IT4010 – Research Project - 2023

Topic Assessment Form

Project ID : TMP-23-116

1. Topic (12 words max)

Depresio: AI Powered Virtual Consulting Assistant for Mental Health - A Comprehensive Solution for Overcoming Communication Barriers

2. Research group the project belongs to

Computing for Inclusive and Equitable Society (CIEC)

3. Research area the project belongs to

ICT for Development (ICTD)

4. If a continuation of a previous project:

Project ID	TMP-23-116
Year	2023

5. Team member details

Student Name	Student ID	Specialization
Leader: Dharmagunarathna S.J.	IT20210892	IT
Member 2: Premarathne H.M.P.D.	IT20211578	IT
Member 3: Harischandra M.A.D.D.K.	IT20211264	IT
Member 4: Ranasgala R.C.S.	IT20128722	IT

6. Brief description of the research problem including references (200 – 500 words max) – references not included in word count

In today's fast-paced and demanding world, mental health has become a major concern for people of all ages. Unfortunately, many individuals who suffer from anxiety, depression, and other mental health issues often find it **difficult to open and talk about their problems with consultants or therapists, because of the fear of judgment or social stigma**. This lack of communication can lead to serious consequences, including a deterioration of mental health and a decrease in overall well-being. To address this problem,

we propose the creation of a chatbot-based counseling **AI Powered Virtual Consulting Assistant for Mental Health** that will serve as an automated and intelligent alternative to traditional consulting services. By leveraging cutting-edge technologies, this smart assistant will enable **individuals to speak openly and directly about their mental health issues, without the fear of judgment or social stigma** [1].

Moreover, our research will focus on developing a comprehensive solution that includes a personalized mood tracking system [2], personalized stress management system [3], emotion recognition, and analysis [4], and with using those data personalized therapy recommendations [5]. The goal is to create a platform that is accessible, reliable, and user-friendly, and that can help **individuals overcome the barriers that prevent them from seeking the help they need.**

Overall, our aim is to create a smart consulting assistant that is not only innovative but also effective in addressing mental health issues [6]. By providing individuals with a safe and secure space to express themselves and utilizing personalized data-driven solutions, we hope to empower them to take control of their mental health and improve their quality of life [7].

References:

[1] Centers for Disease Control and Prevention. (2021). Mental Health and Chronic Diseases. Retrieved from https://www.cdc.gov/mentalhealth/learn

[2] Kim, J. W., Kim, Y. K., & Lee, H. J. (2019). Personalized mood tracking system based on mobile phone usage patterns. Sensors, 19(24), 5369.

[3] Sarkar, S., & Banerjee, S. (2021). Personalized stress management system: a review of current literature. International Journal of Computer Science and Mobile Computing, 10(3), 63-67.

[4] Gunes, H., & Piccardi, M. (2007). Emotion recognition from face and body: the multimodal emotion recognition challenge. IEEE International Conference on Systems, Man, and Cybernetics, 1-6.

[5] Zhang, J., Cao, J., & Zhang, Y. (2020). Personalized mental health therapy recommendation system based on deep reinforcement learning. Journal of Medical Systems, 44(11), 1-10.

[6] Alemi, M., Meghdari, A., & Bashiri, A. (2020). AI-powered mental health chatbots: a review and open research agenda. Journal of Medical Systems, 44(4), 1-16.

[7] Leary, M. R. (2012). Introduction: self and identity in the 21st century. In Handbook of self and identity (pp. 1-14). Guilford Press.

7. Brief description of the nature of the solution including a conceptual diagram (250 words max)

The proposed solution is a comprehensive mental health support system that utilizes natural language processing (NLP) and machine learning (ML) techniques to provide **personalized counseling sessions for individuals.** The system consists of various modules, chatbot-based counseling, personalized therapy recommendations, mental health prediction, personalized music therapy, cognitive-behavioral therapy and stress management.

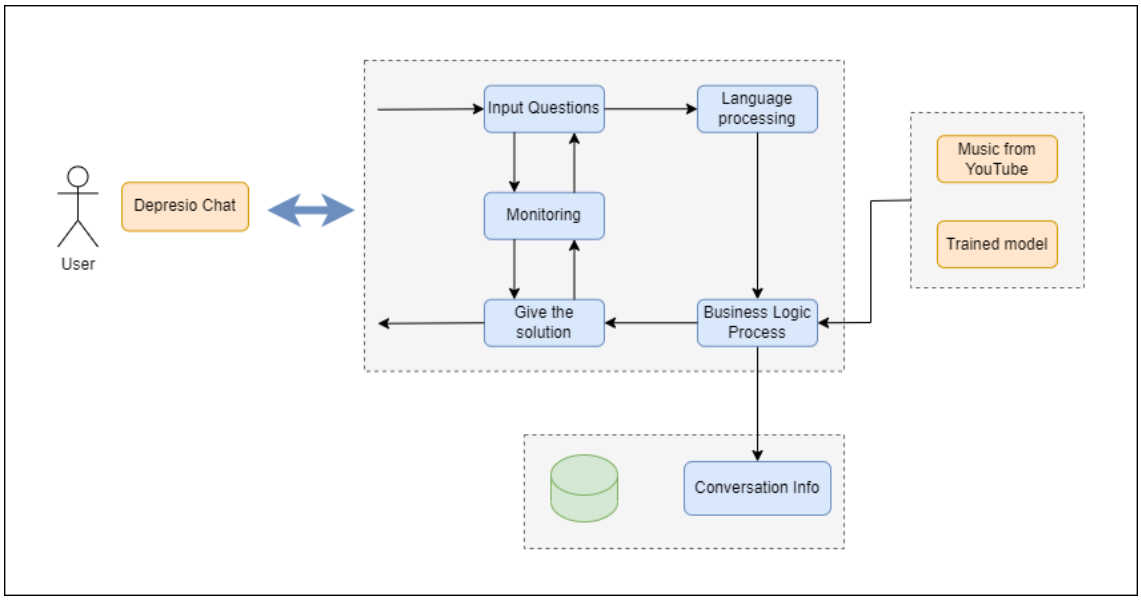
The system's codebase is written in Python and utilizes popular ML and NLP libraries, such as TensorFlow, Keras, Scikit-learn, NLTK, and SpaCy. The repository includes custom trained models, datasets, and scripts for training and testing the models.

By leveraging the latest technologies, this system aims to provide accessible, reliable, and user-friendly mental health support to individuals. The system's personalized approach enables it to understand and respond to users' needs and provide customized solutions and recommendations. **The virtual counseling assistant will provide a safe and secure space for individuals to express themselves without fear of judgment or social stigma.**

Overall, this solution is designed to empower individuals to take control of their mental health and improve their overall well-being through innovative and effective mental health support.

Existing Solutions	Our Proposed Solution
Most existing AI assistants are for general use and not specifically for mental health counseling.	Our solution is specifically designed for mental health counseling and provides personalized support for each user.
Existing solutions may take more time to respond to a user's needs, as they rely on human consultants to review user data and provide feedback.	Our solution uses NLP and ML techniques to provide immediate, accurate support to users.
Existing solutions may not feel as personal to users, as they may feel like they are interacting with an AI system.	Our solution is designed to feel like a personal conversation with a human consultant, which may be more comforting to users who are hesitant to seek help.
Existing solutions may rely on AI to generate solutions based on human input, which can be less effective than human-generated solutions.	Our solution leverages personalized mood tracking, stress management, and emotion recognition and analysis to provide personalized therapy recommendations for each user.
Existing solutions may not effectively address the unique needs and concerns of each user.	Our solution is designed to be accessible, reliable, and user-friendly, and provides personalized support to each user based on their individual needs and concerns.

Conceptual Diagram for the Solution



8. Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

To create a smart consulting assistant that is effective in addressing mental health issues, specialized domain expertise, knowledge, and data requirements are necessary. Expertise in natural language processing (NLP), machine learning (ML), and data analytics are crucial. This includes an understanding of how to **preprocess and analyze textual data**, as well as how to **train and optimize ML models for various NLP tasks**, **such as sentiment analysis, topic modeling, and question-answering**.

Moreover, a deep understanding of mental health and the various issues that individuals may face is also necessary. This includes knowledge of common symptoms and treatments for mental health disorders, as well as an understanding of how **social and cultural factors may impact mental health outcomes**. To ensure the accuracy and effectiveness of the smart consulting assistant, experts in mental health and psychology should be consulted throughout the development process.

In terms of data requirements, diverse dataset of text-based conversations between individuals and mental health professionals would be valuable for training and testing the ML models. Additionally, data on mental health trends and patterns in different populations may be useful for developing more personalized and targeted solutions.

The system's codebase is written in Python, a popular programming language for data science and ML applications. The codebase utilizes **various ML and NLP libraries, such as TensorFlow, Keras, Scikit-learn, NLTK, and SpaCy.** These libraries provide a range of functionalities, including text preprocessing, model training, and evaluation. The repository also includes custom trained, pre-trained models, datasets, and scripts for training and testing the models. Overall, this specialized domain expertise, knowledge, and data requirements will enable the development of a sophisticated and effective smart consulting assistant for mental health issues.

9. Objectives and Novelty

Main Objective

The main objective of the proposed **AI Powered Virtual Consulting Assistant for Mental Health** is to provide personalized and accessible mental health support to individuals using natural language processing (NLP) and machine learning (ML) techniques. By utilizing cutting-edge technologies, The system consists of various modules, chatbot-based counseling, personalized therapy recommendations, mental health prediction, personalized music therapy, cognitive-behavioral therapy, stress management.

The system's codebase is written in Python and uses popular ML and NLP libraries, such as TensorFlow, Keras, Scikit-learn, NLTK, and SpaCy, with trained models, datasets, and scripts for training and testing the models. The AI-based Virtual Mental Consulting Assistant aims to empower individuals to take control of their mental health and **improve their overall well-being by providing a safe and secure space to express themselves without fear of judgment or social stigma.** The objective is to overcome the barriers that prevent individuals from seeking the help they need for anxiety, depression, and other mental health issues, ultimately improving their quality of life.

Member Name	Sub Objective	Tasks	Novelty
Dharmagunarathna S.J.	Natural Language Processing (NLP) based Sentiment Analysis	- Gather and preprocess text data related to mental health. - Develop a sentiment analysis model that can accurately classify text into positive, negative, or neutral	The novelty of this component lies in the use of advanced NLP techniques, such as sentiment analysis and **emotion detection**, to **accurately identify and classify a user's emotional**

		categories. - Incorporate emotion detection techniques to identify specific emotions expressed in the text. - Train and fine-tune the sentiment analysis model using the preprocessed data. - Develop a user interface to allow users to input text and receive sentiment analysis results.	**state**. This will enable the smart consult assistant to provide customized solutions and recommendations that are based on the user's specific mental health needs.
Premarathne H.M.P.D	Cognitive Behavioral Therapy (CBT) based Treatment Recommendations	- Research and gather information on various mental health issues and their corresponding CBT-based treatments. - Develop an algorithm that can match a user's symptoms and mental health history to the appropriate CBT-based treatment.	The novelty of this component lies in the use of CBT techniques to provide customized treatment recommendations that are tailored to the user's specific mental health needs. This will enable the smart assistant to provide targeted and effective solutions that address the

		- Create a database of CBT-based treatment recommendations for various mental health issues. - Continuously update and refine the algorithm and database as new research and treatments become available.	root causes of the user's mental health issues.
Ranasgala R.C.S.	Personalized Treatment Plan	- Research and gather information on various wellness and treatment activities, such as meditation, exercise, and healthy eating. - Develop an ML algorithm that can match a user's personalized preferences and goals to the appropriate wellness activities. - Create a database of personalized wellness plans that incorporate various activities and are tailored to the user's specific needs.	The novelty of this component lies in the use of machine learning algorithms to **generate personalized wellness and treatment plans based on user's emotions** that are tailored to the user's specific needs and preferences. This will enable the smart assistant to provide users with a holistic approach to mental health and well-being, addressing not just the symptoms of mental health issues but also

		- Develop a user interface to allow users to input their preferences and receive customized wellness plans. - Continuously update and refine the algorithm and database as new research and activities become available.	promoting overall physical and mental wellness.
Harischandra M.A.D.D.K.	Personalized Music Therapy	- Gather and preprocess a large corpus of music data, including various genres and moods that is specified for mental calmness. - Develop an ML algorithm that can match a user's mental health needs and preferences to the appropriate music therapy playlist. - Create a database of personalized music therapy playlists that are tailored to the user's specific mental	The novelty of this component lies in the use of machine learning algorithms to **generate personalized music therapy playlists based on user's emotions** that are tailored to the user's specific mental health needs. This will enable the smart assistant to provide users with a powerful tool for reducing stress, improving mood, and promoting overall well-being.

		health needs. - Develop a user interface to allow users to input their mental health needs and preferences and receive customized music therapy playlists. - Continuously update and refine the algorithm and database as new music and research become available.	

10. Supervisor checklist (supervisors should fill sections 10 and 11)

a) Is this research problem valid?

Yes	✓	No	

b) Is the proposed research group correct?

Yes	✓	No	

c) Is the proposed research area correct?

Yes	✓	No	

d) Do the proposed sub-objectives match the students' specialization?

Yes	✓	No	

e) Is the required domain expertise, knowledge, and the data available either through the supervisor or external supervisor?

Yes	✓	No	

f) Is the scope of the solution practical?

Yes	✓	No	

g) Do all sub-objectives have sufficient novelty?

Yes	✓	No	

11. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor	Mr.	Thusithanjana	Thilakarathna	11/02/2023
Co-Supervisor	Mr	Harshanath	S M B	
External Supervisor				
Summary of external supervisor's (if any) experience and expertise				

IT4010 – Research Project - 2023

Topic Assessment Form

Summary Sheet

The topic evaluation panel will use the summary sheet to evaluate the suitability of the project

1. Brief description of research problem including references (200 – 300 words max)

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we propose the creation of a chatbot-based counseling **AI Powered Virtual Consulting Assistant for Mental Health** that will serve as an automated and intelligent alternative to traditional consulting services. By leveraging cutting-edge technologies, this smart assistant will enable **individuals to speak openly and directly about their mental health issues, without the fear of judgment or social stigma** [1].

Moreover, our research will focus on developing a comprehensive solution that includes a personalized mood tracking system [2], personalized stress management system [3], emotion recognition, and analysis [4], and with using those data personalized therapy recommendations [5]. The goal is to create a platform that is accessible, reliable, and user-friendly, and that can help **individuals overcome the barriers that prevent them from seeking the help they need.**

Overall, our aim is to create a smart consulting assistant that is not only innovative but also effective in addressing mental health issues [6]. By providing individuals with a safe and secure space to express themselves and utilizing personalized data-driven solutions, we hope to empower them to take control of their mental health and improve their quality of life [7].

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Topic Assessment Form

2. Brief description of the nature of the solution (150 words max)

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By leveraging the latest technologies, this system aims to provide accessible, reliable, and user-friendly mental health support to individuals. The system's personalized approach enables it to understand and respond to users' needs and provide customized solutions and recommendations. **The virtual counseling assistant will provide a safe and secure space for individuals to express themselves without fear of judgment or social stigma.**

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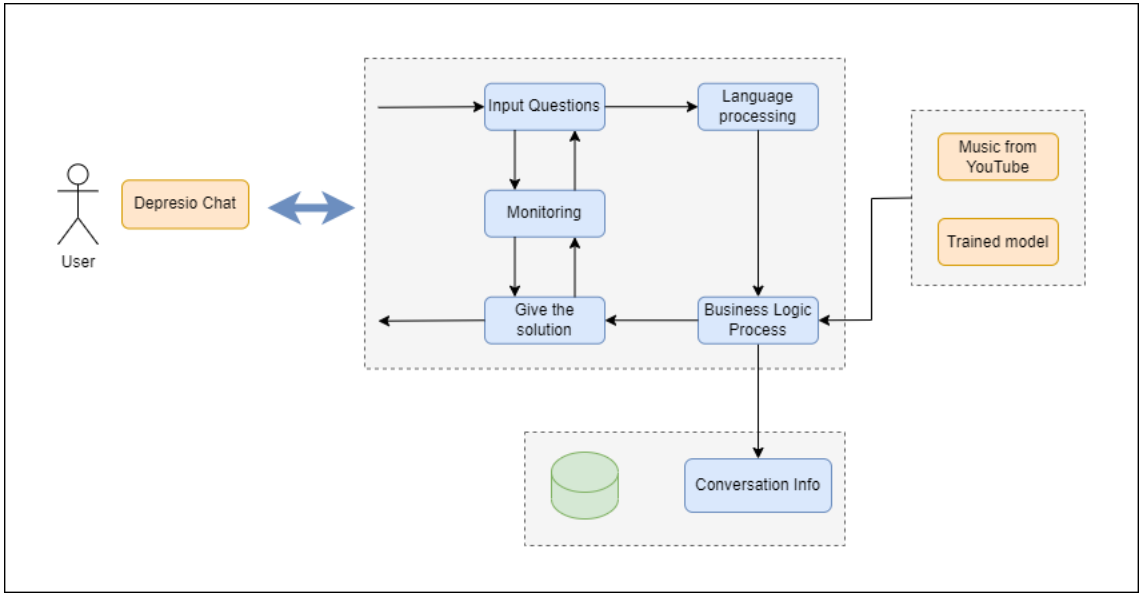

3. Objectives and novelty

Main Objective

The main objective of the proposed AI-based Virtual Mental Consulting Assistant is to provide personalized and accessible mental health support to individuals using natural language processing (NLP) and machine learning (ML) techniques. By utilizing cutting-edge technologies, The system consists of various modules, chatbot-based counseling, personalized therapy recommendations, virtual reality therapy, mental health prediction, personalized music therapy, cognitive-behavioral therapy, stress management.

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		- Incorporate emotion detection techniques to identify specific emotions expressed in the text. - Train and fine-tune the sentiment analysis model using the preprocessed data. - Develop a user interface to allow users to input text and receive sentiment analysis results.	
Premarathne H.M.P.D	Cognitive Behavioral Therapy (CBT) based Treatment Recommendations	- Research and gather information on various mental health issues and their corresponding CBT-based treatments. - Develop an algorithm that can match a user's symptoms and mental health history to the appropriate CBT-based treatment. - Create a database of CBT-based treatment recommendations for various mental health issues.	The novelty of this component lies in the use of **CBT techniques to provide customized treatment recommendations that are tailored to the user's specific mental health needs.** This will enable the smart assistant to provide targeted and effective solutions that address the root causes of the user's mental health issues.

		- Continuously update and refine the algorithm and database as new research and treatments become available.	
Ranasgala R.C.S.	Personalized Treatment Plan	- Research and gather information on various wellness and treatment activities, such as meditation, exercise, and healthy eating. - Develop an ML algorithm that can match a user's personalized preferences and goals to the appropriate wellness activities. - Create a database of personalized wellness plans that incorporate various activities and are tailored to the user's specific needs. - Develop a user interface to allow users to input their preferences and receive customized wellness plans. - Continuously update and refine the algorithm and database as	The novelty of this component lies in the use of machine learning algorithms to **generate personalized wellness and treatment plans based on user's emotions** that are tailored to the user's specific needs and preferences. This will enable the smart assistant to provide users with a holistic approach to mental health and well-being, addressing not just the symptoms of mental health issues but also promoting overall physical and mental wellness.

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		- Continuously update and refine the algorithm and database as new music and research become available. - ML techniques to provide immediate, accurate support to users.	

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Topic Assessment Form

<u>This part to be filled by the Topic Screening Panel members</u>

Acceptable: Mark/Select as necessary

Topic Assessment Accepted	
Topic Assessment Accepted with minor changes (should be followed up by the supervisor)*	
Topic Assessment to be Resubmitted with major changes*	
Topic Assessment Rejected. Topic must be changed	

* Detailed comments given below

Comments

The Review Panel Details

Member's Name	Signature

Important:

1. According to the comments given by the panel, do the necessary modifications and get the approval by the **Supervisor** or the **Same Panel**.
2. If the project topic is rejected, identify a new topic, and request the RP Team for a new topic assessment.
3. The form approved by the panel must be attached to the **Project Charter Form**.