

# Mental Health Prediction of Students Using Machine Learning Method

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**Abstract**— In India, student dropout rates are influenced by a myriad of economic, social, and institutional factors, highlighting the urgent need to address mental health among students. This study presents a novel approach to assessing students' emotional well-being by integrating questionnaire-based assessments with visual data analysis. Utilizing machine learning techniques, we identify trends in students' responses, providing feedback to promote mental health awareness and support. Our platform fosters a positive student community, bridging empathy with technology. The proposed methodology leverages a unique dataset to facilitate the early detection of mental health issues, enhancing the accuracy and reliability of predictions. This paper identifies thematic clusters in students' emotional states, underscoring its innovative contributions to the field. By implementing a robust data collection process and ensuring high-quality visualizations, this study aims to set a new standard for mental health evaluation among students, ultimately striving for improved mental health outcomes

**Keywords**—Machine Learning, Mental Health, Visual Analysis, Students.

## I. INTRODUCTION

To mitigate this issue, we have developed a novel approach using machine learning method and a visual-based questionnaire. A set of questions will be presented to the students for them to answer. Based on their responses, points will be calculated, which will indicate their mental health status. Our innovative approach to mental health assessment using pictures portraying smoking, alcohol, drugs, and violence offers multifaceted benefits. Firstly, by employing visual stimuli, our model provides a non-intrusive and easily accessible means of gauging individuals' emotional responses and cognitive associations. This circumvents the barriers often posed by traditional assessment methods, fostering greater engagement and participation in the screening process. Furthermore, our model's utilization of specific imagery allows for the identification of nuanced patterns and triggers linked to various mental health conditions. Whether it's recognizing cues of addiction, trauma, or stress, the model enhances our understanding of the underlying psychological factors at play. This deeper insight enables targeted interventions and personalized support tailored to individuals' needs, ultimately fostering more effective outcomes in mental health management and treatment.

## II. LITERATURE SURVEY

### A. Fundamentals

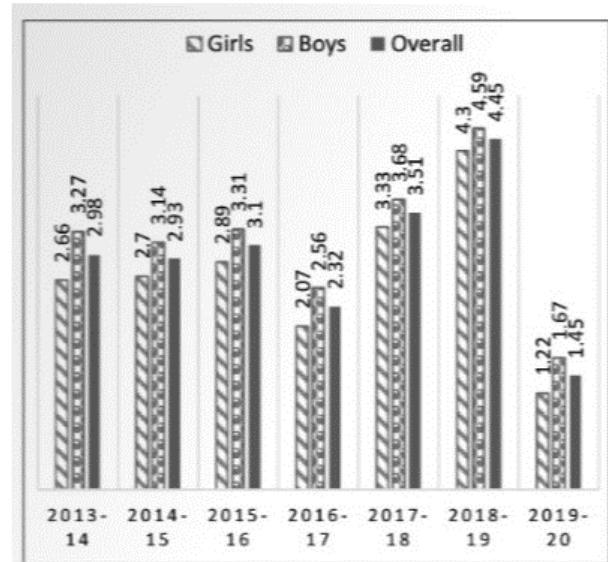


Figure 1. Students dropout rate in India

**Economic Factors:** Poverty is a significant driver of school dropout rates in India. Families living in poverty may prioritize immediate economic needs over education. Children from these families might be required to work to support their families financially, especially in rural areas where agriculture is the primary source of income. Additionally, the cost of education, including school fees, uniforms, and books, can be prohibitive for many families. **Social Factors:** Social norms and cultural practices can also contribute to dropout rates. Nowadays, drugs have also become a menace. Students are adversely affected, and there is a greater threat looming for our society. Many students exhibit poor preacademic performance, particularly upon entering universities, typically at ages 17 to 18.[1] The shift from high school to university introduces newfound freedom, often leading to poor time management among students. **Academic Lag:** Poor time management leads to missed deadlines, incomplete assignments, and last-minute cramming. This directly impacts grades. **Stress and Anxiety:** Falling behind triggers stress and anxiety. Students grapple with the pressure to excel while adjusting to a new environment.

### III. PROPOSED SYSTEM

Our approach provides an anonymous platform, allowing students to express their feelings without fear of judgment. This can contribute to destigmatizing mental health discussions. Empowering Students: Through personalized feedback and recommendations, our approach empowers students to take charge of their well-being. It encourages self-awareness and proactive steps toward mental wellness. Educational Institutions: Schools and colleges can benefit from aggregated data. Insights from our approach can guide policy decisions, resource allocation, and targeted mental health programs. Research and Advocacy: Aggregated, anonymized data can contribute to research on student mental health trends. Advocacy groups can use this information to advocate for better mental health support.

#### A. Methodology

Collecting data through Forms from students regarding their mental health involves designing a questionnaire that incorporates various elements to gain comprehensive insights. The form typically includes components such as images depicting different situations, followed by questions eliciting students' opinions or reactions. These images could represent scenarios related to stress, anxiety, depression, or general well-being. For instance, an image might depict a person studying late at night, feeling overwhelmed with academic pressure. The questionnaire prompts students to reflect on the depicted situations and express their opinions or feelings. Questions may ask about their emotional responses, coping mechanisms, or suggestions for improving mental health support on campus.

Timestamp	Age	Gender	Picture is missing or visible?	Does financial situation of your family affect you ever through what is the doing?	What will you do?	Picture represents?	Do you feel that tobacco products...	According to you, how
2-21-2024 12:24:56	22 Male	Male	Sometimes	No	Taking drugs	Problems	Smoker/Smoker	Can be consumed in less quantity
2-21-2024 12:44:00	21 Male	Male	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 12:47:51	21 Male	Male	Sometimes	No	Taking drugs	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 12:48:00	21 Male	Male	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 12:48:25	21 Male	Male	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 12:52:36	22 Male	Male	Sometimes	Yes	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 12:52:56	22 Male	Male	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 12:53:00	22 Male	Male	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 12:53:14	22 Male	Male	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 12:58:21	21 Male	Male	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:01:30	21 Male	Male	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:02:36	19 Male	Male	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:04:34	21 Female	Female	Sometimes	Yes	Taking drugs	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:05:11	21 Male	Male	Always	Yes	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:05:18	21 Male	Male	Always	Yes	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:05:21	20 Male	Male	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:05:30	21 Male	Male	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:05:36	22 Female	Female	Sometimes	Yes	Taking drugs	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:05:52	20 Male	Male	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:05:55	17 Male	Male	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:06:18	20 Male	Male	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:07:05	20 Male	Male	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:08:11	21 Male	Male	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:08:40	22 Female	Female	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:47:36	17 Male	Male	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:48:10	21 Male	Male	Sometimes	Yes	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:48:40	20 Male	Male	Sometimes	Yes	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things

Figure 2. Data collected through google forms

By integrating visual stimuli with open-ended inquiries, researchers aim to capture nuanced perspectives and experiences related to mental health. Through this approach, researchers can gather qualitative data that delves deeper into students' subjective experiences and perceptions of mental health challenges. Responses may vary widely, offering valuable insights into the diverse ways individuals navigate and cope with stressors in academic settings. Additionally, the open-ended nature of the questions allows for the exploration of unanticipated themes or issues that may emerge during the data analysis process. The collected data serves multiple purposes, including informing institutional policies, designing targeted interventions, and enhancing mental health resources tailored to students' needs. By

understanding students' perspectives firsthand, educational institutions can develop more effective strategies for promoting mental well-being and fostering a supportive campus environment. Furthermore, the anonymity and accessibility of Google Forms contribute to increased participation rates and honest responses, as students may feel more comfortable disclosing sensitive information about their mental health. Ethical considerations, such as ensuring confidentiality and providing resources for support, are essential throughout the data collection process to prioritize students' well-being and privacy. In summary, utilizing Google Forms to collect data from students regarding their mental health combines visual stimuli with open-ended inquiries to gather rich, qualitative insights. This approach facilitates a deeper understanding of students' experiences and perspectives, ultimately informing evidence-based practices aimed at promoting mental well-being within

2-21-2024 13:49:10	21 Male	Male	Sometimes	Yes	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:49:40	20 Male	Male	Sometimes	Yes	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:54:20	20 Male	Male	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:57:41	19 Female	Female	Sometimes	Yes	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 13:59:03	22 Male	Male	Sometimes	Yes	Taking drugs	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:04:34	19 Male	Male	Sometimes	Yes	Taking pills to sleep	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:17:05	20 Male	Male	Never	Yes	Taking pills to sleep	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:18:10	19 Male	Male	Always	No	Taking drugs	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:22:27	19 Male	Male	Always	Yes	Taking pills to sleep	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:24:24	19 Female	Female	Sometimes	Yes	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:28:16	19 Male	Male	Never	No	Taking drugs	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:29:00	19 Male	Male	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:30:42	19 Male	Male	Always	No	Taking drugs	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:38:33	19 Male	Male	Sometimes	No	Taking drugs	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:42:52	19 Male	Male	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:44:16	19 Male	Male	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:45:13	19 Male	Male	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:45:55	19 Male	Male	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:51:16	20 Male	Male	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 14:58:15	19 Male	Male	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 15:13:19	17 Female	Female	Always	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 15:16:36	17 Male	Male	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 15:16:24	22 Male	Male	Sometimes	Yes	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 15:28:49	19 Male	Male	Sometimes	No	Taking drugs	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 15:33:05	20 Male	Male	Sometimes	No	Taking drugs	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 15:45:54	19 Female	Female	Sometimes	Yes	Taking drugs	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 15:45:54	19 Male	Male	Never	No	Taking drugs	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things
2-21-2024 15:56:39	17 Female	Female	Sometimes	No	Nothing	Smoker/Smoker	Can be consumed in less quantity	Used for sugary things

Figure 3. Data collected through google forms

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#### B. Data Segregation

- Once data on students' mental health is collected through Google Forms, it can be segregated based on their responses to facilitate analysis and interpretation. Segregation involves categorizing responses according to common themes or patterns identified within the dataset. This process allows researchers to organize and analyse the data systematically, uncovering insights that can inform targeted interventions and support strategies.
- One approach to segregation involves thematic analysis, wherein responses are grouped based on recurring themes or topics. For example, responses expressing feelings of stress or anxiety related to academic workload may be categorized under a "academic pressure" theme. Similarly, responses mentioning feelings of loneliness or isolation could be grouped within a "social support" theme.
- By identifying these thematic clusters, researchers can gain a holistic understanding of the various factors influencing students' mental health. Another method of segregation involves sentiment analysis, which entails categorizing responses based on the prevailing emotions expressed within them.

- Responses exhibiting positive emotions, such as hope or resilience, may be classified separately from those expressing negative emotions, such as sadness or frustration. This approach provides insights into the emotional landscape of students' mental health experiences, highlighting areas of strength and vulnerability.
- Additionally, segregation may involve demographic factors such as gender, age, or academic year. Analysing data based on demographic characteristics enables researchers to identify potential disparities or trends among different student groups. For instance, differences in coping strategies between male and female students or variations in stress levels across academic years can be explored through demographic segregation.
- By segregating data based on responses, researchers can uncover nuanced insights into students' mental health experiences and needs. This process facilitates targeted interventions and support initiatives tailored to address specific challenges identified within the dataset. Ultimately, segregation enhances the utility and relevance of the collected data, guiding evidence-based decision-making aimed at promoting student well-being and academic success.

### C. Random Forest

- **Data Preprocessing:** Before applying Random Forest, it's essential to preprocess the collected data. **Feature Selection:** Random Forest of input automatically perform feature selection. However, depending on the complexity of the dataset, it may be beneficial to conduct feature selection.
- **Training the Model:** After preprocessing, the Random Forest model is trained using the training dataset. The algorithm builds multiple decision trees from the training data.
- **Interpretation:** Random Forest provides insights into feature importance, allowing researchers to identify which factors contribute most significantly to students' mental health outcomes. This information can guide intervention strategies and resource allocation.
- **Prediction:** Beyond analysis to predict students' mental health status based on new data inputs. This predictive capability enables proactive support and intervention efforts by identifying at-risk individuals early.
- In the mental health assessment websites employing images associated with smoking, alcohol, and violence, the integration of the Random Forest algorithm can notably augment the classification procedure. Following the deployment of the model on the website, refinement can be achieved by recurrently retraining it with fresh data and fine-tuning hyperparameters as required to enhance precision and user satisfaction.

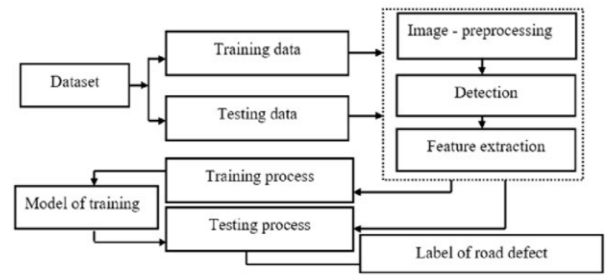


Figure 4. Random forest flowchart

- Integrating the Random Forest algorithm into your mental health assessment website, users can be furnished with more precise and dependable prognoses derived from their responses to inquiries accompanied by pertinent images. This initiative holds promise for early detection, intervention, and support for individuals grappling with mental health adversities.

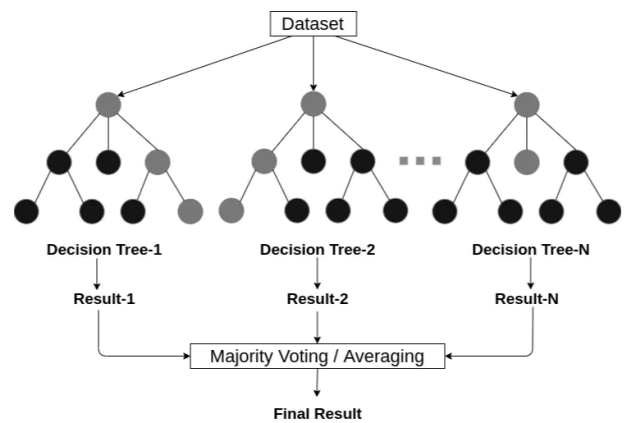


Figure 5. Random forest working model

### D. Trained Dataset

```

Prediction.ipynb
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

[71]: from sklearn.ensemble import RandomForestClassifier
      from sklearn.model_selection import train_test_split
      from sklearn.metrics import accuracy_score
      from sklearn.preprocessing import LabelEncoder

      # Handle categorical data
      label_encoder = LabelEncoder()
      for column in X.columns:
          X[column] = label_encoder.fit_transform(X[column])

      # Split the data into training and testing sets
      X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

      # Create a random forest classifier and fit it to the training data
      rf_classifier = RandomForestClassifier(n_estimators=100, random_state=42)
      rf_classifier.fit(X_train, y_train)

      # Make predictions on the testing set
      y_pred = rf_classifier.predict(X_test)

      # Calculate the accuracy of the model
      accuracy = accuracy_score(y_test, y_pred)
      print("Accuracy:", accuracy)

      # Calculate the mean absolute and mean squared error
      from sklearn import metrics
      print("Mean Absolute Error:", metrics.mean_absolute_error(y_test, y_pred))
      print("Mean Squared Error:", metrics.mean_squared_error(y_test, y_pred))

Accuracy: 0.8
Mean Absolute Error: 0.2
  
```

Figure 6. Implementing random forest algorithm

## IV. WORKING NATURE

**Reducing Stigma:** By offering an anonymous platform, students can express themselves without fear of judgment.

**Questionnaire User interaction:** Students answer a set of mental health-related questions. **Scoring System:** Responses are scored based on severity, frequency, and patterns. **Risk Assessment:** ML algorithms correlate answers with known risk factors (e.g., sleep quality, stress levels). **3. Feedback and Recommendations Individual Reports:** Students receive personalized reports summarizing their mental health status. **Recommendations:** Based on the analysis, the software suggests coping strategies, resources, or professional help. **Technical Implementation.** **Training Data:** Annotated datasets of images and labelled responses train the models. Key features of our working model include real-time picture perception analysis, allowing for swift and dynamic insights into an individual's mental state. The model adapts to diverse datasets, fostering a personalized approach to mental health assessment. Through continuous learning, our model evolves, refining its understanding of picture perception and enhancing its diagnostic capabilities over time. This project represents a pivotal step towards a more nuanced understanding of mental health, demonstrating the potential of machine learning to revolutionize psychological analysis through the lens of picture perception.

V. RESULTS AND DISCUSSIONS

The homepage of our web application serves as the gateway for users to access our mental health assessment platform. Additionally, users are prompted to create a unique username and password, ensuring secure access to their personalized account. The user-friendly interface guides individuals through the registration process, facilitating a seamless experience. By providing their contact details and educational background, users enable us to tailor the assessment to their specific needs and demographics, ensuring personalized insights and recommendations. The creation of a username and password enhances security and privacy, safeguarding users' sensitive information and ensuring that only authorized individuals can access their account and assessment results. This step reinforces our commitment to confidentiality and data protection, fostering trust and confidence among users. Overall, the homepage serves as the initial point of engagement, offering a streamlined registration process that empowers individuals to take control of their mental health journey in a secure and user friendly environment.

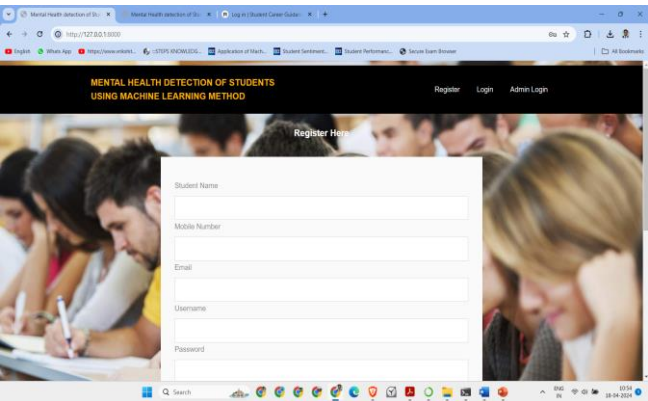


Figure 7. Website created

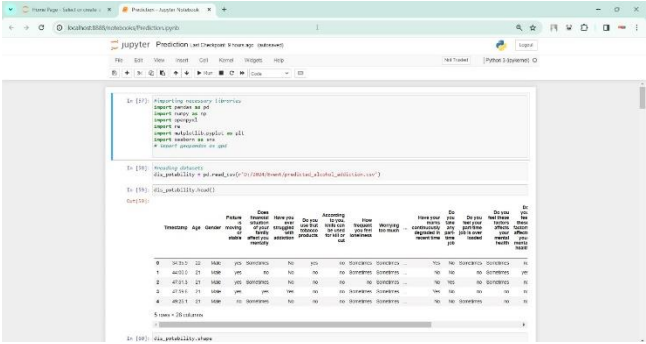


Figure 8. Trained dataset

K-Nearest Neighbours (KNN) is simple and instance-based, making predictions based on similarity to neighbouring data points. However, it's sensitive to noisy data. Finally, Support Vector Machines (SVM) find optimal hyperplanes and work well in high-dimensional spaces, but they can be computationally expensive.

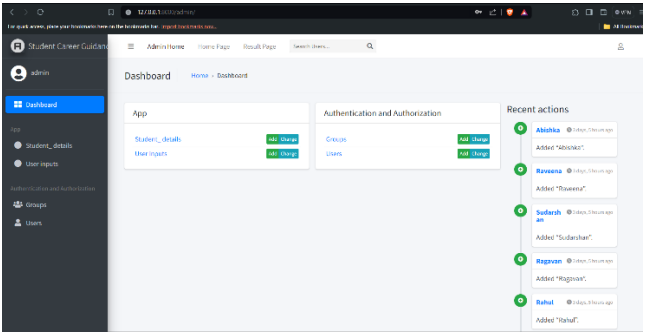


Figure 9. Admin dashboard

The admin dashboard which enables seamless user management, empowering administrators to add new users to the system and remove existing accounts as needed. Through a simple and intuitive interface, admins can input essential user details such as name, phone number, email address, and educational background. This ensures that only authorized individuals gain access to the platform, maintaining security and privacy standards. **User Information Modification:** Admins have the capability to modify user information, providing flexibility and adaptability to accommodate changes or updates. Whether it's updating contact details, adjusting educational background, or addressing any other pertinent information, the admin panel streamlines the process, ensuring that user profiles remain accurate and up-to date. **Access to Assessment Results:** One of the key functionalities of the admin panel is access to assessment results. Admins can view aggregated data and individual assessment outcomes, gaining valuable insights into users' mental health status and trends. This feature facilitates informed decision-making and enables admins to identify patterns, monitor progress, and tailor interventions or support accordingly. **Adding Additional Admins:** Recognizing the importance of delegation and collaboration, the admin panel allows existing administrators to designate additional admins. This capability promotes scalability and efficiency by distributing administrative responsibilities among trusted individuals. New admins undergo a similar registration process, after which they gain access to the same administrative functionalities, enhancing the versatility and sustainability of the platform.



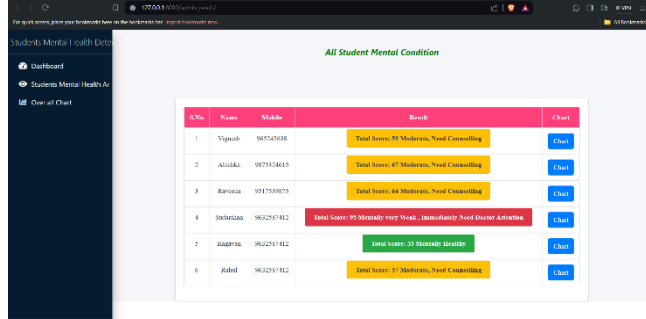


Figure 10. Overall performance of students

The result page of our mental health assessment platform provides a concise summary of each student's scores, categorizing their mental health status based on predefined thresholds. Students scoring below 56 are classified as mentally healthy, indicating a robust psychological well-being. For these individuals, the platform may offer resources and tips for maintaining good mental health, such as stress management techniques or healthy lifestyle habits. Students scoring between 57 and 75 fall into the category of mentally moderateConclusion

Bridging Minds and Technology In the realm of student well-being, your software stands as a beacon of innovation. By seamlessly integrating visual analysis, machine learning, and user-friendly design, it transcends traditional approaches. Here's what sets it apart: Empathy in Pixels: The fusion of visual data (pictures) with questionnaires allows for a deeper understanding of students' emotional states. It's not just about answers; it's about capturing feelings. Personalized Insights: Your software doesn't offer generic advice. It crafts individual reports, suggesting coping mechanisms tailored to each student's unique mental landscape. Anonymity and Trust: By ensuring privacy, it encourages candid responses. Students can share their struggles without fear, fostering a culture of openness.

## VI. FUTURE SCOPE

In the future, we should move away from stigmatizing depression prevention among college students. Instead, we must focus on personalized and private approaches when developing and implementing preventive measures. Additionally, combining general prevention strategies with evidence-based treatments like cognitive intervention therapy is crucial for addressing college students' depression effectively.

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