

# MYALO: A System for Recognizing, Diagnosing, and Advising on Three Main Mental Illnesses

<sup>1</sup>Mayadunne J.N.A, <sup>2</sup>Withana W.D.T.S.J, <sup>3</sup>K.D.M.I. Jayathilake, <sup>4</sup>P.G.T. Dilmith, <sup>5</sup>Uthpala Samarakoon, <sup>6</sup>Samanthi Siriwardana

<sup>1,2,3,4,5</sup>Undergraduate, Faculty of Computing, Sri Lanka Institute of Information Technology, Sri Lanka

<sup>6</sup>Lecturer, Faculty of Computing, Sri Lanka Institute of Information Technology, Sri Lanka

**Abstract** - The burgeoning global prevalence of mental health disorders has ignited a critical need for innovative approaches to diagnosis and treatment. This research paper explores the challenges confronted by the Sri Lankan community in identifying and delivering effective care for mental disorders: Schizophrenia, Social anxiety, and Acrophobia, focusing on the imperative development of a tailored expert system. "Mental health" encompasses the intricate interplay of psychological, emotional, and social well-being, significantly influencing an individual's thoughts, emotions, and behaviors. Despite this awareness, Sri Lanka grapples with impediments hindering the accurate recognition and provision of adequate support for these conditions. This study sheds light on the conspicuous escalation of the chosen mental illnesses within Sri Lanka, emphasizing the urgency for contextually relevant interventions. While existing expert systems offer promise, a conspicuous void exists concerning the development of an advanced system targeting schizophrenia, acrophobia, and social anxiety, which prominently impact Sri Lanka's populace. This void calls for the creation of an adept expert system adept at diagnosing and evaluating the severity of these mental health disorders, and subsequently guiding individuals towards tailored treatment avenues. This research envisions an expert system that amalgamates state-of-the-art technologies, including machine learning, with culturally sensitive diagnostic paradigms. By harnessing sophisticated algorithms, this system seeks to achieve precise diagnostic accuracy and nuanced severity assessment. Moreover, the system's integration of socio-cultural dimensions is poised to enhance its applicability within Sri Lanka's unique societal context. In sum, this paper underscores the pressing need for a bespoke expert system tailored to address schizophrenia, acrophobia, and social anxiety within Sri Lanka. The proposed system stands to revolutionize mental health diagnosis and assessment, effectively bridging gaps in care and ushering in a novel era of personalized treatment. This study serves as a pivotal stride towards fortifying mental health care in Sri Lanka, advocating for a more inclusive and proficient approach to mental health disorders.

**Keywords:** (mental health disorders, Expert system, machine learning, treatment, diagnosis)

## I. INTRODUCTION

The field of mental health faces a pervasive and substantial challenge on a global scale, as well as within our cultural context. The alarming dearth of awareness and accessible services has led to countless individuals enduring silent suffering as a consequence. Mental health conditions such as schizophrenia, social anxiety, and acrophobia have a profound impact on individuals, affecting their daily lives, relationships, and overall well-being. [1]Recognizing the pressing need to address this critical concern, our research endeavors to devise a cutting-edge mobile application that serves as a beacon of hope and empowerment.

Our innovative solution addresses schizophrenia, social anxiety, and acrophobia, equipping individuals to understand and manage these conditions for better mental well-being. Previous research emphasizes the demand for awareness and accessible mental health services [2]. Our approach bridges knowledge and practical interventions, utilizing a shared questionnaire for identification and advanced Virtual Reality (VR) for personalized exposure therapy. We prioritize thorough evaluation and personalized treatment suggestions for individual needs. This intervention offers hope to those in need [2].

According to the WHO, social anxiety affects about 7% of early to mid-teenagers, more commonly in females. Acrophobia is present in 5% of those aged twenty to fifty globally [3]. Schizophrenia occurs in 0.3%-0.7% of the world's population, typically emerging in late teens or early twenties. In Sri Lanka, around 0.6% suffer from schizophrenia, with higher rates in urban areas. Social anxiety affects 3.7% of Sri Lankans, particularly women with lower income and education [Citation Needed]. Limited research on acrophobia in Sri Lanka [4] indicates effective exposure therapy among university students. This review targets the lack of accessible digital tools for the mental health needs of these specific conditions in Sri Lanka.

## II. LITERATURE SURVEY

According to the initial level survey of our research, depicted in Figure 1 the proportion concerning the illnesses of Schizophrenia, Social anxiety, and Acrophobia of the Sri Lankan community are as follows.

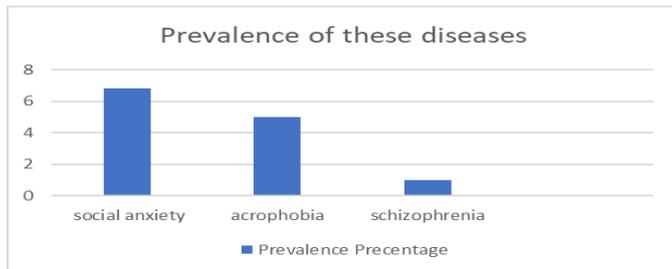


Figure 1: Survey results of the prevalence of the diseases

The literature survey highlights the urgent need for improved awareness and accessible mental health services, particularly for conditions like schizophrenia, social anxiety disorder, and acrophobia [5]. Prior research underscores the significance of accurate diagnosis and personalized treatment. To tackle these challenges, a shared questionnaire set has been employed as an assessment tool [5]. Virtual Reality (VR) technology has also been integrated to identify acrophobia and social anxiety, offering a secure space for individuals to address their fears. Researchers have further enhanced illness assessment and personalized treatment by utilizing tailored exercises to gauge symptom severity [6]. Self-reported user data has contributed to a more nuanced understanding of illness severity, accommodating individual differences, and enabling customized therapeutic strategies.

Digital therapies, such as apps and virtual reality programs, show promise for treating conditions like schizophrenia, acrophobia, and social anxiety. Apps like PRIME [7], FEAR FIGHTER [8], and Richie's Plank Experience [9] have effectively reduced symptoms. These programs integrate mental health specialists to offer live support, fostering a sense of community. They also use diagnostic tools for accurate assessments. Researchers are addressing limitations by focusing on underrepresented disorders and collaborating with local professionals, as seen in the Sri Lankan context. The platform provides tailored treatment, aiming to improve adherence and tackle root causes.

The literature survey underscores innovative efforts to enhance current mental health applications. These include involving experts, integrating diagnostics, targeting underrepresented disorders, tackling language and cultural obstacles, and prioritizing effective treatment strategies. These advancements collectively enhance accuracy, build community support, and mitigate stigma.

## III. METHODOLOGY

The proposed system contains four sub-components. Figure 2 represents the flow and structure of the overall system. The four main components are the Mental Illness Identification phase, Severity checking phase, Initial Level Treatment Stage, and Medium and Extreme Level Treatment Stages.

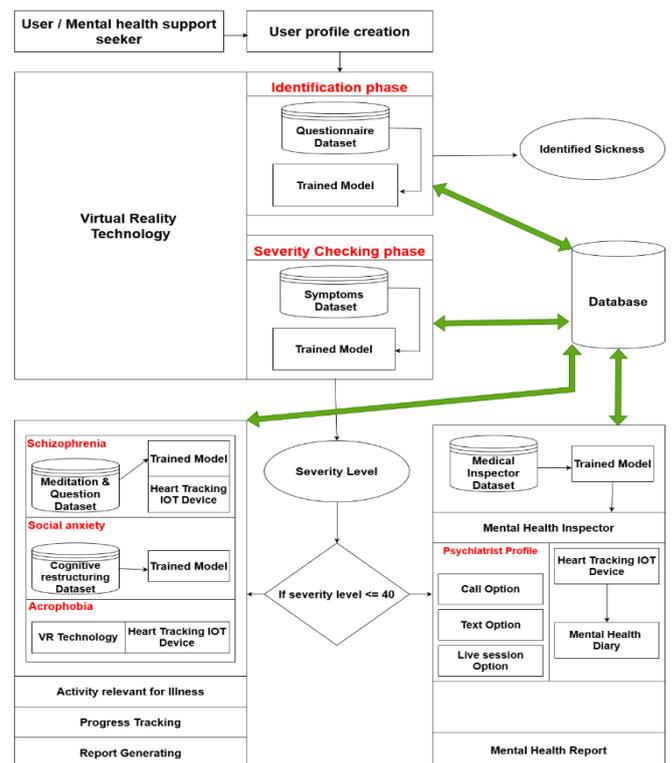


Figure 2: Overview Diagram

### 2.1 Mental Illness Identification phrase

Usage of Machine Learning and VR Technology for the Accurate Prediction of a Specified Illness - This study introduces an innovative method for diagnosing acrophobia, schizophrenia, and social anxiety by combining machine learning [10] and virtual reality (VR) technology [11]. A standardized questionnaire comprising multiple-choice questions (MCQs) is designed to collect pertinent patient information as per Figure 3. By utilizing a trained classification model, the gathered data facilitates precise identification of the patient's mental disorder. Furthermore, VR activities are integrated into the diagnosis to evaluate and manage acrophobia and social anxiety. The innovative aspect of our proposed system lies in its automated diagnostic capability [12]. This eliminates the need for user self-diagnosis and reduces potential biases. By leveraging trained models, the system can analyze questionnaire responses and accurately classify patients into the relevant mental health condition. The integration of VR technology further enhances

the diagnostic process, enabling medical experts and researchers to systematically assess patients' fear responses and symptom intensity.

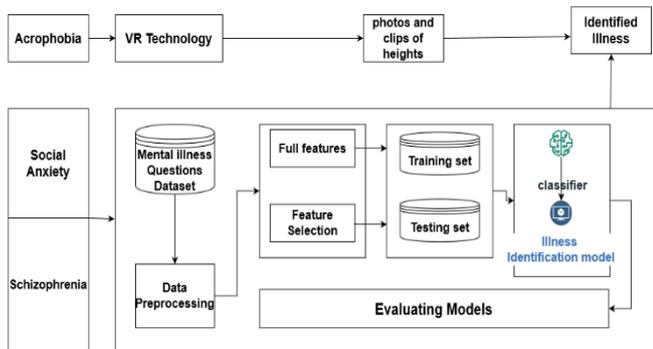


Figure 3: Identification Model Diagram

### 2.2 Severity checking phase

Symptom Scaling - The developed app includes a valuable Symptom Scaling function as depicted in Figure 4 for evaluating symptom severity related to schizophrenia, acrophobia, and social anxiety [13]. This tool enables users to quantitatively assess and track their symptoms, aiding treatment planning and progress monitoring. It offers standardized scales to rate specific symptoms, such as hallucinations, fear responses to heights, and social anxiety symptoms. Therapists can utilize the collected data for personalized interventions and progress reports. However, professional guidance is crucial to ensure accurate assessment and recommendations alongside clinical expertise.

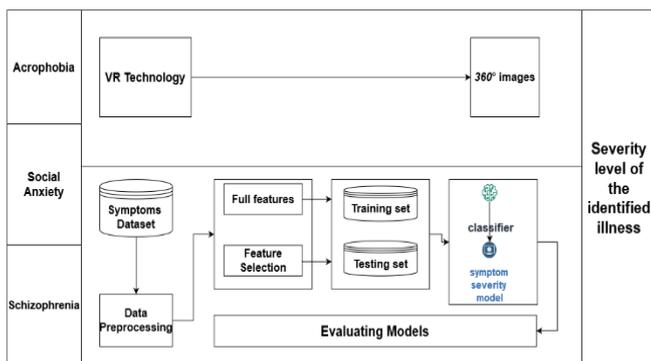


Figure 4: Severity checking Model Diagram

Usage of VR Technology for Severity Checking - Proposing VR technology for assessing the severity of mental health conditions involves creating tailored virtual environments. These settings can replicate real places through immersive 360° images or unique designs. Individuals with conditions like social anxiety or acrophobia can experience lifelike simulations using VR. The aim is to help them confront symptoms in a controlled manner, measuring

reactions to triggers. This approach focuses on symptom measurement rather than therapy.

### 2.3 Initial Level Treatment Stage

The intervention of VR and usage of cognitive therapy visual cues - VR interventions coupled with cognitive therapy visual cues have displayed promise in addressing early-stage acrophobia [14]. By creating secure and controlled settings that offer realistic height-related experiences as depicted in Figure 5, VR interventions leverage platforms like Unity for tailored virtual environments. To bolster the efficacy of such interventions, cognitive behavioral therapy informs the integration of visual cues. Notably, cues like deep breathing and muscle relaxation, established techniques in acrophobia treatment, are incorporated to induce relaxation and mitigate panic responses. The VR intervention includes two key cues to enhance its effectiveness [15]. The first cue employs visuals to guide users in practicing deep and slow breathing, proven to induce relaxation and symptom regulation. This technique helps individuals manage panic and stay calm when encountering virtual heights. The second cue involves visual prompts that lead participants through muscle relaxation, reducing tension and physical symptoms linked to acrophobia. This dual approach aims to bolster the treatment's impact.

The integration of visual cues in the VR intervention serves multiple purposes, acting as therapeutic tools to aid individuals with acrophobia [16]. These cues guide participants in practicing deep breathing and muscle relaxation, facilitating relaxation and the development of coping strategies for fear regulation.

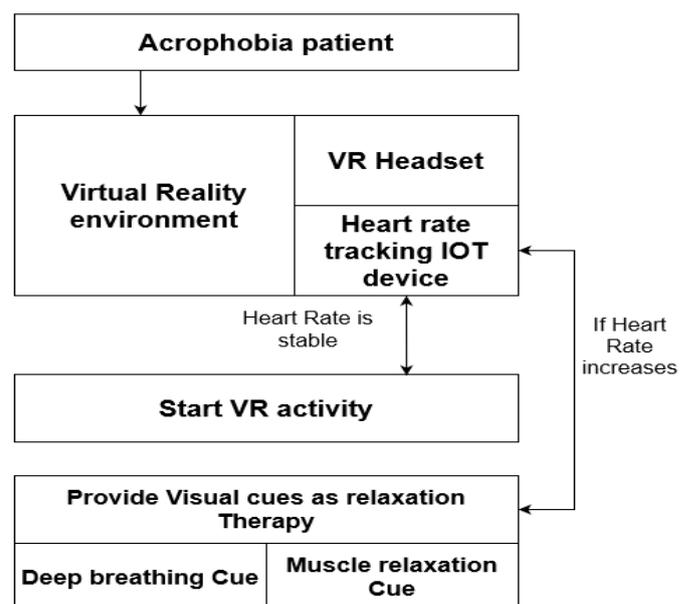
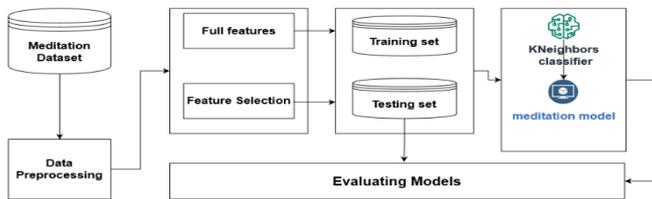


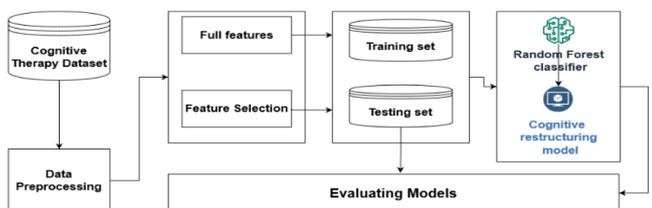
Figure 5: Acrophobia Activity Model Diagram

Usage of Machine learning approaches to predict cognitive behavioral therapy - A data-driven study investigated the impact of meditation on well-being for individuals with schizophrenia, utilizing the "Meditation and Schizophrenia Assessment" dataset. The research focused on predicting the effect of meditation using machine learning. Essential factors considered were meditation duration and heart rate. As shown in **Figure 6** The k-Nearest Neighbors (k-NN) algorithm was chosen for predictive modeling. Training/testing sets were created with an 80:20 split, and the model predicted relaxation levels based on meditation duration and heart rate, achieving accuracy with k=3. This approach offers insights into the relationship between meditation, relaxation, and well-being for this demographic.



**Figure 6: Schizophrenia Activity Model Diagram**

Using machine learning, this study explores how cognitive distortions relate to psychiatric problems and how cognitive restructuring can help. A Random Forest model is created **Figure 7** to classify restructuring techniques and predict suitable questions based on distortion severity and type. Data from the "Cognitive Distortions and Cognitive Restructuring Study" is preprocessed, features like severity and type are extracted, and target variables like techniques and questions are identified. The model is trained on 80% of the dataset using 100 trees. It learns to categorize techniques and predict questions. Evaluation involves comparing predictions with actual values using the test set and using the accuracy score metric to assess model performance.

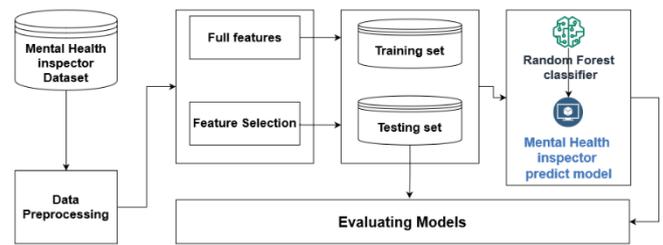


**Figure 7: Social Anxiety Activity Model Diagram**

## 2.4 Medium and Extreme Level Treatment Stage

Usage of Machine learning approaches to Predict Mental Health Inspectors - In this study [17], a novel approach is presented to enhance the efficacy of mental health applications by integrating qualified specialists and employing a random forest classification model as depicted in **Figure 8**. The focus is on predicting appropriate therapists or psychiatrists

based on user severity levels, considering underrepresented disorders like schizophrenia, social anxiety, and acrophobia. The model is trained using user data, incorporating personal experiences, perspectives, and specialist knowledge. Severity levels are used as the target variable, with ranges indicating moderate (40-69) and extreme (70-100) levels. The model aids in accurately matching users with suitable mental health professionals, transcending symptom management for better treatment adherence and effectiveness. The research aims to optimize mental health support accuracy, bolster well-being, and reduce associated stigma by offering culturally sensitive assistance tailored to the Sri Lankan context.



**Figure 8: Mental Health Inspector Prediction Model Diagram**

Incorporating a rating and feedback system is vital for enhancing transparency and credibility in mental health services [18]. To achieve this, we propose the integration of a dedicated feedback section where users can openly share their experiences regarding their designated mental health inspector. This section will encompass fields for an overall rating, as well as specific facets such as communication, professionalism, and expertise. Furthermore, it will offer users the opportunity to provide additional comments and insights, enabling unhindered expression of their viewpoints [19]. Utilizing a numerical rating system like stars or a 1 to 5 scale ensures rating consistency, allowing users to succinctly express their satisfaction with the mental health inspector. Displaying these ratings prominently on the inspector's profile helps potential users make informed choices, showing both overall and specific aspect ratings

Heart Rate tracking IOT Device - Incorporating a heart rate tracker through an IoT device enhances the platform's efficacy and user experience [18], **Figure 9**. This study outlines the integration process. It commences with procuring an Arduino board and a compatible heart rate sensor like MAX30102/Pulse Sensor. Following the sensor manufacturer's guidelines, it's connected to the Arduino. Subsequently, Arduino code is crafted to wirelessly transmit heart rate data to the platform's backend. The front end necessitates a user interface to exhibit real-time heart rate details, permitting users to log it in their mental health diary.

The results and discussion may be combined into a common section or obtainable separately. They may also be

broken into subsets with short, revealing captions. This section should be typed in character size 10pt Times New Roman, Justified.



**Figure 9: Heart Rate Tracking IOT Device Diagram**

Integrating the heart rate tracker seamlessly into the platform allows users and mental health professionals to effortlessly monitor and document heart rate patterns, providing insightful information about their well-being. Sharing this data with mental health experts enhances understanding and personalized treatment strategies. The incorporation of an Arduino-based IoT heart rate tracker enhances the platform's capabilities in tracking and analyzing heart rate trends.

Integrating a Mental Health diary - Integrating a Mental Health diary with a heart rate tracker and user-mental health inspector communication improves care by offering data for treatment adjustment and communication. The diary records mental health experiences, while the heart rate tracker adds physiological insights. Mental health inspectors access entries and heart rate data to identify patterns and tailor treatments. Users' notes add context, promoting engagement and collaborative decisions. Benefits include active user involvement, informed adjustments, and personalized care for enhanced outcomes. This holistic approach advances mental health management.

**IV. RESULTS AND DISCUSSIONS**

Every subcomponent included in Table 1 acts out collectively and interactively. Identification of the mental illness through a mental illness specialized questionnaire pool is a common component for the compared existing applications: PRIME, Fear-fighter, and Richie’s plank experience. For Myalo the uniqueness is emphasized by including a general questionnaire pool specialized for Schizophrenia, Social anxiety, and Acrophobia the Detection of the severity level is available in PRIME and Fear-fighter and Richie’s Plank experience. Yet Myalo consists of this subcomponent and provides the advancement of directing the patient to the level of treatment based on the severity level obtained. Although the existing applications: Richie's plank experience use VR exposure therapy as an initial stage treatment method, Myalo advanced its effectiveness by merging the heart rate tracking mechanism. When referring to the matter of providing therapy, PRIME, fear-fighter, and

Richie's plank experience succeed in their objective. to increase the efficiency of the therapy provided by the proposed application, Myalo uses cognitive behavioral therapy methods. Apart from the mentioned subcomponent maintaining a mental health daily diary can be identified as a unique component of Myalo in comparison with the three existing applications discussed the existing applications PRIME and fear-fighter which are compared here can hold live sessions in between the mental health support seeker and the mental health inspector to increase the convenience of this, Myalo is designed with three separate options as Call, Text, and Video-conference.

**TABLE 1:COMPARISON TABLE BETWEEN MYALO AND EXISTING APPLICATIONS**

Subcomponent	Existing Applications			Uniqueness of Myalo
	PRIME	Fear-Fighter	Richie's plank experience	
Identification of mental illness through a questionnaire pool	✓	✓	✓	Identification of the mental illness through a general questionnaire pool common for Schizophrenia, Social Anxiety, and Acrophobia
Detection of the severity level	✗	✗	✓	Detection of the severity level and directing to the accurate level of treatment
Usage of VR technology for initial-level treatments	✗	✗	✓	Usage of VR technology merging with a Heart Rate Tracking mechanism, for initial-level treatments
Providing therapy using trained models.	✓	✓	✓	Providing Cognitive Behavioral therapy using trained models.
Maintaining a secured mental health daily diary along with the heart rate tracking mechanism	✗	✗	✗	Maintaining a secured mental health daily diary along with the heart rate tracking mechanism
Having customized Live session-holding	✗	✗	✗	Having customized Live session-holding platforms for medium and

Subcomponent	Existing Applications			Uniqueness of Myalo
	PRIME	Fear-Fighter	Richie's plank experience	
platforms for medium and extreme levels				extreme levels with calling, texting, and video-conferencing modes

After clarifying each component, System was able to achieve all of the project management phases. Evaluation demonstrates its effectiveness in identifying and treating chosen mental illnesses (Schizophrenia, Social anxiety, Acrophobia). Myalo's specialized questionnaire pool ensures accurate diagnoses. Severity-based treatment levels enhance productivity. Merging heart rate tracking with VR exposure therapy boosts effectiveness. Cognitive behavioral therapy improves treatment efficiency. Daily diary and live session options offer convenient mental health support.

### V. CONCLUSION

In conclusion, our research endeavors to revolutionize the field of mental health applications by integrating qualified mental health specialists, incorporating diagnostic tools, targeting underrepresented disorders, addressing language and cultural barriers, and emphasizing effective treatment recommendations. By combining these groundbreaking contributions, our application aims to optimize accuracy, foster a supportive community, and improve the well-being of individuals while reducing the stigma associated with mental health issues.

Our application stands out by integrating qualified mental health specialists, offering live assistance, guidance, and fostering a sense of community. This personalized support ensures accurate assessments, and appropriate recommendations, and enhances the platform's effectiveness. Diagnostic tools and standardized symptom scaling provide users with quantitative measurement of symptom severity, enabling self-assessment and progress monitoring. Innovative VR interventions, incorporating cognitive behavioral therapy visual cues, help individuals confront fears in a safe environment, promoting relaxation and coping strategies. Machine learning techniques predict suitable therapies and mental health professionals based on data analysis, facilitating personalized recommendations. Integration of a rating system, IoT heart rate tracking, and a mental health diary enhance functionality and user experience. Transparency is fostered through ratings and feedback, while physiological insights and

collaborative decision-making are facilitated by heart rate tracking and the mental health diary.

Accordingly, while the proposed application targets a range of mental health concerns, future iterations could extend their focus to include a broader spectrum of disorders, ensuring that a wider population's needs are met comprehensively. On the other hand, As AI and machine learning continue to advance, Myalo could incorporate more sophisticated algorithms to refine treatment suggestions. This could involve personalized adaptive interventions that evolve based on user responses and changing circumstances. Expanding the application's availability to regions with limited access to mental health resources could have a significant positive impact. Collaboration with non-profit organizations and governments could facilitate this expansion. Finally, to truly break down language and cultural barriers, our application could be expanded to include support for a wider array of languages and cultural nuances. This would make mental health resources more accessible to diverse communities worldwide.

### REFERENCES

- [1] K. E. L. M. & C.-K. D. Anderson, "Exploring mental health professionals' perspectives on using mobile technologies for mental health care," JMIR Mental Health, 2020.
- [2] D. Jayasuriya, "Mental health in Sri Lanka: Where is it heading?," International Journal of Mental Health Systems,, vol. 4(1), p. 22, 2010.
- [3] F. A. J. R. S. K. J. & S. P. G. Schultze-Lutter, "Schizophrenia Proneness Instrument, Adult Version (SPI-A)," Rome: Giovanni FioritiEditore, 2007.
- [4] C. S. R. & P. M. Siriwardhana, " Caregiving impacts on caregivers' mental health: A population-based cross-sectional study in rural Sri Lanka," Social Psychiatry and Psychiatric Epidemiology, vol. 48(7), pp. 1161-1167, 2013.
- [5] J. R. A. & M. V., " Muroff Virtual reality in the assessment and treatment of psychosis: a systematic review of its utility, acceptability, and effectiveness.," Psychological Medicine, vol. 48(3), pp. 362-391, 2018.
- [6] M. B. & E. P. M. Powers, "Virtual reality exposure therapy for anxiety disorders: A meta-analysis," Journal of Anxiety Disorders, vol. 22(3), pp. 561-569, 2008.
- [7] "https://psmag.com/news/meet-prime-the-new-app-that-wants-to-help-treat-schizophrenia".
- [8] "https://onemindpsyberguide.org/expert-review/fearfighter-expert-review/".
- [9] "https://midlifegamergeek.com/2021/10/10/review-richies-plank-experience/".

[10] X. Z. H. C. S. L. J. & H. G. Yao, "Machine Learning in Mental Health: A Systematic Review," Journal of Medical Internet Research,, vol. e16724, p. 22(4), 2020.

[11] J. L. Y. C. & M. N. Maples-Keller, "Virtual reality exposure therapy for social anxiety disorder: A systematic review," Journal of Anxiety Disorders, vol. 102277, p. 74, 2020.

[12] R. C. A. G. C. L. J. H. E. M. D. K. N. S. L. ..& Z. A. M. Kessler, " Short screening scales to monitor population prevalences and trends in non-specific psychological distress," Psychological Medicine, vol. 32(06), pp. 959-976, 2002.

[13] A. M. C. P. P. & M. R. J. Heeren, "Attention bias modification for social anxiety: A systematic review and meta-analysis," Clinical Psychology Review, vol. 40, pp. 76-90, 2015.

[14] D. R. S. R. A. E. A. C. D. S. B. & S. M. Freeman, "Virtual reality in the assessment, understanding, and treatment of mental health disorders," Psychological Medicine, vol. 47(14), pp. 2393-2400, 2017.

[15] A. E. R. T. W. F. H. & R. W. T. Meuret, "Voluntary hyperventilation in the treatment of panic disorder - Functions of hyperventilation, their implications for breathing training, and recommendations for standardization," Clinical Psychology Review, vol. 25(3), pp. 285-306, 2005.

[16] C. S. B. B. R. M. & G.-P. A. Botella, "Virtual reality exposure-based therapy for the treatment of post-traumatic stress disorder: A review of its efficacy, the adequacy of the treatment protocol, and its acceptability," Neuropsychiatric Disease and Treatment, vol. 11, p. 2533–2545, 2015.

[17] E. C. M. E. M. M. S. M. & R. C. M. Børøsund, " How User Characteristics Affect Use Patterns in Web-Based Illness Management Support for Patients with Breast and Prostate Cancer," Journal of Medical Internet Research , vol. e77, p. 16(3) , 2014.

[18] M. A. F. C. D. A. C. L. & W. P. J. Pimentel, "The Challenge of Detecting Hypovolemia and Dehydration in Older Adults Using Augmented Reality Glasses," Journal of Medical Internet Research, vol. e111, p. 19(4), 2017.

[19] D. B. F. P. & K. N. Dwyer, " Machine learning approaches for clinical psychology and psychiatry," Annual Review of Clinical Psychology, vol. 14, pp. 91-118, 2018.

### AUTHORS BIOGRAPHY



Name – J.N.A.Mayadunne

E-mail – jnavodya.mayadunne@gmail@gmail.com  
Title - Undergraduate



Name –W.D.T.S.J. Withana

E-mail – sathmawithana0@gmail.com  
Title - Undergraduate



Name –G.W.C.D. Jayathilaka

E-mail – dileeshana2000@gmail.com  
Title - Undergraduate



Name – P.G.T. Dilmith

E-mail – thisaldilmith16@gmail.com  
Title - Undergraduate



Name – Uthpala Samarakoon

E-mail – uthpala.s@sliit.lk  
Title - Senior Lecture



Name – Samantha Siriwardana

E-mail – samanthi.s@sliit.lk  
Title - Lecturer

**Citation of this Article:**

Mayadunne J.N.A, Withana W.D.T.S.J, K.D.M.I. Jayathilake, P.G.T. Dilmith, Uthpala Samarakoon, Samanthi Siriwardana, "MYALO: A System for Recognizing, Diagnosing, and Advising on Three Main Mental Illnesses" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 7, Issue 10, pp 445-452, October 2023. Article DOI <https://doi.org/10.47001/IRJIET/2023.710059>

\*\*\*\*\*