chatbox Dialogue box***

A decision tree is a decision - making aid that employs a tree - like graph or model of options and their potential outcomes, such as chance event outcomes, resource costs, and utility. It's one method to show an algorithm made up entirely of conditional control statements. A decision tree is a flowchart - like structure in which each internal node represents a "test" on an attribute (for example, whether a coin flip will come up heads or tails), each branch reflects the test's result, and each leaf node provides a class label (decision taken after computing all attributes). Classification rules are represented by the routes from root to leaf.

Tree - based learning algorithms are widely regarded as one of the most effective and widely used supervised learning techniques. Tree - based techniques provide excellent accuracy, stability, and interpretability to prediction models. The user's sentiment is employed as a determining element in the discussion flow, and effective Cognitive Therapy is then performed for the user's optimum comfort.

5. Snapshots

a) Code

```
def predict(text):
    preprocessed = [word[:-3] if word[-3:] == 'xxx' else word for word in
                    preprocess_string(text.lower().replace('not', 'notxxx'))]
    txt_list = [(vocab.token2id[word] + 1) for word in preprocessed
                if word in vocab.token2id.keys()]
    txt_list = [txt_list]
    max_tweet_len = 20
    if len(txt_list[0]) < max_tweet_len:
        for i in range(max_tweet_len - len(txt_list[0])):
            txt_list[0].append(0)
    elif len(txt_list[0]) > max_tweet_len:
        while len(txt_list[-1]) > max_tweet_len:
            txt_list.append(txt_list[-1][max_tweet_len:])
            txt_list[-2] = txt_list[-2][:max_tweet_len]
    prediction = 0
    for txt in txt_list:
        prediction += model.predict(np.array([txt]), batch_size=1)
    prediction /= len(txt_list)
    return prediction

def finisher():
    print('Jarvis:It was really nice talking to you and I hope that now you'\
          ' feel better after talking to me.\nBest of luck for your future '\
          'endeavours. Bye!')
```

Figure 4.1: The "predict" function predicts the sentiment score of each statement the user inputs.

```
[ ] name = name[0].upper() + name[1:]
    print("Hi " + name + "! My name's Jarvis. Let's start with our session.")
    print("Jarvis:How are you doing?\n")
    response = input()
    if (predict(response) >= 0.55):
        print('Jarvis: That is good. Are you usually this happy, or are there '\
              'some worries that you want to talk about?\n')
        response = input()
        if (predict(response)>=0.7):

            response = input('Jarvis: You seem to be really content. Wanna sign off?\n')
            if(predict(response)>=0.7):
                print('Ok, bye ' + name + '!')
            else:
                response = input('Jarvis: Is there something bothering you? Would you '\
                                 'share it with me?\n')
                if(predict(response)>=0.7):
                    print("Jarvis: That's okay. It was nice talking to you. You can chat "\
                          "with me anytime you want.\n Bye" + name + "!")
                else:
                    sad1()
        else:
            sad2()
    else:
        sad3()
```

Figure 4.2: Decision Tree in dialogue

```
[ ]     return (tweets, labels)

    def create_word2vec(tweets):
        wv_model = Word2Vec(size=32, alpha=0.1, window=2, min_count=0, workers=8,
                            min_alpha=0.01)
        print ("Created Word2Vec model\nBuilding vocabulary...")
        wv_model.build_vocab(tweets)
        print ("Training...")
        wv_model.train(tweets, total_examples=wv_model.corpus_count, epochs=10)
        print ("Trained")
        wv_model.save('model_word2vec')
        print( "Model saved")
        return wv_model

    def get_word2vec(tweets=None):
        if 'model_word2vec' in os.listdir('.'):
            response = raw_input('Word2Vec model found. Do you want to load it?'\
                                 ' (Y/n): ')
            if response.lower() in ['n', 'no', 'nah', 'nono', 'nahi', 'nein']:
                if not tweets:
                    tweets, labels = export()
                    del labels
                return create_word2vec(tweets)
            else:
                print ("Loading model...")
                wv_model = Word2Vec.load('./model_word2vec')
                print( "Loaded model")
```

Figure 4.3: Creation of word vectors and training of neural network

B. Chatbox –

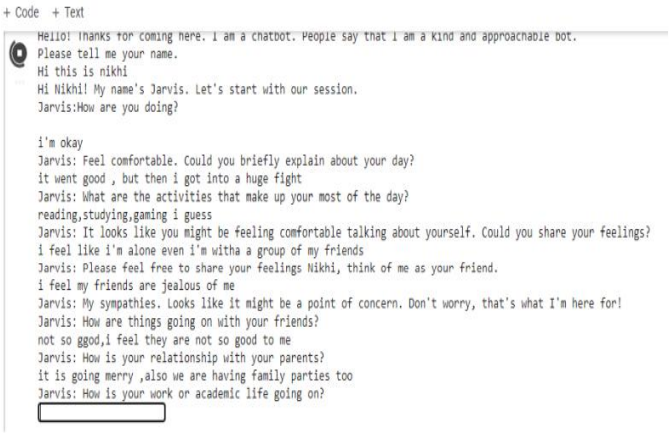

Figure 4.4: Emotion detection with reply

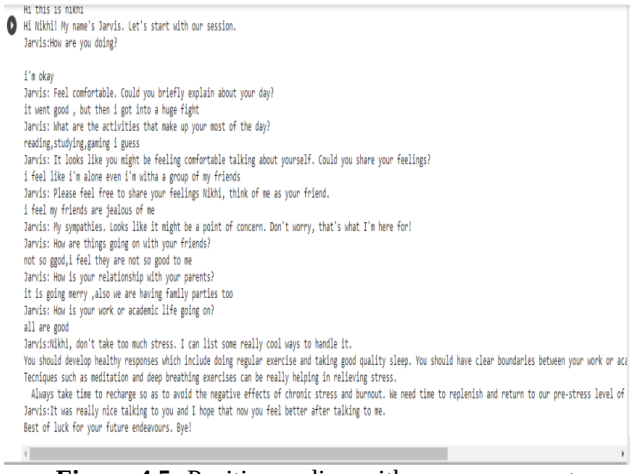

Figure 4.5: Positive ending with encouragement

6. Conclusion

Mental or neurological illnesses impact about 450 million individuals worldwide, with one in every four people expected to be affected in the next several years. With the fast progress of technology and its use in the medical area, researchers and medical practitioners are currently exploring how artificial intelligence and machine learning may be

used to identify early signs and perhaps heal various mental illnesses. Significant progress has been made in this area over the years, with AI - powered technologies such as natural language processing (NLP) and even chatbots meant to comprehend the human mind.

Current results show accuracy of 84.14% on the training data, accuracy of 83.32% on the cross validation data and accuracy of 60.17% on the test data.

We look at ways in which these solutions are helping psychiatrists and other mental health professionals deliver their job better and the potential harm associated with these technologies.

7. Future Scope

The need for digital healthcare solutions has steadily risen as the gap between the availability of mental health professionals and the expense of each therapy session continues to widen. Even when they are at their lowest, an increasing number of people prefer the app experience over a genuine treatment session. In the future, this initiative might show to be a very valuable tool in this situation.

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