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Neural Network and Natural Language Processing Based Anti-Depression Chatbot

Pankaj Atram[1], Swapnil Chitalkar[2], Faizan Ali[3], Kedar Muluk[4], Amit Kadam[5]
[1, 2, 3, 4, 5]*Department of Information Technology, Pune Institute of Computer Technology, India*

Abstract: ***More than one in eight teenagers suffer from mental health issues like depression which is now becoming a common thing in society nowadays which can more often lead people to take extreme steps like suicides. Anti-Depression Chatbot is ideal, cost-effective, highly available web based Chatbot to help fight depression. Users can trust and turn to Anti-Depression Chatbot by simply using any browser for seeking help if they are feeling depressed. When user chats with Anti-Depression Chatbot about depression, mental health and things causing depression like toxic relationships, etc bot replies to user positively and provides information, advises user, etc in such a way that users depression level or sadness reduces. Anti-Depression Chatbot uses Natural Language Processing to understand user and replies with limited amount knowledge it has, to successfully reduce depression and boost mental health of user.***
Keywords: Natural Language Processing, Natural Language Toolkit, Pytorch, Feed Forward Neural Network, Flask.

I. INTRODUCTION

More than one in eight teenagers struggle with their mental health, a struggle that too often can lead to suicide each year nearly an estimated 46000 adolescents die by their own hand, a figure UNICEF is sounding the alarm over in its annual report[1]. The rise in the use of social media is a main cause. There are very few limited ways they can hurt each other in ways that really hurt their self-esteem, their development and it leads to anxiety, social anxiety, depression and even suicide. Bullying is something that has been in the increase because of social media and comes with very limited parental or adult supervision. In this era of competition not only teenagers but also adults find it difficult to overcome stress and depression. An easy and accessible solution to help teenagers and those in distress is a chat bot that talks to them via their smartphones. Chatbot can immediately help an unlimited number of teenagers, while waiting lists for an appointment with psychologists keep on growing. It's like having something that is very available in their environment, there is something that they can easily reach. It might seem contradictory to use smart devices to treat teenagers for the angst provoked by those same screens, but it does works. It's a nice idea and it could be helpful for kids that don't have someone to talk to or don't have a relationship like that with someone with a parent or a friend and they don't feel like talking to someone human or don't feel like talking with someone with emotion. Nowadays almost all teenagers have cell phones. It's much easier than a conversation face to face it's reassuring to talk to a robot because it can't hurt people with its judgements because it is not designed to do that.

II. OBJECTIVES

1) Facilitate easy and interactive conversation between user and chatbot.
2) Chatbot should be able to give appropriate response to user which should help reduce depression of user.
3) Able to give non-repetitive answers.
4) Redirect user to human intervention if unable to understand user.

III. PROBLEM DEFINITION

To develop a web based chatbot which can make conversations with users which are suffering depression and some other mental health related issues to help overcome them.

IV. SCOPE

This chatbot will be process the inputs of users and provide appropriate result which will aim to decrease depression of user. As it is a retrieval based chatbot it will not be able to make very deep conversations. Chatbot will direct user to the professional help if it is unable to answer and understand user or is not able to reduce depression of a person.

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User will be able to chat with chatbot over a web application. This chatbot will have limited knowledge and will be able to chat with user based on limited information available/fended to it.

V. LITERATURE SURVEY

Depression leads to mood swings, avoidance of socialising, etc. It can affect person's well-being, make feel demotivated, and change the way to look at life [2]. It is therefore danger to society and it's important to fight depression by every individual.

Though Chatbots are not as intelligent as humans but people like have conversations with theses automated chatbot systems[3]. Alan Turing was first to think of machines which are designed to carryout tasks that humans do, he wondered if machine could speak to people without making them realize they are interacting with machine[4]. This was concept used behind Turing test which is used in testing generative based of chatbots. First chatbot was developed nearly fourteen years later in 1964, at MIT Artificial Intelligence Laboratory chatbot ELIZA was developed by Joseph Weizenbaum[5]. It was based on principle of keyword matching and a fixed response was selected based on already fended responses, therefore ELIZA had limited knowledge and can only discuss particular domain, cannot learn from pass and make deep conversations. Jabberwacky was first artificial intelligence based chatbot written using CleverScript introduced in 1988. It responded users with contextual pattern matching of previous discussions, but was slow in replaying and cannot handle multiple users[6]. Dr. Sbaitso (i.e. Sound Blaster Acting Intelligent Text to Speech Operator) made use of sound cards to make people feel of having conversations with psychologist but was unable to have deep conversations[7]. ALICE was another chatbot based on concept of pattern matching, inspired by ELIZA introduced in 1995[8]. ALICE was developed with Artificial Intelligence Markup Language (AIML) which was based on three main components user query, query response and query type.

Modern Artificial Intelligent chatbots came into existence in from of personal voice assistants, which were made available on modern smartphones most popular voice assistants are Google Assistant, Apple Siri, Amazon Alexa, Microsoft Cortana, and IBM Watson. Chatbots have come a long way many milestones in history of chatbots are already discussed, some others were development of Parry, Smarterchild, Tay, etc but many are yet to come in future and chatbots are here to stay[9].

Most currently functional chatbots in field of mental health are used by millions of users and are successful in helping people overcome depression and other mental health related problems and build using decades of research. Woebot[10] is built to give cognitive behavioural therapy to the user in form of daily, brief conversations. Woebot also traces mood and helps with depression and anxiety of clients. Wysa[11] employs combination of various techniques like cognitive behavioural therapy, DBT, rewarding clients on doing right things, make client aware of his current mental state, promotes meditation, helps improve quality of life by employing special techniques, motivational interviewing and, overcome depression and improves overall mental health of users. Tess[12] tries to imitate humans as a conversational partner. Tess is trained using artificial intelligence and expert guidance from psychologists using strategies such as CBT, Personal short, focused treatment, educating users about mental conditions, making users understand mistakes are absolutely fine, etc. through information gained from a decade of research. Tess delivers various personalised solutions for each user and has ability to learn from past if user state does not improve by previous recommendation, it make use of new things to help users overcome depression. Youper chatbot is an integration of psychology and artificial intelligence and uses evidence-based therapies such as CBT, make user understand not everything in life is controllable, DBT, gives therapy to users undergoing stress due to inefficiency in analytical skills, and therapy based on current mental state of user. Youper is able to decrease symptoms of anxiety and depression in first 2 weeks of use[13]. Woebot[14] is user friendly bot which takes short surveys to access mental health and gives instructions to user in case of emergency but it has feel of being scripted.

Modern chatbots are using techniques like NLP to process and Deep learning for building chatbots. Manaswi, N.K.[15] proposed steps for Building a Chatbot which involves Word2Vec, Tokenization, Removing Punctuation Marks, Removing Stop Words, Term Frequency-Inverse Document Frequency (TF-IDF), Named Entity Recognition using NLTK and Intent Classification, Word Embedding, etc techniques which form basis of many NLP and neural network based chatbots. Mittal M Et al[16] successfully developed chatbot using Gradient Descent Algorithm and Natural language processing techniques such as tokenisation, stemming and enumeration to make bag of words. Bag of words produce input for the feed forward neural network that calculates probabilities for each response to find the highest probability response which can be given to user.

Chatbots help improve mental well-being of individual, chat supports systems are proven promising in decreasing depression[17]. However, there are limitations when it comes to comparison between human-to-human conversations and human to bot conversations. Chatbots have limited abilities and cannot totally replace humans[18]. People may lack confidence or fell of human conversation. Therefore, more improvements are required in chatbots which is need of time more than ever.

VI. METHODS

A. Natural Language Processing Techniques

Natural Language Processing is used to analytics tools, giving robots the ability to comprehend human speech. Applications like automated data collection are made possible by this human-computer connection. Textual summary, behaviour analysis, topic prediction, identify key in text and categories, speech converted into word and tag, connection extraction, stemming, and other techniques are available. We perform some NLP operations on raw data like Tokenization, Stemming and Bag of words. Bag of Words is a Natural language processing technique. Using this model, a textual content such as a sentence or a document is represented as the bag or multiset of its words. It maintains count of most often used words. Tokenization is frequent tasks when it comes to working with textual content data. Tokenization means splitting a phrase, sentence, paragraph, or a complete textual content file into smaller units, such as character words or terms. Stemming is one of NLP technique. Stemming used to decrease a phrase of its personal stem or to the lemma which are roots of the words. Analyse the which means in the back of the word is an utility of stemming.

B. Neural Network

An artificial intelligence technique known as a neural network trains computers to interpret information in a sequence like how our human being brain does. Deep learning is sub-type of machine learning used to explore and copy the human brain by using of linked neurons or nodes in some layered structure. For the training dataset and model creation in project, a feed forward neural network is utilised. An artificial neural network that does not include looping connections between nodes is called a feedforward neural network. A function's approximation is the goal of feedforward neural networks. Using torch and FNN with some hidden layers which get bag of words as a input and get output size must be the number of different classes and then apply SoftMax to get probability of each classes. Created dictionary to store model state, input size, output size, hidden size and store all the words, texts in a file.

VII. SYSTEM OVERVIEW

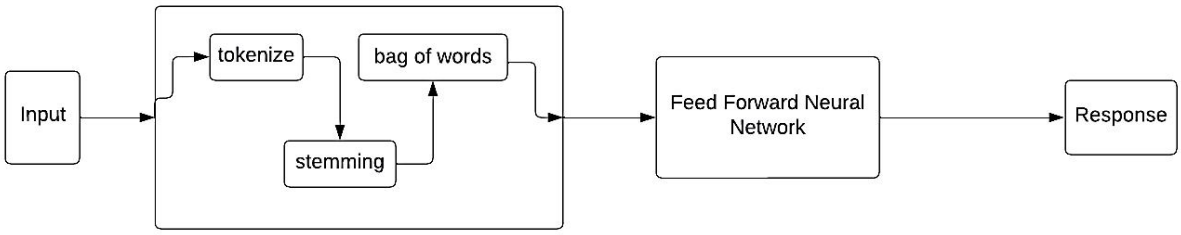


Fig. 1. System Architecture

The proposed system has a NLP pre-processing pipeline which processes the input provided by the user in form of a text string. This pre-processing includes methods like tokenization, stemming etc. After applying these methods, a bag of words is created which is then transformed to an array of integers based on the training data in the intents. The main part of the chatbot is the feed forward neural network model which takes the processed input to produce the final output. The model consists of two hidden layers and a SoftMax layer.

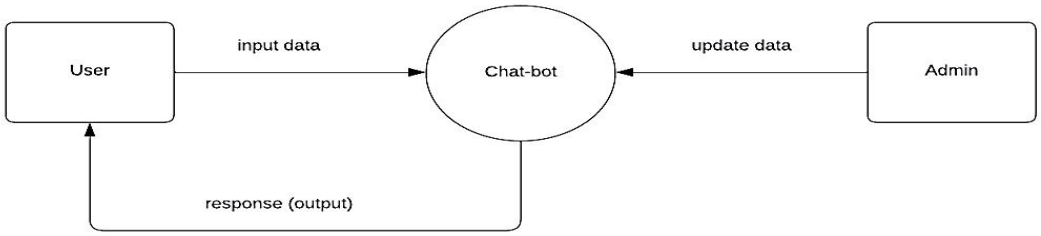


Fig. 2 DFD level 0

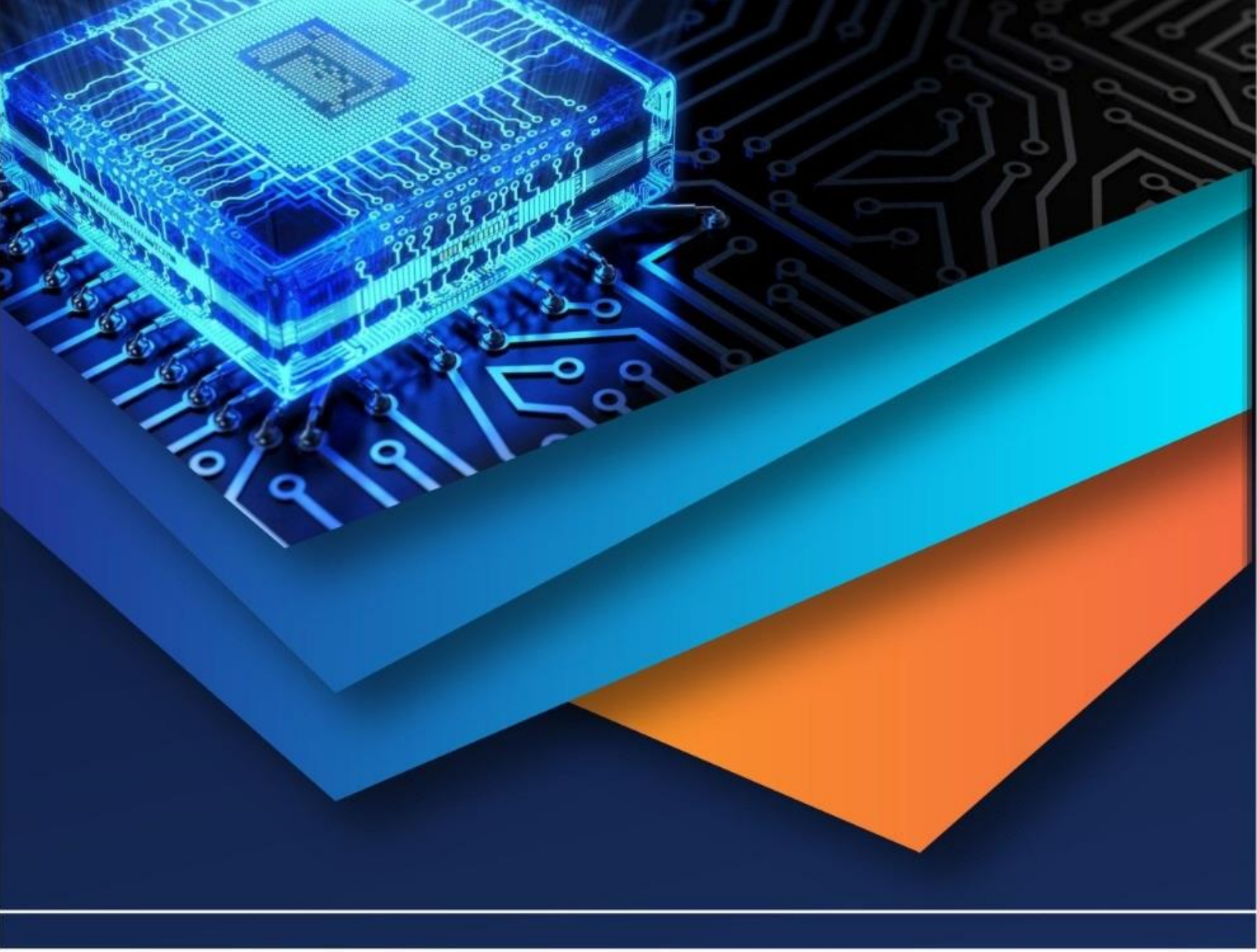
The above figure represents the data flow diagram in the system. The user message is taken as the input data and the chatbot. response is the output data. The admin can update the database to add more sets of intents to improve user experience.

VIII. CONCLUSION

We have proposed the idea of creating an anti-depression chatbot which will interact according to the user input. After going through available models and methods which can be used to design the chat-bot, we have gone for feed forward neural networks for its simple mechanism and its wide range of applications. We have proposed the designs and architecture which will feature the chat-bot. As conversational agents are becoming a readily available platform for many service providers, the benefits in the healthcare domain are emerging. The design and development of our chatbot, followed by its participatory evaluation will be effective in providing support for individuals with stress and mental health issues.

REFERENCES

[1] Hopkins Bloomberg, J., Fine, S., Martinez, M., Blum, R., Diniz De Oliveira, J., Rykiel, N., Lai, J., Dooley, T., & Keeley, B. (2022). On My Mind: How Adolescents Experience and Perceive Mental Health Around the World.
[2] de Zwart, P. L., Jeronimus, B. F., & de Jonge, P. (2019). Empirical evidence for definitions of episode, remission, recovery, relapse and recurrence in depression: A systematic review.Epidemiology and Psychiatric Sciences, 28(5), 544–562. https://doi.org/10.1017/S2045796018000227.
[3] Hill, J., Randolph Ford, W., & Farreras, I. G. (2015). Real conversations with artificial intelligence: A comparison between human-human online conversations and human-chatbot conversations. Computers in Human Behavior, 49, 245–250. https://doi.org/10.1016/j.chb.2015.02.026.
[4] Turing, A. M. (1950). MIND A QUARTERLY REVIEW OF PSYCHOLOGY AND PHILOSOPHY I.COMPUTING MACHINERY AND INTELLIGENCE (Issue 236).
[5] Shawar, B. A., & Atwell, E. S. (2005). Using corpora in machinelearning chatbot systems. International Journal of Corpus Linguistics, 10(4), 489–516. doi:10.1075/ijcl.10.4.06sha
[6] Wikipedia(2022) Retrieved from https://en.wikipedia.org/w/index.php?title=Jabberwacky&oldid=926273345
[7] Wikipedia(2022) https://en.wikipedia.org/wiki/Dr. Sbaitso
[8] Wallace, R.S. (2009). The Anatomy of A.L.I.C.E.. In: Epstein, R., Roberts, G., Beber, G. (eds) Parsing the Turing Test. Springer, Dordrecht. https://doi.org/10.1007/978-1-4020-6710-5 13
[9] A visual history of chatbots (2018) Medium website:https://chatbotsmagazine.com/a-visual-history-of-chatbots8bf3b31dbfb2.
[10] Prochaska J, Vogel E, Chieng A, Kendra M, Baiocchi M, Pajarito S, Robinson A, A Therapeutic Relational Agent for Reducing Problematic Substance Use (Woebot): Development and Usability Study J Med Internet Res 2021;23(3):e24850 URL: https://www.jmir.org/2021/3/e24850 DOI: 10.2196/24850
[11] Inkster B, Sarda S, Subramanian V, An Empathy-Driven, Conversational Artificial Intelligence Agent (Wysa) for Digital Mental Well-Being: Real-World Data Evaluation MixedMethods Study JMIR Mhealth Uhealth 2018;6(11):e12106 URL:https://mhealth.jmir.org/2018/11/e12106 DOI: 10.2196/12106
[12] Fulmer R, Joerin A, Gentile B, Lakerink L, Rauws M, Using Psychological Artificial Intelligence (Tess) to Relieve Symptoms of Depression and Anxiety: Randomized Controlled Trial JMIR Ment Health 2018;5(4):e64 URL: https://mental.jmir.org/2018/4/e64 DOI: 10.2196/mental.9782
[13] Mehta A, Niles A, Vargas J, Marafon T, Couto D, Gross J Acceptability and Effectiveness of Artificial Intelligence Therapy for Anxiety and Depression (Youper): Longitudinal Observational Study J Med Internet Res 2021;23(6):e26771 URL: https://www.jmir.org/2021/6/e26771 DOI:10.2196/26771
[14] Fitzpatrick K, Darcy A, Vierhile M Delivering Cognitive Behavior Therapy to Young Adults With Symptoms of Depression and Anxiety Using a Fully Automated Conversational Agent (Woebot): A Randomized Controlled Trial JMIR Ment Health 2017;4(2):e19 URL:https://mental.jmir.org/2017/2/e19 DOI: 10.2196/mental.7785
[15] Manaswi N. K, (2018). Developing Chatbots,Deep Learning with Applications Using Python : Chatbots and Face, Object, and Speech Recognition With TensorFlow and Keras(145–170). DOI:10.1007/978-1-4842-3516-4 11
[16] Mittal M, Battineni G, Singh D, Nagarwal T, Yadav P. Web-based chatbot for Frequently Asked Queries (FAQ) in Hospitals. J Taibah Univ Med Sc 2021;16(5):740e746.
[17] Hoermann S, McCabe KL, Milne DN, Calvo RA. Application of Synchronous Text-Based Dialogue Systems in Mental Health Interventions: Systematic Review. J Med Internet Res. 2017 Jul 21;19(8):e267. doi:10.2196/jmir.7023. PMID: 28784594; PMCID: PMC5595406.
[18] Vaidyam, A. N., Wisniewski, H., Halamka, J. D., Kashavan, M. S., & Torous, J. B. (2019). Chatbots and Conversational Agents in Mental Health: A Review of the Psychiatric Landscape. Canadian Journal of Psychiatry (Vol. 64, Issue 7, pp. 456–464). SAGE Publications Inc. https://doi.org/10.1177/0706743719828977.



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