

# Chatbot for Depressed People

Sonali Nagargoje<sup>1</sup>, Vishakha Mamdyal<sup>2</sup> and Rucha Tapase<sup>3</sup>

<sup>1,2,3</sup> Pune Institute of Computer Technology, Pune, India

Email: <sup>1</sup>[sonalinagargoje1@gmail.com](mailto:sonalinagargoje1@gmail.com), <sup>2</sup>[mamdyalv@gmail.com](mailto:mamdyalv@gmail.com) and <sup>3</sup>[ruchatapase8@gmail.com](mailto:ruchatapase8@gmail.com)

**Abstract**— This paper is developed to take the edge off depression. Chatbots are special agents which are used to process a specific task, and it can be used to introduce a product to a customer or solve relative problems associated with a product, thus saving human resources. In this study, we have aimed to provide a chatbot for a society that will help to reduce the number of depression survivors. In this study, we have used RNN LSTM encoder-decoder model to know the user's emotional state and according to that chatbot gives the best response. We have proposed a multi-purpose dialogue model which can be used in daily communication rather than for specific tasks. It helps those people who are suffering from depression and have fear of sharing their feelings or fear of being judged.

**Keywords**— Depression, Therapy, ChatBot, LSTM (Long short-term memory) model, Seq2Seq, Encoder, Decoder.

## I. INTRODUCTION

Depression is a serious mental illness and it negatively affects the entire body. According to the WHO survey, more than 300 million people are suffering from depression. It can lead to a variety of emotional and physical problems and can decrease a person's ability to work. One of the best ways to relieve depression is interacting, but due to fear of being judged most sufferers avoid interacting. Hence chatbots came into the picture, this chatbot communicates with the user and creates personalized and natural conversation to the user, and also provides great emotional support using artificial intelligence.

Basically, the functional framework of chatbots is based on the Cognitive Behavioral Therapy methodology. CBT therapy is nothing but making negative thoughts of a user into positive. The important component in mental health chatbots is empathetic engagement.

One of the biggest challenges of mental health care chatbots is to provide privacy and confidentiality.

Since the user's activity is completely related to personal life thus it becomes a piece of sensitive information hence it is necessary to address this problem.

So, this research helps depression survivors to relieve depression through a simple chatting system by providing huge mental support. It brings positivity to a depressed person's life. It will give an affinity to the user as a virtual buddy by creating natural and human-like conversation. It will also motivate the users to share their problems and emotions.

It answers all the technical doubts related to depression and suggests ways the user can control their anxiety. It even tries to cheer the user by sending messages of hope.

## II. RELATED WORK

In recent times, there are so many companies have developed AI applications to support for depressed people, so far provide security and anonymity.

These applications, aimed at user, were developed to proactively check on patients, be ready to listen them and chat anytime, anywhere with recommend activities which tries to improve the user's mental state.

- One of the successful chatbots that have been in the market so far is woebot which scan the moods and create a platform in which users will express their thoughts and emotions.
- Moodkit: It is an application that helps users reduce stress of user using CBT therapy. This app try to recognize and change negative thought of user. It much like a daily thought record.
- Pacifica: It is an application which helps to manage stress based on CBT Therapy. It includes meditation, relaxation, mood and health tracking tools.
- Wysa: It is an emotionally intelligent chatbot that help users to manage their emotions and thoughts based on CBT, DBT Therapy with meditation practice and motivational interviewing.

All these apps are not designed to prescribe proper treatment. They are just the first step of recognize and to manage depression.

This application seems to be feasible solution capable of handling anxiety and depression management upto some limit.

Table 1: Published Papers Related to Chatbot

Name of the Paper	Methods Used	Result/Outcome
Combating Depression in Students using an Intelligent ChatBot: A Cognitive Behavioral Therapy	Convolutional Neural Network (CNN), Recurrent Neural Network (RNN),  Hierarchical Attention Network (HAN)	Gives classified depression levels  Accuracy of 75% with CNN and 70% with RNN.
Digital Psychiatry – Curbing Depression using Therapy Chatbot and Depression Analysis	Machine Learning and Natural Language Processing	Classifies depression level and provides therapy according to level of depression.
A Chatbot for  Psychiatric Counseling in Mental Healthcare Service Based on Emotional Dialogue Analysis and Sentence Generation	RNN based decoder	Gives effective counseling by continuous observations of users emotional changes.
Model of Multi-turn Dialogue in  Emotional Chatbot	SeqGAN model with Seq2Seq model	Smoother emotional transition because of higher value for continuous positive and negative emotions.
The ChatBot Feels You – A Counseling Service Using Emotional Response Generation	Deep Learning,  Natural Language Processing	Understand user state and observation of continuous user’s emotional changes sensitively and according to that provides mental healthcare.

**III. PROPOSED METHODOLOGY**

In this study, we have proposed an intelligent chatbot which takes users ‘chat as the input and reply accordingly by suggesting ways to low down their stress level. The proposed design of the chatbot using LSTM (Long short-term memory) model is shown in Fig. 1.

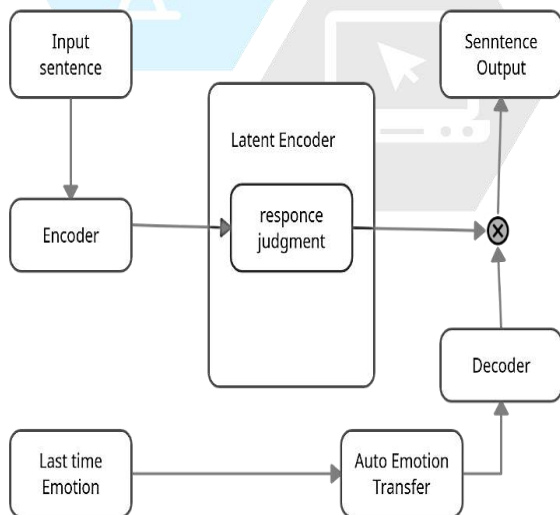


Fig 1: System Architecture

Fig. 2 shows the model of long short-term memory unit with dropout regularization and softmax.

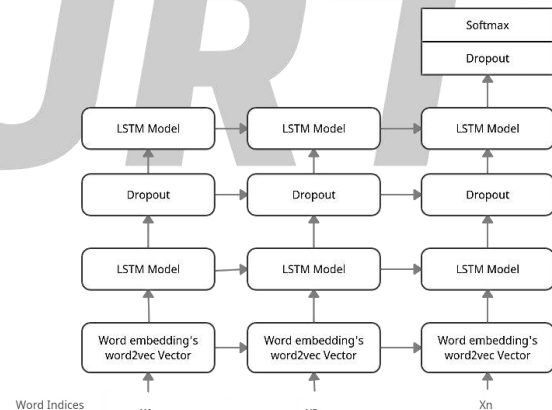


Fig 2: LSTM Model

**A. Dataset:**

For extracting online-websites data web scraping tool, beautiful soup is used. Also twitter’s sentiment analysis data is considered to analyse the most frequent words used by depressed people. The extracted data stored into yml files for further pre-processing data step which includes converting text into lowercase and remove punctuation marks.

**B. Training and Testing:**

For the training and testing part dataset is divided into two part. To extract the emotion from text, deep learning

model, LSTM an artificial recurrent neural network is useful for this process.

**C. Model:**

Seq2Seq LSTM (Long short-term memory) an artificial recurrent neural network model learns long dependencies and work greatly for sequential data. LSTM is basically a solution to resolve the vanishing gradient problem of RNN over multiple time steps.

**Encoder:**

Input to the encoder is user’s input into words. At each time step, word is passed as an input to the RNN along with the output of the RNN of the previous time step called hidden state. In the beginning, this hidden state is initialized to zero. The encoder encodes the input data through this RNN network

**Decoder:**

In the training phase, input to the decoder is Spanish words shifted by one step. That is, the decoder is given an input word that has to predicted, irrespective of what it actually predicts.

For the very 1st time step, the decoder is given start-of-sequence (SOS). The decoder is expected to end the sentence with an end-of-sequence (EOS) token.

**Evaluation:**

We used Pandas, Keras library in Jupyter notebook experimented using 200-dimensional vectors. This library provides high performance for loading large dataset and analysis tools for python.

Jupyter Notebook create document that contain visualization on a web-application. The softmax loss function used to optimize the error. Model accuracy reach up to 70 percent using 15 epochs.

**IV. RESULTS**

Sequence-to-sequence LSTM, an artificial recurrent neural network model shows more accurate result for sequential data by handling vanishing gradient problem in RNN model.

Suggesting different ways to the user to control their anxiety over depression model able to manage around 70% accuracy.

The only disadvantage of LSTM model is takes more time than other deep learning algorithm as it works on feedforward and back propagation.

Table 2: Emotion classification results using LSTM (Long short-term memory)

Model: "model"

Layer (type)	Output Shape	Param #
input_1 (InputLayer)	[(None, 22)]	0
input_2 (InputLayer)	[(None, 74)]	0
embedding (Embedding)	(None, 22, 200)	200
embedding_1 (Embedding)	(None, 74, 200)	200
lstm (LSTM)	[(None, 200), (None, 320800)]	
lstm_1 (LSTM)	[(None, 74, 200), (N 320800)]	
dense_2 (Dense)	(None, 74, 1)	201

**V. FUTURE SCOPE**

- Enabling different languages in chat.
- Review different aspects of the language, which enlighten problems for chatbot-learning.
- Maintain a natural conversation flow of chatbot.

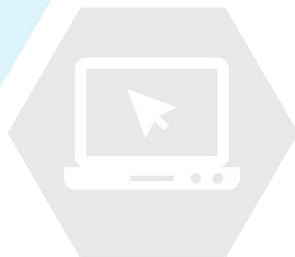
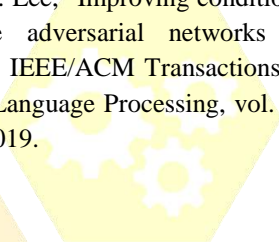
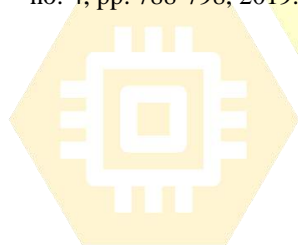
**VI. CONCLUSION**

In this work, an intelligent chatbot is built for the user who can talk openly to the bot since there is no fear of judgement and it tries to suggest some ways to overcome their depression. In order to identify emotion of user from chat text and reply accordingly, deep learning algorithms LSTM (RNN) is used which handle gradient problem. There are still so many factors which affects the conversation, where need to work on that.

**REFERENCES**

- [1] C. K. M, “Artificial paranoia: A computer program for the study of natural language communication between man and machine,” ACM Communications, vol. 9, pp. 36–45, 1975
- [2] ] Bhargava V., Nikhil M. (2009), “An intelligent speech recognition system for education system”, [Online]. Available: <https://pdfs.semanticscholar.org/8ea7/725bab4e390e4d8ab8eb-ee747d2a5340c3b2.pdf>
- [3] M. Wöllmer, F. Weninger, T. Knaup, B. Schuller, C. Sun, K. Sagae, and L. P. Morency, “Youtube movie reviews: Sentiment analysis in an audio-visual context,” IEEE Intelligent Systems 28(3), pp. 46-53, 2013.
- [4] B. Inkster, S. Sarda, and V. Subramanian, “An empathy-driven, conversational artificial intelligence agent (wysa) for digital mental well-being: real-world data evaluation mixed-methods study,” JMIR mHealth and uHealth, vol. 6, no. 11, p. e12106, 2018.

- [5] R. Plutchik, "Emotions and Life: Perspectives from Psychology, Biology, and Evolution," Washington, DC: American Psychological Association, 2002.
- [6] B. K. Kim, J. Roh, S. Y. Dong, and S. Y. Lee, "Hierarchical committee of deep convolutional neural networks for robust facial expression recognition," *Journal on Multimodal User Interfaces*, pp. 1-17, 2016
- [7] D. Elmasri, A. Maeder, "A Conversational Agent for an Online Mental Health Intervention," In *proc. of International Conference on Brain and Health Informatics*, pp. 243-251, 2016.
- [8] T. Kiss and J. Strunk, "Unsupervised multilingual sentence boundary detection," *Computational Linguistics*, vol. 32, no. 4, pp. 485-525, 2006.
- [9] Y.-L. Tuan and H.-Y. Lee, "Improving conditional sequence generative adversarial networks by stepwise evaluation," *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, vol. 27, no. 4, pp. 788-798, 2019.



**UIJRT**