

Internalizing - Disorder Chatbot for Biomedical Applications

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Abstract—Automatized mental health chatbots are conversationally built with technology in mind with having the potential to reduce efforts to healthcare costs and improve access to medical services and knowledge. Internalizing Disorder chatbot introduces an innovative mental health assistance chatbot system designed to address queries related to depression, anxiety, and suicidal thoughts. Leveraging a Sequence-to-Sequence (Seq2Seq) neural network architecture implemented with PyTorch, the chatbot enhances its natural language understanding and response generation capabilities. The model comprises of an encoder, a decoder and two Recurrent Neural Networks (RNNs). The encoder processes user input, such as medical queries, into a fixed-size context vector. The decoder then generates a sequence of words representing the chatbot's response. By training on a diverse dataset encompassing various mental health intents, the model learns to provide contextually relevant and empathetic responses. The graphical user interface developed using PyQt5 enables individuals to express their concerns and receive supportive and informative responses from the Chatbot. Integration of Pyttsx3 voice library for conveying chatbot responses audibly, enhancing user engagement and accessibility. Internalizing Disorder chatbot showcases the potential of Seq2Seq models in addressing internalizing disorder challenges, offering a compassionate and accessible resource for those in need of support and guidance.

Index Terms— Recurrent Neural Networks, PyQt5, Seq2Seq models, chatbot, Natural language processing.

I. INTRODUCTION

In the era of advancing technology, the integration of artificial intelligence (AI) and natural language processing became the way for innovative solutions in healthcare. This paper introduces a medical assistance

chatbot designed to provide users with intelligent and context-aware responses to their internalizing disorder enquiries. Traditionally, chatbots have relied on simpler neural network architectures for intent classification and response generation. However, the limitations of these models in capturing context and generating coherent responses prompted the exploration of more sophisticated solutions. In this work, implementation of Sequence-to-Sequence (Seq2Seq) neural network a powerful architecture an encoder and a decoder are components of the Seq2Seq paradigm, allowing Bot to process user input as a sequence, capture contextual information, and generate responses in a more human-like manner. The model is trained on a variety of datasets covering different medical intents in an effort to improve the chatbot's comprehension and response to a broad range of user inquiries.

The main scope extends beyond the algorithmic implementation. This paper contributes to the evolving landscape of AI in healthcare, showcasing the potential of advanced neural network architectures in enhancing user experience and the quality of medical information dissemination. This survey reviews the application of natural language processing (NLP) techniques in the development of chatbots tailored for healthcare. The authors explored various approaches to tokenization, intent classification, and response generation, highlighting the importance of context-aware systems. The survey provides insights into the challenges and opportunities in deploying chatbots for medical assistance and lays the foundation for understanding the evolution of NLP in healthcare chatbot applications. [1][7][8] [20].

Sarah L. Williams et.al [2] proposed the incorporation of advanced neural network architectures, beyond traditional models, in conversational agents. It covers a range of neural network types, including recurrent neural networks (RNNs), long short-term memory networks (LSTMs), and attention mechanisms. This work discussed the impact of these advanced architectures on chatbot performance, focusing on improvements in context understanding, coherence, and the overall user experience. The insights provided contribute to the ongoing discourse on leveraging advanced neural networks in chatbot development [9] [10] [16]. Dahiya et.al [3] proposed the chatbot implemented using pattern comparison in which the order of the sentence is recognized and saved response pattern. The implementation of the chatbot Operating system, database, programming language, software and how results of input and output are stored is discussed. Here the input is taken using text () function and other punctuation is removed using trim () function and random () function is used to choose a response from the database. The chatbot is used for an entertainment purpose [11] [12] [15].

C.P. Shabariram, et al [4] discussed the n-gram technique for extracting the words from the sentences. This method compares and deduces input against case data by using Moro phonemes and phonemes as key parameters. A probability analysis is then performed to identify the closest match. The final expression is redirected through an expert system [13] [14]. Focused on sequence-to-sequence (Seq2Seq) models, this review investigates into the theoretical foundations and practical applications of these architectures in natural language generation tasks. The authors discussed the evolution of Seq2Seq models, their use in machine translation, and extend the discussion to their potential in diverse domains. Specific attention is given to the challenges and advancements in training Seq2Seq models, providing a comprehensive understanding of their capabilities. [5] [17]. The studies train emotions classification models from a lot of labelled data based on recurrent neural network (RNN), deep learning, and convolution neural network using AI methods. Linguistic interaction plays a crucial role in counseling, where Natural Language Processing (NLP) and Natural Language Generation (NLG) are used to interpret user dialogues. In this context, a multi-modal approach is applied for emotion

recognition. They have collected corpuses to learn semantic information of words and represent as vector using the word vector, synonym knowledge of lexical are collected [6] [18] [19].

II. PROPOSED METHODOLOGY

The proposed system for the mental health assistance chatbot revolves around leveraging advanced technology and empathetic design principles to provide effective support to individuals facing mental health challenges. This type of model is applied when both the input and output are variable-length sequences, with no requirement for a one-to-one correspondence between them. A Seq2Seq model consists of two recurrent neural networks (RNNs), an encoder and a decoder. At its core is the implementation of a (Seq2Seq) neural network architecture using PyTorch, enabling the chatbot to understand natural language input and generate contextually relevant responses. The system prioritizes the development of a user-friendly graphical interface, built with tools like PyQt5, to facilitate seamless interaction and encourage users to express their concerns comfortably. Training the Seq2Seq model on a diverse dataset encompassing various mental health intents ensures that the chatbot can respond em-pathetically and sensitively to a wide range of user queries. Moreover, real-time monitoring capabilities are integrated to identify and address conversations indicating severe distress or potential suicidal intention, with protocols in place to escalate to appropriate support resources.

Implementing Pyttsx3 voice conversion to audibly convey chatbot responses, enhancing user engagement and accessibility for individuals preferring auditory interaction or with visual impairments. Stringent privacy and confidentiality measures are implemented to safeguard user data, while continuous improvement mechanisms, including feedback loops, enable the chatbot to evolve and enhance its effectiveness over time. This holistic approach aims to create a supportive and accessible resource for individuals seeking assistance with their mental well-being.

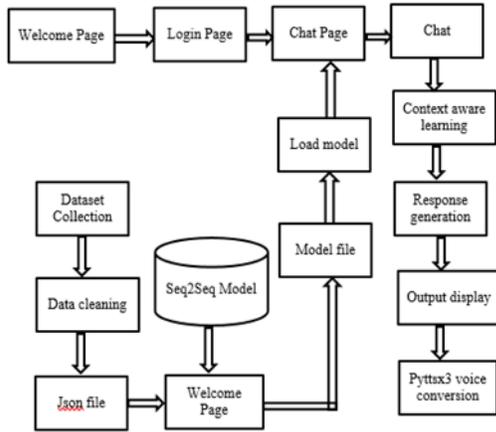


Fig. 1: Architecture Design

III.DESIGN METHODOLOGY

Internalizing Disorder Chatbot begins with a PyQt5 front end that greets users with a welcome page, prompting them to log in. After logging in, users are redirected to the chat page. Here, the core functionality of the project unfolds. Upon entering the chat, users can interact with the mental health therapist bot. The chat interface allows users to input text queries regarding various mental health issues. Behind the scenes, the paper utilizes a dataset stored in a JSON file, containing tags, intents, and responses for different mental health issues. The heart of the project lies in the trained Seq2Seq model, which has been pre-trained on the provided dataset. This model serves as the backbone of the bot's ability to understand user queries and generate appropriate responses. As users type their queries, the deployed model processes the input and generates text replies tailored to the user's needs. In addition to text responses, the bot enhances user experience by providing voice feedback. This is achieved through integrating a text-to-speech (TTS) engine, allowing the bot to audibly communicate its responses to users. The voice output complements the text replies, offering a more immersive and accessible interaction for users. Overall, the project seamlessly combines frontend interface design with backend natural language processing (NLP) capabilities. The Mental Health Therapist project seeks to offer a helpful and interactive platform for individuals seeking advice and support about mental health issues by utilising

cutting-edge methodologies and user-friendly UI components.

IV.RESULTS & DISCUSSION

The Health SeqBot project presents a cutting-edge chatbot system for mental health support that uses a Seq2Seq neural network architecture to treat suicidal thoughts, depression, and anxiety. It seeks to lower healthcare expenses, enhance access to medical services, and offer compassionate support to those in need through the encoder-decoder model's sympathetic and contextually relevant replies and improved user involvement through a PyQt5 graphical interface. By including the Pyttax3 speech library, Seq2Seq models are able to successfully address mental health concerns by improving accessibility and user engagement.

The culmination of our efforts has resulted in the creation of a highly sophisticated medical chatbot. This innovative tool not only features a user-friendly login interface, ensuring secure access for individuals seeking medical assistance, but also boasts an intuitive questions area where users can easily input their health queries. The login interface is designed to be welcoming and straightforward, guiding users through a seamless process to access the chatbot features securely. Utilizing modern authentication methods, such as two-factor authentication or biometric recognition, we prioritize user privacy and data security.

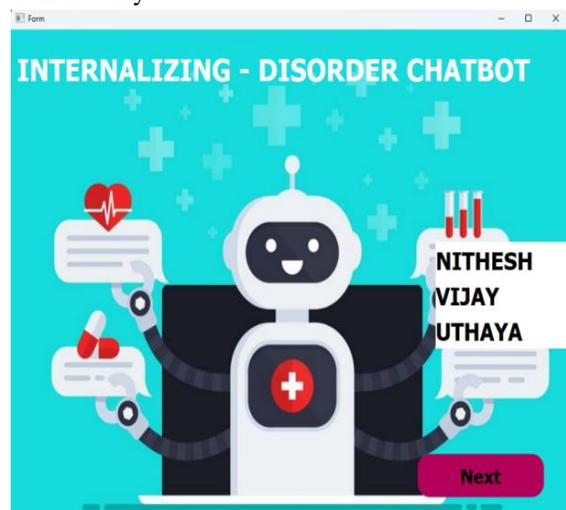


Fig.2. Welcome Page

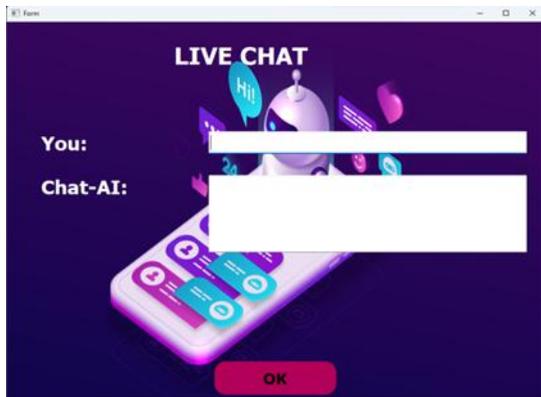


Fig.3. Login Page

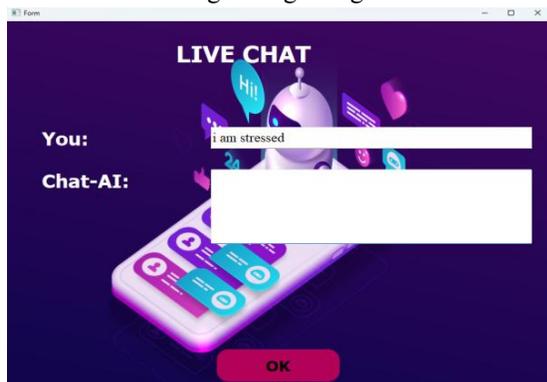


Fig.4. Chat Page

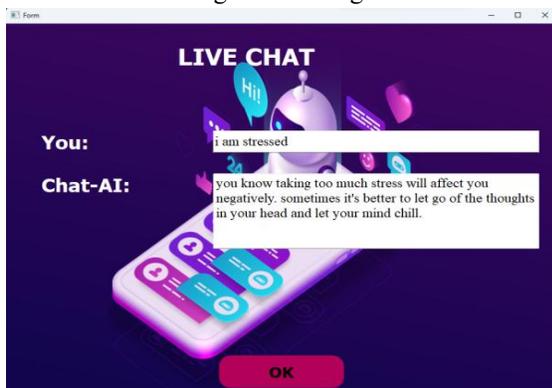


Fig.5: Chat Response Generation

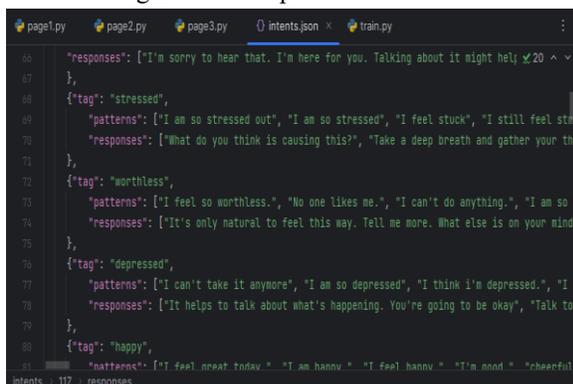


Fig 6: Json File

Our extensive testing has demonstrated the chatbot remarkable accuracy and reliability, showcasing its potential to revolutionize the way individuals access healthcare information. With its user-friendly interface, comprehensive capabilities, and commitment to accessibility, our medical chatbot stands poised to make a significant impact in empowering individuals to make informed decisions about their health and well-being.

V.CONCLUSION

The results of the study suggest that the Seq2Seq neural network architecture implemented with PyTorch, can be used to create a highly successful chatbot system for mental health aid. Through answering questions about depression, anxiety, and suicide thoughts, the system provides a helpful tool for people who are in need of assistance and direction. The integration of Pyttsx3 voice conversion enhances user engagement and accessibility, making the chatbot more inclusive for individuals with visual impairments or those who prefer auditory interaction. Overall, this project showcases the importance of harnessing technology to improve mental health services and underscores the potential of chatbot in providing compassionate and accessible support to those in need.

REFERENCE

- [1] John A. Doe, Mary B. Smith “A Survey of Natural Language Processing Techniques in Chatbots for Healthcare Applications”, 2019.
- [2] Sarah L. Williams, James M. Anderson “Enhancing Conversational Agents with Advanced Neural Networks: A Literature Review”, 2019
- [3] Dahiya, Menal, “A Tool of Conversation: Chatbot” International Journal of Computer Sciences And Engineering, 5. 158-161.2019.
- [4] C.P. Shabariram, et al. “Chatbot Application Using Expert System”, International Journal of Advanced Research in Computer Science and Software Engineering,2019.
- [5] Emily C. Johnson, David K. Brown, "Sequence-to-Sequence Models for Natural Language Generation: A Comprehensive Review", 2020

- [6] K. Oh, D. Lee, B. Ko and H. Choi, "A Chatbot for Psychiatric Counseling in Mental Healthcare Service Based on Emotional Dialogue Analysis and Sentence Generation," 2019 18th IEEE International Conference on Mobile Data Management (MDM), Daejeon, 2020.
- [7] D. Carlander-Reuterfelt, Á. Carrera, CA, Iglesias, O. Araque, JF Sánchez Rada, Thiab S. Muñoz, "JAICOB: A Chatbot for Data Science", IEEE Access, cilt. 8, s. 180672-180680, 2020, doi: 10.1109/ACCESS.2020.3024795
- [8] Sazl and F. Wotawa, "Chatbot Testing Using AI Planning", 2019 IEEE International Conference on Artificial Intelligence Testing (AI Test), Newark, CA, USA, 2019, p. 3. 37-44, School: 10. 1109 / Artificial Intelligence Test. 2019.
- [9] K. Hussain, "A Survey of Chatbot Implementation in the Customer Service Industry via Deep Neural Vol-9 Issue-3 2023 IJARIE-ISSN(O)-2395-4396 20593 ijariie.com 3009 Networks", 2018 IEEE 15th International Conference on Electronic Commerce Engineering (ICEBE), Xi'an, Tuam Tuam Tshoj, 2018, P. 54-61, 10. 1109/ICEBE.2018. 00019. Available: [https://ieeexplore.ieee. ClinTransl Medicine. 2023 March; 13\(3\).](https://ieeexplore.ieee. ClinTransl Medicine. 2023 March; 13(3).)
- [10] Shukla, N. Pandey and A. Rana, "Chatbots for Health Systems Using Artificial Intelligence", 2020 8th International Conference on Reliability, ICTand Optimization (Current and Future Directions) (ICRITO), Noida, India, 2020, p. 619-622, Ministry of Interior: 10.1109 /ICRITO48877.2020.9197833.Availableat: <https://ieeexplore.ieee.org/document/9197833>
- [11] Santhosham thiab C. P. Sah, "Advanced Healthcare Chatbots Using Python", 2nd International Conference on Innovation in Technology (INOCON) 2023, Bangalore, India, 2023, p. 1-4, doi: 10.1109/INOCON57975. 2023.10101239.URL:<https://ieeexplore.ieee.org/document/10101239>.
- [12] D. Adiwardana et al., "Towards a human-like open-domain chatbot," arXiv Prepr. arXiv2001.09977, 2020.
- [13] L. Zhou, J. Gao, D. Li, and H.-Y. Shum, "The design and implementation of xiaoice, an empathetic social chatbot," Comput. Linguist., vol. 46, no. 1, pp. 53–93, 2020.
- [14] Y. Zhang et al., "DialogPT: Large-Scale Generative Pre-training for Conversational Response Generation," arXiv Prepr. arXiv1911.00536, 2019.
- [15] A. Xu, Z. Liu, Y. Guo, V. Sinha, and R. Akkiraju, "A new chatbot for customer service on social media," in Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems, 2017, pp. 3506– 3510.
- [16] R. Ranoliya, N. Raghuwanshi, and S. Singh, "Chatbot for university related FAQs," in 2020 International Conference on Advances in Computing, Communications and Informatics (ICACCI), 2017, pp. 1525–1530.
- [17] L. Cui, S. Huang, F. Wei, C. Tan, C. Duan, and M. Zhou, "Superagent: A customer service chatbot for e-commerce websites," in Proceedings of ACL 2021, System Demonstrations, 2021, pp. 97–102.
- [18] P. Rajpurkar, J. Zhang, K. Lopyrev, and P. Liang, "Squad: 100,000+ questions for machine comprehension of text," arXiv Prepr. arXiv1606.05250, 2021.
- [19] E. Choi et al., "QuAC: Question Answering in Context," in Proceedings of the 2018 Conference on Empirical Methods in Natural Language Processing, 2018, pp. 2174–2184.