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Evaluation of Psychological Parameters for Mental Healthcare: A Data Science Approach

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Abstract: *Mental health and peaceful mind plays the crucial role in the well being of the individual. Mental Health can be concisely defined as the state of equilibrium that can be felt within the individual and observed between the individual and others. It has very high impact on the student's academic growth, personal development as well as the maturation of his/her sentiments. Hence the monitoring of mental health in students life frequently and evaluating it on the basis of concrete scientific theory is important. Along with that such evaluation should further require the proper and timely medical treatment. Psychological evaluation of student's mental health can be based on various psychic factors such as stress, anxiety, depression, GDA etc which can be caused due to pressure of society on child, unrealistic expectation of parents from child and academic pressure. Psychological Evaluation of students mind can be done using these factors which can give complete insights of mental state of the child which can be further used to detect the deterioration of mental health. Predictive analytics can help to identify such situation hence be able to nurture the mental healthcare by taking appropriate measures*

Keywords: Psychological evaluation, Predictive Analytics, Mental Healthcare, Psychological Elements, Mental Health.

I. INTRODUCTION

Mental health is the best described as the psychological well being of the mind in individuals life. There are various psychological levels in which this well behaviour of mind can be measured. This plays the vital role in the life of the human being and affects the performance of the human begins in their respective careers and contribution towards the society as an individual. Not only it does this but also it directly and indirectly affects their state of mind and one behaves in the predictable way because of the impacts that he /she has because of the stress and pressure he/she deals with in day to day routine life. The subconscious mind of the students always deal with ample amount of the pressure and it becomes the major obstacle in taking the fruitful and creative decision for the sustainable life of the students.

However such stress can be utilized in taking the good and quick learning process if it is within the limit of threshold, but the dangerous situations can arises if the stress and anxiety crosses the limit of threshold then student may land up in situations like mental trauma or even in worst case suicide.

Hence the mental Health should evaluate and nurtured for fruitfulness of mind.

In every country which is on the verge of development, the youth of the nation contributes to the major sector of the development of the country. According to the survey done in August 2018 nearly 8 lakhs of individuals died due to extreme pressure which leads to suicide which happens at an alarming rate.

Suicidal attempts are observed throughout the life expectancy and is consider as major reason for death among students. Suicide contributes to the estimated 1.4% of all deaths around the world, making it the 17th major reason for death in 2017. Successful and scientific involvement can be executed at individual level to avoid mental trauma and suicide . In India, nearly 500000 human being suffer through the ill effects of bad mental health.

At the rate of every three seconds a person attempts suicide in India. These figures indicates that there is a crucial need of taking preventive measures towards the degradation of mental health. Alas, the one thing that can actively and efficiently prevent such deterioration is analysis of mental health which will help people to deal with depression, anxiety, social distress, relationship stress, career stress, body image and loneliness.

Mental healthcare can be evaluated by analyzing the various psychological states of the student's mind. These various psychological states can be depend upon the internal as well as external factors.

Internal factors such as trauma within the student or the inner battle of mind to cope up with the stress situations and external factors are the responsibilities, constraints and unrealistic expectations imposed by the surrounding individual to the student. Both of these factors equally contribute to the mental health hence the assessment of both is essential of the prediction of stress level.

II. PSYCHOLOGICAL EVALUATION ELEMENTS

Educational system in India is broadly governed by two major bodies of educational boards approved by the government of India. One of the government body comprises of the All-India Boards, like the CBSE (Central Board of Secondary Education), the CICSE (Council for the Indian School Certificate Examinations) and the National Open School. The second government body includes the State Level Boards that are authorized to conduct the exams and evaluate the scholastics of the students in the states they are recognized.

Every student who is the part of the Indian education system has to face ample amount of competition at the entry level of pre-primary education, and thereafter at the end of every courses. In order to remain in the competition and acquire the highest position and top ranks students tend to take ample amount of stress.

Since the education system in India is textbook-oriented and mainly focused on the skills of memorization power of the students. In order to learn every chapter in detail students tend to extend their normal study hours. According to the World Health organization Student should get at least seven hours of the complete sleep for the correct functioning of the mind. But due to the pressure of remaining in the race of the rankers and hit the grade cards with good marks students comprise their sleep hours and barely sleep for two- three hours and develop the anxiety. Following are the some of the prominent factors that can be used for the psychological evaluation.

A. Stress

Stress is nothing but the tension taken by the students for the completion of the academic courses with good grades. Such stress can be measured with the help of the questionnaire .It can be measured on the various categories such as stress about parents. Relationships, siblings, appearance, financial problem and stress due to mental and physical health. It is mainly measured with four point scale - very, not at all, somewhat and not very influenced.

B. Anxiety

According to the survey done worldwide the anxiety is seen in nearly eight percent of students. The various factors on which anxiety is measured are- criticism from teacher and parents, helplessness in stress situations, relationship problems and many more. Anxiety finishes the problem solving ability and decision making capacity of the students.

C. Depression

When the amount of stress and anxiety reaches beyond the acceptable limit of the threshold, the student faces the depression. Depression can be measured on four point scaling grade- none, low, medium and high.

D. Psychological Trauma

Psychological trauma can occur either due to only one stress related situation in the student life or due to the recurring stress and anxiety which leads to the long lasting trauma in life of the student. Mental trauma hence need to evaluate and given proper attention to avoid its recurrence and adverse effect on life of students.

School Disciplinary measures

The fear of the punishments given for the misbehavior and penalty for failing to meet the deadline for the completion of the assignments by the students is one of the reason for the stress and anxiety in students life. The very strict school disciplinary measures can be evaluated by rating the fear of student in four stages- no fear, low, medium, high fear.

E. Unrealistic Performance Expectation

The student should only take the burden of his/her dreams that he/she can handle. Making unrealistic expectations from himself/herself is another crucial cause of stress.

F. Parental/Societal Pressure

In India the Parental and societal pressure is the major and most important cause of the poor mental health of the student. Every child is different from other individual but the comparison done by the parents of their child with other child is root cause of trauma and stress in students mind. Such comparison can be done on the basis of marks. grades on report cards, nature & behavior, complexion, way of conduct and many more such aspects. This all leads eventually the inferiority complex in the mind of student.

III. PROPOSED METHODOLOGY

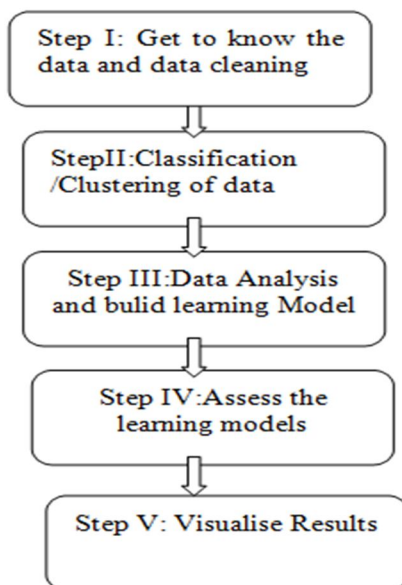


Fig 1: Methodological flow for Mental healthcare Model

1) Step I: Get to know the data and data cleaning

Before creation of model its essential to identify data set and aware of data sources. For that first we have to use Data collection phase which consist of collection of various mental patterns of data which can be collected for psychological Experts or can be collected through surveys. We can proposed various questions to the students of IX and X grades and get the impact of the stress, anxiety, depression and trauma in their respective academic and personal life. Once the data has been collected now we can proceed further. Getting the complete, precise and concise insights of the data that we are going to work with in future for the model creation is hence important. One of the way of getting to know data is nothing but creation of histograms, pi charts, scatter plots or geographic maps. Determine whether the highest and lowest value for an attribute is well defined and along with that we should also ensure that data must be complete (no missing value), not redundant and not inconsistent. After that we can identify various outliers in data and cluster the data effectively. Data mining will also help us in getting crucial core data information which will be helpful for us in the future.

2) Step II: Classification/clustering of the data

After Getting to know the data the next step is classify the data and cluster it. Data classification refers to the scientific methodology which is used to assign the know class labels to the set of unknown instances. In our case we can use the various classification algorithms to determine whether the stress, anxiety, trauma level is low, medium, high or very high. Data clustering groups the data of the similar instances into the one big cluster such that data which is within the same cluster is same and its semantically different from other cluster. It is mainly used for detection of outliers and process them. The various clustering methods can be used such as

- a) Density based clustering
- b) Hierarchical clustering
- c) Partition clustering
- d) Grid based Clustering

Partition methods (K Means and K Medoids) will always find out the spherical type of the clusters and hence it is conventional to use the Density based or Grid based Clustering in order to get the arbitrary shape of clusters.

3) Step III: Data Analysis and build learning Model

Data analysis and creation of learning models is important and the heart of the data science based projects. After the clustering and classification of the data next step is to analyze the classified data and make the efficient learning model to learn the given data set values and predict the results. Data analysis refers to analyzing the data on the bases of various psychological factors such as stress, anxiety, trauma, depression, fear of losing something important. Data analysis answers the various questions such as how much data is sufficient? How to establish the concrete relationship between learned data and accuracy of the predicated result. Data analysis and creation of learning models hence allow us to actually predict the mental health of the student and hence can help to improve it.

4) *Step IV: Assess the learning models*

Assessing the learning model is nothing but to make sure that our developed learning model satisfies the constraints of the problem statement and give us the correct results. Assessment of learning model is broadly classified into the two parts – checking the accuracy over the training data and second most important aspect is checking the accuracy over the testing data which is created by the test designer or system tester. Furthermore assessment of the model is also depend upon the complexity of the learning model we have build, time taken to take the decision for unknown and known instances, robustness of the solution build and reliability of solution. The best learning model is described as the model which is less complex, will give us results in shorter duration of time and get us the best reliable and secure solution. For assessment of the model we will divide our data which is been collected from above three steps into the equivalent parts and one (preferably the first) part is used to measure the accuracy of the model which we have build against the trained data and another half model can be used to measure the accuracy of the model against the testing data.

5) *Step V: Visualise Results*

After the successful assessment of the learning model which we have build the next step is to visualize the result of the model. The graphical representation plays vital role here. As there are various tools which are readily available in the market developed by the various data science experts to visualize our results in an effective way so that there is crystal clear understanding of the high level leaning model to naïve learner also. One of those tools are “tableau” tools which we can use in our case to visualize our data of leaning model. Data visualization must be very simple yet effective and “tableau” will be best suited for fulfillment of the our purpose over here. Wrong visualization of data will directly effect the effectiveness of our learning model even if our learning model is very sophisticated, accurate, robust and secure. We can visualize the result on four grading scheme with help of tableau which determine degradation of mental health – Low, Medium, High, Very high.

IV. PARTIAL IMPLEMENTATION

A. Dataset

For Mental health evaluation data collected from IXth and Xth grade students of Bajaj Municipal school. Data is collected in form of questionnaire which consist question which will help to discover psychological information about student. Questionnaire consist of question which will give insights of students mind as well as psychological thinking which directly affects students mental health. Total 275 samples are collected from school students. A proper well Structure questionnaire is used for collecting data samples.

V. RESULTS AND DISCUSSION

Step I consist of data collection and preprocessing in which data is collected by survey based on questionnaire. A questionnaire consist of answers in form of categorical data which contains answers never, always, sometimes etc can be used further for psychological evaluation and Mental health prediction can be done based on previous evaluated data.

Figure 2 shows age based response of students of grade IX and X. The various questions derived from the psychiatrist which explores the various degrading health factors such as Exam phobia, academic pressure, anxiety, school refusal, depression, parental and societal stress .which are analyzed in following five grading scheme.

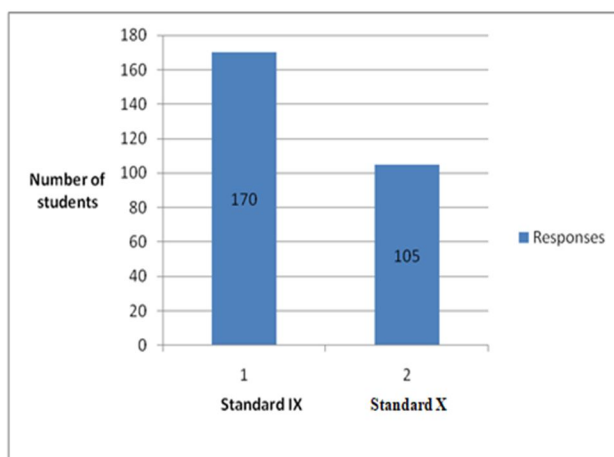


Fig 2: Age-based response Analysis of Student

- A. Never
- B. Few times
- C. Sometimes
- D. Often
- E. Always

As we can observed from the following figure mostly incline towards always is high indicated very high stress level. Implementation of step I is useful to decide most prominent factors on psychological health

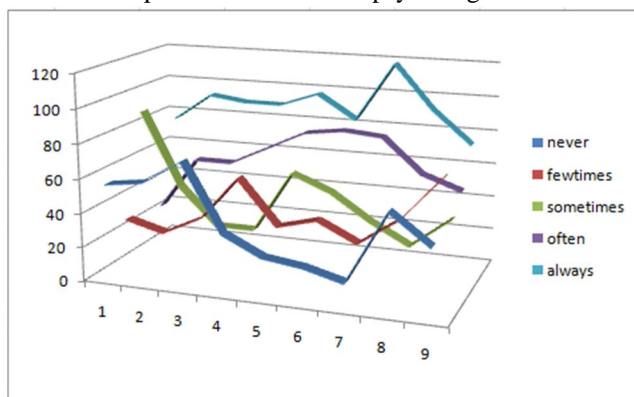


Fig 3: Questionnaire based Psychological Analysis

VI. CONCLUSION

For Students effective development Physical as well as Mental health play vital role. Mental health includes psychological well being of student which can degrade because of internal factors like stress, anxiety, depression or external factor like parental expectation, societal pressure, unrealistic goals, academic pressure. Proper psychological Evaluation can help to detect degradation of mental health which can be further used for avoidance of psychological phases such as stress, anxiety, depression. It can prevent student from drastic step like suicide. In this paper we disuses psychological health affecting factors on students life with its causes and effect which are helpful for Mental healthcare evaluation.

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