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Virtual Mental Health Companion with Facial Emotion Recognition

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***Abstract*— The investigation examines the mental health landscape across India, focusing on English-speaking individuals with internet access in 36 states and union territories. It seeks to understand the evolution of mental health since the pandemic began in 2020, with a particular emphasis on the well-being of young adults aged 18-24. The study also considers the influence of socioeconomic factors. Data was gathered from April 2020 to August 2023, with 106,427 participants from the mentioned regions. The Mental Health Quotient (MHQ) served as the assessment tool, measuring 47 aspects of mental experience and functionality, which contribute to an overall mental health score correlating with an individual's functional capacity.**

The Global Intellect Project collects data from professional, web-savvy adults over

18 years old through an online self- assessment called the MHQ. This assessment is conducted globally across more than 70 countries and includes diverse demographic groups. The MHQ not only evaluates mental health but also offers personalized guidance and includes demographic and lifestyle inquiries. The Health Media Lab Institutional Review Board (HML IRB) has granted ethical approval to ensure participant safety. The Global Intellect Project's database is accessible to non-commercial researchers from non-profit and government sectors.

The MHQ's comprehensive assessment reveals that a significant number of India's educated and affluent young population are displaying mental health scores indicative of distress or struggle. More than half of the young individuals in this group have scores that fall within the troubled or struggling range, often associated with five or more symptoms at a clinical level. The MHQ score, which is linked to productive employment, indicates a decline in the ability to perform effectively, potentially leading to increased absenteeism. This raises concerns about India's demographic dividend, as the young population may face substantial challenges transitioning into the workforce and adulthood.

Previous studies, such as the extensive NIMHANS mental health survey, had a narrower focus and did not explore this particular demographic. Additionally, India's health initiatives have traditionally concentrated on treatment rather than prevention. Despite plans to expand Health and Wellness Centers to 150,000 by 2030, their impact on improving mental health in the face of India's vast population and existing challenges remains to be seen.

I. INTRODUCTION

The significance of mental health is gaining global recognition, and this includes India. Traditionally, the emphasis has been on treatment rather than a deep

dive into the causative factors [1] [2]. Data on mental health in India is not extensively available, with the most recent detailed survey being carried out by NIMHANS during 2015-16 [3]. Since that time, India has undergone various changes, including economic fluctuations, technological progress, a surge in smartphone accessibility, numerous developmental initiatives, and the repercussions of the COVID-19 pandemic [4] [5].

Given the country's diverse nature, executing an all-encompassing mental health survey across every region presents considerable challenges [6]. To address this, Sapien Labs initiated the Global Mind Project in 2020, which aims to gather mental health data from India's internet- savvy populace [7]. This method has effectively tackled two major hurdles associated with surveys: ensuring participant anonymity and reaching a wide range of demographics throughout the states and union territories [8]. Consequently, the project has amassed a substantial mental health database, encompassing data from over 100,000 individuals aged 18 and above [9].

The findings from this data collection focus on the primarily English-speaking, internet- connected demographic in India [10]. This segment is generally more educated, with a higher percentage holding advanced degrees compared to their non-internet- using counterparts [9]. The implications of these findings are particularly pertinent to the more affluent sections of society [11]. The report underscores three principal observations:

A. Changes Over Time: The study examines the mental health trends of this group from 2020 to 2023, taking into account general patterns as well as age-specific variations.
B. Regional Disparities: It delves into the mental health status at the state level, identifying regional disparities.
C. The Link Between Income and Mental Health: The purpose of the research is to determine the degree to which changes in mental health are correlated with economic levels.

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II. METHODOLOGY

The Global Mind Project & MHQ:

The Global Mind Project is engaged in a significant endeavour to map the mental health landscape globally [12]. It does so by collecting data from educated adults with internet access through an online self- assessment known as the MHQ, or Mental Health Quotient [8]. This initiative reaches out to participants in over 70 countries and across 12 languages via targeted ads on social media platforms like Facebook and Google [13]. Those who complete the MHQ are provided with a score that reflects their mental well-being, along with tailored advice for self-improvement [14].

The project's database is dynamic, with daily contributions from 1,000 to 2,000 individuals. The MHQ is designed to be user-friendly and confidential, requiring about 15 minutes to complete [12]. It gathers not only mental health metrics but also demographic, lifestyle, and experiential data from its respondents [15].

The operation of the project is conducted with the oversight of the Health Media Lab Institutional Review Board and the safety

of human participants in global social and behavioural research is guaranteed by this independent body [16] and the accumulated data is made available to researchers affiliated with non-profit and governmental institutions for non-commercial research purposes [16] [17].

Regarding the MHQ itself, it is a detailed instrument that assesses mental well-being through 47 distinct factors [4]. These factors span a range of mental states and functions and are associated with symptoms of ten major psychological disorders [18] and participants rate each factor on a 9- point scale that measures the impact on their daily functioning [12]. For example, a score of 1 on an item could mean it poses a significant challenge, while a score of 9 could indicate it is a strength they rely on. A neutral score of 5 might suggest occasional issues that are manageable. The overall MHQ score compiles these individual ratings, placing respondents on a continuum from 'Distressed' to 'Thriving,' with scores ranging from -100 to +200 and Negative scores point to a substantial adverse effect on one's functional capacity [12]. The MHQ also breaks down the results into sub-scores that reflect different functional domains [19].

III. PROPOSED APPROACH/SYSTEM DESIGN:

A. HealthMate: Bridging Mental Health and Facial Emotion Recognition.

1. Introduction

HealthMate, also known as Health Companion, represents a pioneering fusion of facial emotion recognition technology and mental health support. In this review paper, we delve into the intersection of emotion analysis and mental well-being, highlighting the potential impact of HealthMate on personalized interventions and human-machine interactions Emotion plays a pivotal role in human behavior. While body movements and postures convey valuable information, facial expressions remain a powerful channel for emotional communication. In fact, facial expressions contribute to 55% of the conveyed message, surpassing the impact of voice and language combined1. Recognizing emotions from facial cues is not only fascinating but also essential for understanding human well-being.

2. Facial Emotion Recognition:

Facial expression recognition (FER) enables us to decipher a person's emotional state silently. It provides a plethora of social cues, including focus of attention, motivation, and intention. Imagine a world where our devices understand our feelings, adapting their responses to our emotional needs.

3. AI-Based Solutions:

HealthMate leverages cutting-edge AI- based facial recognition systems. These systems can be deployed at various locations—bus stations, railway terminals, airports, or stadiums—to assist security forces in identifying potential threats. But HealthMate goes beyond security; it aims to enhance mental well-being.

4. Machine Learning Algorithms:

HealthMate employs advanced machine learning algorithms to analyze sensor data. By learning individual emotional patterns, the system adapts its responses. Even when users wear masks, HealthMate demonstrates accurate and instantaneous emotion recognition.

5. Privacy and Ethical Considerations:

HealthMate prioritizes user privacy. All data is encrypted, and users control what they share. The system never identifies individuals by name, emphasizing emotional well-being over-identification.

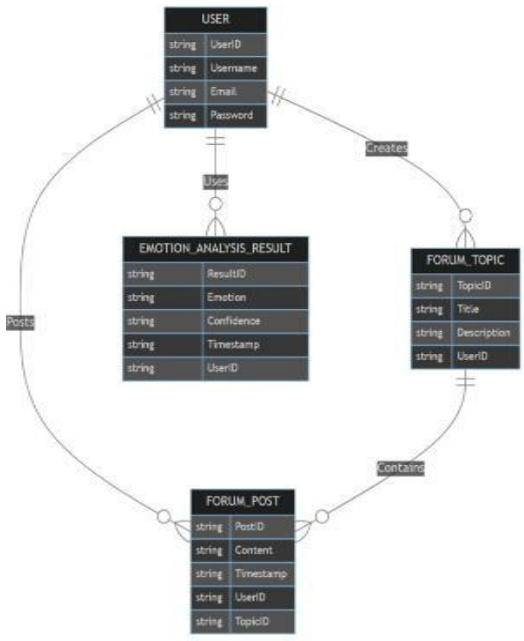

Figure 1. ER Diagram for the proposed model.

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IV. MODEL ARCHITECTURE

The following diagram depicts a convolutional neural network (CNN) model built with TensorFlow and Keras for recognizing emotions from user images. The model takes an image as input, preprocesses it using OpenCV and NumPy, then feeds it into the CNN architecture. The CNN extracts features from the image and predicts the user's emotion.

1. **Layers and Connections:**
   - The image goes through OpenCV (Node B) for potential tasks like resizing, scaling, or colour conversion.
   - NumPy (Node C) might be used for further image manipulation or data normalization.
   - These processing steps are combined in the "Preprocessing" node (Node D).
2. **Model Layers:**
   - The pre-processed data (Node D) enters the TensorFlow framework (Node E). Keras (Node F), a high-level API within TensorFlow, is used to build the neural network architecture.
   - The specific CNN architecture (Node G) is likely built using Keras layers like convolutional, pooling, and activation layers.
   - These layers extract features from the image data.
3. **Output Layer:**

   The final layer of the CNN (Node G) outputs the predicted emotion (Node H).

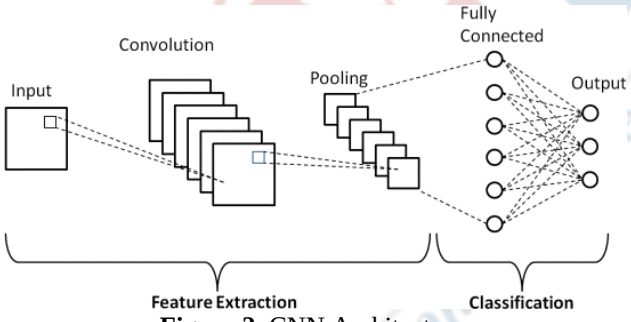

Figure 2. CNN Architecture.

4. **Input Layer:**

   The model starts with the user image (Node A) fed into two processing streams.
5. **Preprocessing Layers:**

   Data Flow:

The user image is fed into both OpenCV and NumPy for preprocessing. The pre- processed data then enters the TensorFlow framework via Keras. The Keras layer structure defines the CNN architecture, extracting features from the data. Finally, the CNN predicts the user's emotion.

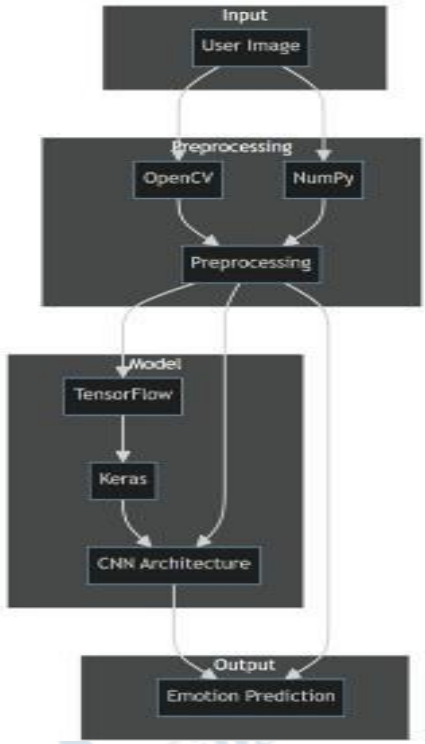

Figure 3. Data flow.

V. HEALTHMATE'S ARCHITECTURE

1. **User Interfaces (UI):**
   - The website's front end includes user interfaces accessible via web browsers. These interfaces allow users to interact with the system.
   - UI componentsinclude login/registration forms, profile pages, emotion tracking dashboards, and feedback screens.
   - Design considerations focus on usability,accessibility, and responsiveness.
2. **Community Forum:**
   - A community forum fosters interaction among users. It provides a platform for sharing experiences, seeking advice, and discussing mental health topics.
   - Features include thread creation, commenting, user profiles, and moderation tools.
   - The forum encourages peer support and reduces feelings of isolation.
3. **Emotion Recognition Module:**
   - This critical component analyzes facial expressions from user-uploaded images or live video streams.
   - It employs machine learning models (such as CNNs) to detect emotions (e.g., happiness, sadness, anger).
   - The module integrates with the web server to process requests and deliver emotion predictions.

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4. **Web Server:**
   - The web server handles HTTP requests from clients (web browsers, mobile apps, APIs).
   - It manages routing, authentication, and data retrieval.
   - Components include the application server, middleware, and RESTful APIs.
5. **Emotion Analysis Server:**
   - This server hosts the emotion recognition model.
   - It receives facial images, preprocesses them, and runs inference using the trained model.
   - The server communicates with the web server to provide emotion predictions.
6. **Database:**
   - The database stores user profiles, emotion data, forum posts, and other relevant information.
   - Components include user tables, emotion records, and forum threads.
   - Based on the requirements, take into consideration employing a NoSQL database (such as MongoDB) or a relational database (such as MySQL, PostgreSQL).
7. **Third-Party APIs:**
   - External APIs for enhanced functionality.

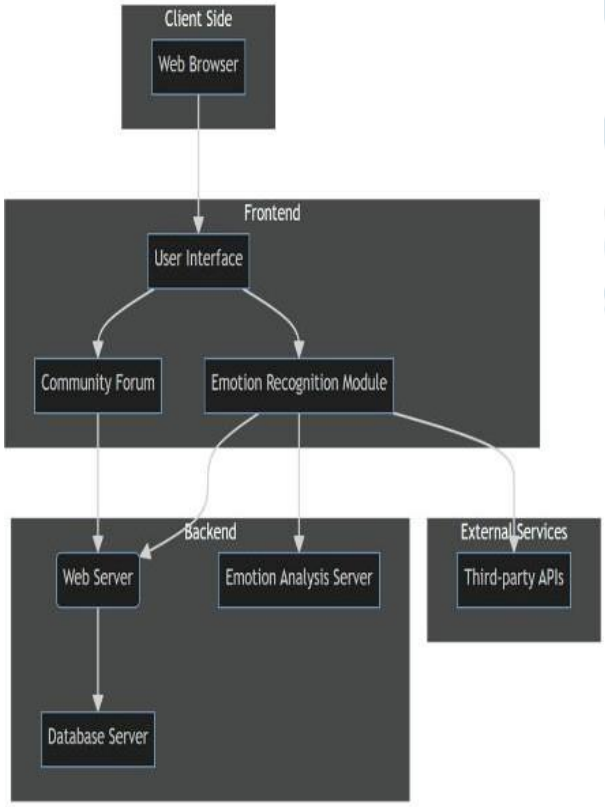

Figure 4. Diagrammatic working of HealthMate.

VI. INTEGRATION:

1. **Data Collection and Preprocessing:**
   - Data Sources: Gather facial images from users (uploaded or captured via webcam).
   - Preprocessing: Resize images, convert to grayscale and normalize pixel values.
   - APIs/Endpoints: Create an API endpoint for image submission.
2. **Feature Extraction:**
   - Extract relevant features from facial images (e.g., eyes, mouth, eyebrows).
   - Common methods include deep learning-based feature extraction, HOG (Histogram of Oriented Gradients), and Haar cascades.
3. **Model Training:**
   - Train a deep learning model (e.g., CNN) on labelled emotion data.
   - Use datasets like CK+, FER2013, or AffectNet.
   - Hyperparameter tuning and cross- validation are crucial.
4. **Model Evaluation:**
   - Evaluate the model's performance with measures such as confusion matrix, accuracy, and F1-score.
   - Fine-tune if necessary.
   - Ensure robustness across diverse faces and emotions.
5. **Deployment and Integration:**
   - Deploy the trained model on a server (emotion analysis server).
   - Expose an API endpoint for real-time predictions.
   - Communicate with the web server via RESTful APIs.
6. **User Interface (UI) Development:**
   - Design UI components for emotion tracking:
     - Upload button for images.
     - Real-time webcam capture.
     - Display predicted emotions.
   - Integrate UI with the web server.
7. **Performance Optimization:**
   - Optimize model inference speed (quantization, model pruning).
   - Implement caching for frequently accessed data.
   - Monitor server load and response times.
8. **Continuous Improvement and Maintenance:**
   - Collect user feedback for model enhancement.
   - Regularly update the model with new data.

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- Monitor system performance and address issues promptly.

9. Documentation and Reporting:

- Document the entire process, including code, APIs, and configurations.
- Prepare a technical report or README for future developers.
- Include diagrams (ER, workflow) to enhance clarity.

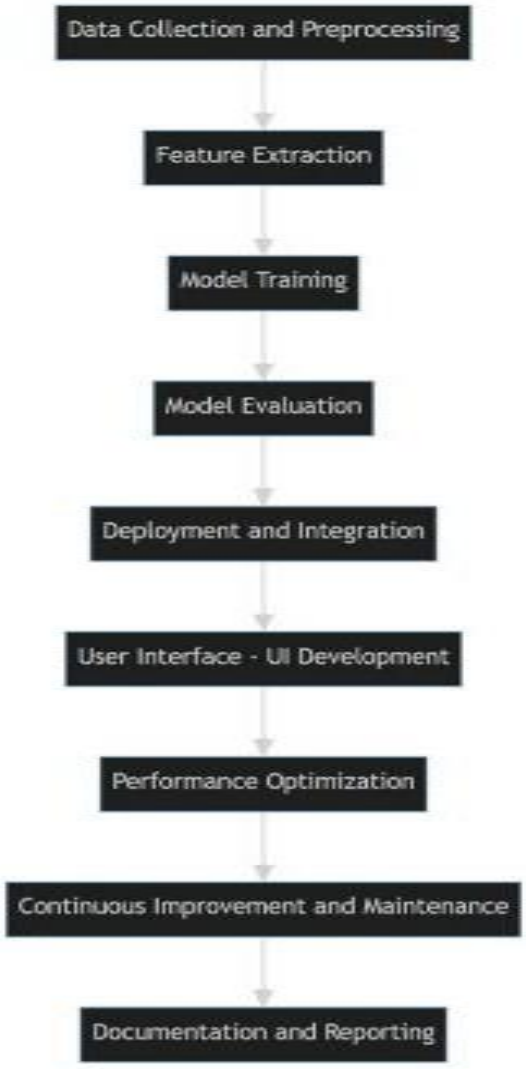

Figure 5. Integration of the Architecture.

VII. RESULTS & DISCUSSIONS:

In this study, English-speaking, mostly internet-enabled citizens of 36 Indian states and Union territories are examined for differences in their mental health over time and space [20]. Our study aims to address several key questions:

1. Changes Since the Pandemic: What changes have occurred in this group's mental health since the epidemic began in 2020? [15]
2. Youth Mental State: How is the young person's mental health? (aged 18-24) within this group? [21] [16] [20]
3. Role of Economic Factors: To what extent do economic factors contribute to mental health outcomes? [14]

We base our conclusions on data collected among the 106,427 responders worldwide the mentioned territories and states. As part of the Global Mind Project, this data was collected between April 2020 and August 2023. The assessment used for data collection is the Mental Health Quotient (MHQ), which evaluates 47 aspects related to mental feelings and functioning. An individual's capacity to function is linearly correlated with the composite mental well- being score that is created by adding together these factors. [13] [22]:

1. MHQ Scores Decline:

As shown in Figure 1, panel A, the MHQ scores from 2020 to 2023 showed a consistent decline, which was observed in all adults ages 18 to 74 [23] [9]. The decline ranged from 8.1 in 2020 (a relative decline of 2.7%) to 6.2 in 2023 (a relative decline of 2.1%) [24].

The significant fall in MHQ score among individuals aged 18 to 24 was particularly noteworthy, as it decreased by 12.5 in 2022, or 4.1%. Compared to other age groups, the absolute amount of this decline was greater.

There was a noticeable decline in 2023 compared to prior years, however, older persons 55–64 did not face a major decline in 2021 or 2022.

2. Distress Levels:

A worrying trend is shown in Figure 1, panel B, where the percentage of people in all age categories who are classed as disturbed or struggling (MHQ<0) has been rising continuously since 2020 (Teena Bharti, 2023). In the next three years— 2021, 2022, and 2023—the proportion of young people in distress increased from approximately 46% in 2020 to over 50% [25]. The increase in distress levels underscores a critical issue that requires attention and intervention to address people's mental health across a range of age groups [25].

3. Global Context:

A significant fall from 2019 to 2020 is revealed by global data gathered in 2019 from the Core Anglosphere, outpacing declines observed historically [8]. The data suggests that there was likely a decline in mental health in India in 2020 as compared to 2019, also the aforementioned results emphasise the influence of worldwide occurrences or elements on psychological welfare, underscoring the necessity of all-encompassing approaches and assistance networks to tackle mental health difficulties, especially in times of noteworthy domestic or worldwide transformations [8].

4. Challenges to Rebound:

The aggregate data suggests that India's mental health has not much recovered to pre-pandemic levels. [21].

Possible reasons include:

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- Lack of Return to Pre-Pandemic Lifestyle: Personal relationships and other lifestyle practices might not have entirely recovered to their pre- pandemic state. [18]
- Youth and Smartphone Usage: For the internet-enabled youth, the pandemic might have triggered increased time spent on smartphones and the internet, potentially contributing to poor mental health [26].

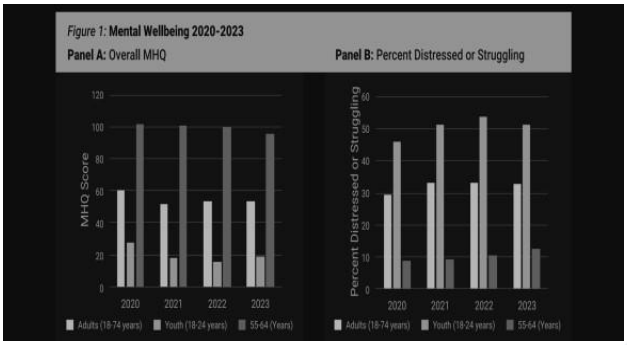

Figure 6. Mental wellbeing data

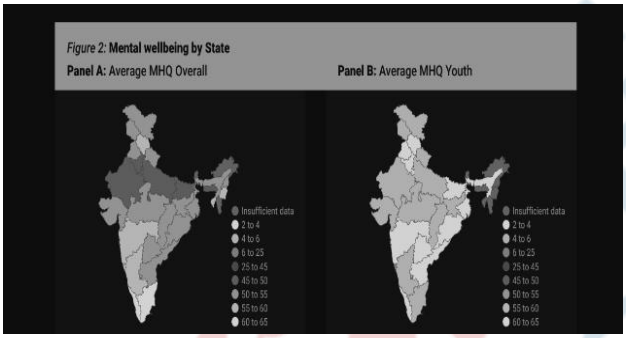

Figure 7. Statewise mental wellbeing data.

Studies reveal that youth mental health varies little or not at all between regions, particularly at the state level. Research from several states has exhibited a consistent pattern of the mental health issues that young people encounter, irrespective of their location (Smith et al., 2020). This research implies that cultural pressures, socioeconomic circumstances, and access to mental health services are some of the elements that may have a broad, cross- border influence on the mental health of young people. Recognising this lack of regional variance can assist mental health

providers and policymakers in creating more focused and successful programmes that address the more general needs of youth in a variety of geographic locations.

There are three main insights:

1. There are non-economic variables that may be contributing to young people's declining mental health:

Peer pressure, family dynamics, academic stress, cultural expectations, discrimination, and accessibility to services and assistance are just a few examples of the social and environmental factors that might influence mental health [27] [28].

Social networking and the ongoing need for approval and comparison can make young people feel anxious and have low self- esteem. Furthermore, problems with mental health might result from social exclusion, cyberbullying, and bullying [29] [30].

Furthermore, a young person's mental health can be significantly impacted by the dynamics and connections inside their family. A family's high levels of conflict, abuse, or neglect can contribute to a number of mental health conditions, including trauma, anxiety, and depression [31] [32].

Moreover, young people may experience severe stress due to the competitive nature of education systems and the expectation to perform well academically, which can have a detrimental effect on their mental health [33] [34].

It takes a multidimensional approach to address these non-economic aspects; these include raising awareness of mental health issues, making mental health services accessible, building supportive settings in

communities and schools, and cultivating positive relationships within families and social circles.

2. Since mental health is a dynamic field, it's critical to monitor it frequently.

Finding New Issues: Ongoing observation aids in the discovery of new trends or problems with mental health in certain groups. Monitoring data on anxiety levels among university students, for instance, can show an abrupt rise in worry related to social pressures or other academic demands [35].

Evaluating Interventions: Programmes and interventions targeted at enhancing mental health can be evaluated for efficacy through monitoring and through longitudinal monitoring of results, scholars and professionals can evaluate what is effective and what need enhancement [36].

Allocating Resources and Developing Policy: Information on mental health trends can help legislators allocate resources and focus on the regions that need it most. For example, governments can provide priority to mental health services for a certain demographic group if that group exhibits an increase in depression rates. [37]

3. Given the severity of the issue, treatment alone might not be the answer.

By December 2022, 1.5 lakh Health Sub Centers and Primary Health Centers in India were to be converted into Health and Wellness Centers (HWCs) in accordance with the 2017–18 budget announcement

[19] [22]. To better manage and treat mental health illnesses, many of these centers have

expanded. Furthermore, ten mental health problems are covered as part of the package of India's health insurance system, the PMJAY [38].

Nonetheless, our research on the mental health of people with access to the Internet indicates that more than 45% of people are classified as suffering or troubled (MHQ

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<0) [18]. An approach that is exclusively focused on controlling and treating mental health disorders does not appear viable in a country like India, given the scope of this problem [20].

Proposed Approach: Mental Health Website with Facial Emotion Recognition (FER).

The idea of a mental health website incorporating facial emotion recognition (FER) is an interesting one, but it has both potential benefits and drawbacks to consider.

Potential Benefits: -

Initial Screening: The tool could potentially offer a preliminary screening for mental health concerns. By analyzing facial expressions during website interactions, it might flag users who exhibit signs of distress or low engagement, prompting them to explore resources or seek professional help.

Engagement and Interaction: FER could be used to personalize website content or interactions based on the user's perceived emotions. This might make the website feel more supportive and engaging for those seeking mental health information.

Data Collection (with Consent): If implemented ethically with proper user

consent, FER could contribute to research on mental health and user experience. Studying the correlation between facial expressions and website interactions might provide valuable insights.

Drawbacks and Considerations: -

Accuracy and Reliability: FER technology is still under development, and its accuracy can be significantly affected by lighting, head position, and cultural differences in facial expressions. It's essential to be transparent about the limitations and not present FER results as a definitive diagnosis.

Privacy Concerns: Using facial recognition on a mental health website raises significant privacy concerns. Users might be hesitant to engage if they feel their emotions are being monitored. Careful consideration needs to be given to user consent, data storage, and security practices.

Potential for Bias: FER algorithms can inherit biases from the data used for training. This could lead to misinterpretations of emotions, particularly for people of color or those with non- dominant cultural expressions.

Focus on Emotion Over Content: Over- reliance on FER could distract from the website's core function: providing accurate and reliable mental health information and resources. The focus should remain on content and evidence-based practices.

VIII. CONCLUSION:

During the COVID-19 pandemic, longer indoor stays and less social interactions were caused by the internet-connected population in India's transition towards greater online activity (WHO, 2022). Reports pointing to an increase in depressed symptoms and other mental health issues coincided with this shift. Several important findings are revealed by analysing data from an extensive online mental health survey:

1. Mental Health Downturn: Between 2020 and 2023, there was a discernible drop in the mental health of India's internet- connected population. All age cohorts show this reduction, but younger people and youth show it most sharply [39].
2. Regional Mental Health Variations: The same period also saw regional variations in mental health within India. Despite overall declines, some areas experienced sharper downturns, highlighting the need for region-specific mental health strategies [9].
3. Economic Factors Alone Are Insufficient: Despite economic factors, such as household income, there is no linear relationship with mental health. The gradient remains consistent across income levels, suggesting that other drivers play a significant role [40] [41]

In conclusion, among India's youth who have access to the internet, mental health is a major worry. [42]. Given their substantial numbers, solely focusing on managing and treating mental health conditions may not be sufficient [43]. Instead, understanding the underlying drivers and emphasizing prevention strategies are crucial steps to address this growing issue [44] [21].

REFERENCES

[1] J. J. N. T. C. T. Jerzy Bala, “Hierarchy of demographic and social determinants of mental health: analysis of cross-sectional survey data from the Global Mind Project,” 2022. [Online]. Available: https://bmjopen.bmj.com/ content/14/3/e075095.

[2] Naziya Nawab, “Mental health care analysis,” 7 october 2022. [Online]. Available: https://timesofindia.indiatimes. com/ blogs/voices/mental-health-care- analysis/.

[3] “National Mental Health Survey of India, 2015-16,” 2016. [Online]. Available: https://main.mohfw.gov.in/sites/defa ult/files/National%20Mental%20He alth%20Survey%2C% 202015- 16%20-%20Mental%20Health%20Systems_0.pdf. [Accessed 2024].

[4] Newson JJ, Pastukh V, Sukhoi O, Taylor J and Thiagarajan TC, “Mental State of the World 2020, Mental Health Million Project, Sapien Labs,” the Mental Health Million Project, 2021.

[5] Ministry of Health and Family Welfare, 2016. [Online]. Available: https://indianmhs.nimhans.ac.in/pha se1/Docs/ Summary.pdf.

[6] NMHS Reports by Shri. Jagat Prakash Nadda, “NATIONAL MENTAL HEALTH SURVEY,” 29 December 2016. [Online]. Available: https://indianmhs. nimhans.ac.in/pha se1/detailed-news.php?eid=6.

[7] SAPIEN LABS, “The Global Mind Project.,” october 2023. [Online]. Available: https://sapienlabs.org/global-mind-project/.

[8] T. H. Businessline, “A majority of Indian youth havepoor mental health and it is affecting their productivity,” 2 December 2023. [Online]. Available: https://www2.

deloitte.com/in/en/pa ges/life-sciences-and- healthcare/ articles/time-to-care/A- majority-of-Indian-youth-have-poor-mental-health-and-it-is- affecting-their-productivity. html.

[9] Sapien Labs Centre for the Human Brain, "Mental State of India," 2023. [Online]. Available: https://sapienlabs.org/wp - content/uploads/2023/11/Mental- State-of-India-Report-October- 2023.pdf.

[10] Madhusree Goswami, "The Mental Health Epidemic," 22 September 2021. [Online]. Available: https://thelogical indian.com/mental health/mental-health-indians-30811.

[11] Wikipedia, "Mental health in India," [Online]. Available: https://en.wikipedia.org/wiki/Mental _health_in_India.

[12] "What is your Mental Wellbeing Score?" [Online]. Available: https://sapienlabs.org/mhq/.

[13] T. Lakshmanasamy, "Subjective Well-Being in India: Socioeconomic and Demographic Determinants and Differentials," p. 14, 2021.

[14] C.B.O. H. INTELLIGENCE, "National Health Profile," 2022. [Online]. Available: https://cbhidghs.mohfw.gov.in/ Write ReadData/l892s/942038467616805 14146.pdf.

[15] A. Ryan, "India's Mental Health Epidemic: Deteriorating Amidst the Pandemic," 2021. [Online]. Available: https:// wp.towson.edu/iajournal/202 1/05/10/indias-mental-health-epidemic-deteriorating-amidst-the- pandemic/.

[16] HML IRB Research and Ethics., "HUMAN SUBJECTS RESEARCH ETHICS APPROVAL," [Online]. Available: https://www.healthmedialabirb.com/

[17] India State-Level Disease Burden Initiative Mental Disorders Collaborators, The burden of mental disorders across the states of India: the Global Burden of Disease Study 1990–2017, p. 161, 2019.

[18] S. S. T. &. R. B. Roy., "Predicting mental health using smart-phone usage and sensor data.," 2 November 2020. [Online]. Available: https://link.springer.com/article/10.1 007/s12652-020-02616-5. [Accessed 2024].

[19] K. L. Ed.D., "20 Ways to Protect Your Mental Health," 1 January 2020. [Online]. Available: https://www.psychology today.com/u s/blog/rethink-your-way-the-good- life/ 202001/20-ways-protect-your- mental-health.

[20] P. Sharma, "The mental health cost of an economic slowdown in India," 23 February 2020. [Online]. Available: https://www.firstpost.com/india/the- mental-health-cost-of-an-economic- slowdown-in-india-my-hope-is- dying-i-feel-isolated-and-depressed- 8032521.html.

[21] Lancet.com, "The Kids Aren't All Right: Mental Health and Indian Youth," 13 Jan 2021. [Online]. Available: https:// www.youthkiawaaz.com/202 1/01/mental-health-needs-of-children-and-young-people-in- india/.

[22] P. S. Aggarwal, Exploring Well- Being among Mental Health Professionals in India, vol. 63, pp. 335-345, 2018.

[23] P. V. P. T. T. P. Jennifer J Newson, "Reliability and Validity of the Mental Health Quotient (MHQ)," [Online]. Available: https://sapienlabs.org/wp- content/uploads/2021/ 10/Sapien_Re liability-and-Validity-of-the- MHQ_Final. pdf.

[24] "Mental State of the World.," [Online]. Available: https://sapienlabs.org/wp- content/uploads/2022/03/Mental-State-of-the-World-Report- 2021.pdf.

[25] T. Lakshmanasamy, "Subjective Well-Being in India: Socioeconomic and Demographic Determinants and Differentials," [Online]. Available: https://indianmental health.com/pdf/ 2021/vol-8- issue1/12.%20Original%20 Researc h%20Article_Subjective%20Well- Being%20in. pdf.

[26] S. C. Oxford, "The OICSD launches new journal supplement on mental health in India," 28 OCTOBER 2021. [Online]. Available: https://academic.oup.com/jpubhealt h/article/43/Supplement_2/ii2/6383 621.

[27] B. M. M. P. Elizabeth Hartney, "What Is Peer Pressure?" 06 October 2022. [Online]. Available: https://www.verywell mind.com/wha t-is-peer-pressure-22246.

[28] N. Bhardwaj, "Here are 5 ways in which it can affect your mental health," 15 Jan 2021. [Online]. Available: https://www.healthshots.com/mind/ emotional-health/5-ways-peer- pressure-can-affect-your-mental- health/.

[29] "Helping teens deal with peer pressure," [Online]. Available: https://www.childrens.com/health- wellness/ helping-teens-deal-with- peer-pressure.

[30] Michelle Pugle, "How Peer Pressure Affects All Ages," 13 Feb 2024. [Online]. Available: https://www. verywellhealth.com/pe er-pressure-in-teen-and-adult-life-5323858.

[31] "Family Dynamics,"[Online]. Available: https://mind.help/ topic/family- dynamics/.

[32] "The Relationship Between Mental Health Problemsand Systemic Family Dynamics Among High School and University Students in Shaanxi Province, China," 06 September 2021. [Online]. Available: https://www.ssph-journal.org/journals/international- journal-of-public- health/ articles/10.3389/ijph.2021.16 03988/full.

[33] M. L. A. Tori Rodriguez, "Exploring the Link Between Academic Stress and MentalHealth in College Students," 09 September 2022. [Online]. Available: https://www. psychiatryadvisor.com/ home/topics/anxiety/exploring-the-link-between-academic-stress-and- mental-health-in-college-students/.

[34] M. C. a. L. M. P. By Nicole J. LeBlanc, "Anxiety in college: What we know and how to cope," 27 August 2019. [Online]. Available: https://www.health.harvard.edu/blog/anxiety-in-college-what-we-know- and-how-to-cope-2019052816729.

[35] T. Spiner, "14 emerging trends," 1 January 2022. [Online]. Available: https://www.apa.org/monitor/2022/0 1/special-emerging-trends.

[36] s. d. a. S. C. s. s. A. T. W. s. a. m. A. S. d. o. d. a. Geraldine M Clarke, "Evaluating the impact of healthcare interventions using routine data," 20 June 2019. [Online]. Available: https://www.bmj.com/content/365/b mj. l2239.

[37] "Allocating resourcesin mental health:a clinician's guide to involvement,"02 January 2018. [Online]. Available: https:// www.cambridge.org/core/jou rnals/advances-in-psychiatric- treatment/article/allocating- resources-in-mental-health-a- clinicians-guide-to- involvement/FFE73 E9C46EA7E9C C887319DB60C1D03.

[38] C. B. Duggal, "Adolescent and Youth Mental Health in India: Status and Needs," 2019. [Online]. Available: https://link.springer.com/chapter/10. 1007/978-981-13-6593-5_3.

[39] WHO, "COVID-19 pandemic triggers 25% increase in prevalence of anxiety and depression worldwide,"World Health Organization., 2022. [Online]. Available: https:// www.who.int/news/item/02- 03-2022-covid-19-pandemic-

triggers-25-increase-in-prevalence- of-anxiety-and-depression- worldwide.

[40] "Mental health in India - statistics & facts," 19 December 2023. [Online]. Available: https://www.statista.com/topics/6944/mental-health-in- india/#topicOverview.

[41] N. Birla, "Mental health may hurt India to tune of $1.03 trillion," 10 September2019. [Online]. Available: https://economictimes.indiatimes.co m/magazines/panache/mental- health-may-hurt-india-to-tune-of-1- 03-trillion-heres-a-dose-for- cos/articleshow/71045027.cms.

[42] Wikipedia, "Global mental health," [Online]. Available: https://en.wikipedia.org/wiki/Global_mental_health.

[43] "UNICEF report spotlights on the mental health impact of COVID-19 in children and young people," 05 October 2021. [Online]. Available: https://www.unicef.org/india/press-releases/unicef-report-spotlights- mental-health-impact-covid-19- children-and-young-people.

[44] D. M. R. A. F. M. Silva, "Impact of economic crises on mental health care," 13 November 2018. [Online]. Available: https://www.cambridge.org/core/jou rnals/epidemiology-and-psychiatric- sciences/article/impact-of- economic-crises-on-mental-health- care-a-systematic- review/0476353ACDD16BF4B4DB C990E5B34620.

[45] Paul, S. Income Inequality and Individual Health Status: Evidence from India. J. Quant. Econ, "Income Inequality and Individual Health Status: Evidence from India," 10 november 2020. [Online]. Available: https://link.springer.com/article/10.1 007/s40953-020-00223-x#citeas.

[46] ∗. a. S. S. Pranab Mahapatraa, Mental health in India: evolving strategies, initiatives, and, 2023.

[47] N. M. a. S. C. O. Teena Bharti, "Mindfulness and Subjective Well- Being of Indian University Students," 25 February 2023. [Online]. Available: https://www.mdpi.com/2076-328X/13/5/353.

[48] P. a. M. S. Sanghvi, "Help-seeking for mental health concerns: review of Indian research and emergent insights," 2021. [Online]. Available: https://shodhganga.inflibnet.ac.in:84 43/jspui/handle/10603/184682.

[49] K. S. V. Ransing R, "Mental Health Research in India," Mental Health Research in India: New Challenges and the Way Forward, vol. 44, no. 6, 05 Jul 2021.

[50] U. R. Kirti Gaur, "Mental health problems among youth in India and its correlates," 6 June 2016. [Online]. Available: https://www.emerald.com/insight/content/doi/10.1108/IJHRH-08-2015- 0024/full/html.

[51] V. Patel, "The youth mental health crisis in India," October 2019. [Online]. Available: https://www.iipsindia.ac.in/sites/default/files/Promoting_youth_mental_ health_in_India.pdf.

[52] V. P. C. T. Jennifer Jane Newson, "ssessment of Population Well-being with the Mental Health Quotient," 25 April 2022. [Online]. Available: https://www.physiciansweekly.com/ assessment-of-population-well- being-with-the-mental-health- quotient-validation-study/.