

**IMPACT OF THE STUDENTS MENTAL HEALTH CONDITION AND ACADEMIC  
SITUATION DURING COVID- 19 THROUGH MACHINE LEARNING  
ALGORITHM**

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This Report Presented in Partial Fulfillment of the Requirements for the Degree  
of Bachelor of Science in Computer Science and Engineering

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**DAFFODIL INTERNATIONAL UNIVERSITY**

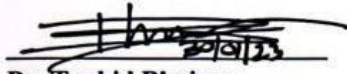
**DHAKA, BANGLADESH**

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## APPROVAL

This Project titled “Impact Of The Students Mental Health Condition And Academic Situation During COVID-19 Through Machine Learning Algorithm”, submitted by Suraiya Zaman Chowdhuy Shahmony and MST.Muniya Akter Liza , ID No: 191-15-12849 and 191-15-12634 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfilment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 28 January 2023.

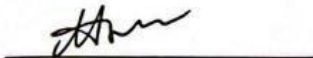
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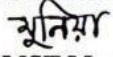
## DECLARATION

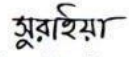
We hereby declare that, this project has been done by us under the supervision of **Md Abbas Ali Khan, Assistant Professor, Department of CSE Daffodil International University**. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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## **ABSTRACT**

The covid 19 pandemic has acutely impacted on both students' mental health academic flux. The prevalence of anxiety, depression, stress symptoms among students are considered a major concern for their future health conditions. During the corona pandemic, all educational institutions of our country were shut down by the authority. Then government of Bangladesh imposed numerous restrictions to control the situation. In this period and situations many students were undergoing depression. To respond the situation, we conduct a survey among the students of different age and levels. This survey is aimed to clarify the situation meticulously. In this manner several studies have been conducted but they focused the urban area of our country. As a result, it is essential to analysis and investigate rural area's student's condition. To promote students' health condition, we suggest several ideas. Therefore, in this research paper, we emphasized the need of facilitation for the poor Students to continue their studies. Proper analysis showed worrying about people's knowledge. The lack of knowledge about pandemic aggravated the situation mast. About 75% students of our country are not willing to share their situation but those findings can mitigate the situation by taking proper steps. Our collecting findings confirm the effective efforts are necessary to cope with pandemic in this moment.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

The COVID-19 germinated in China at the end of 2019. The Corona virus mainly originated in Wuhan, a province of China. It has spread all over the world in a short time. Corona virus disease is an infectious disease caused by the SARS-CoV-2 virus. After a few days, COVID-19 was declared a global pandemic by the World Health Organization (WHO). The pandemic has impacted people negatively all across the world in several ways. Its devastating effects have been reported to have disrupted people's normal lives. The pandemic is moving like a wave and may yet crush those least able to cope. Unfortunately, COVID-19 is much more than a health issue. It has the potential to devastate social, economic, and political influence, rendering people ineffective. In this moment, people are losing jobs and income every day and don't know when it will return. The impact of COVID-19 on students is huge. It has a negative/severe impact on students' lives and mental health. Educational institutions like schools, colleges, and universities have shut their doors to students since the outbreak of the pandemic in March 2020.

The negative effects of the COVID-19 pandemic on students' educational and mental health are enormous. The pandemic outbreak has had a greater negative impact on students from less privileged backgrounds or poor students. Diminishing family income and limited access to internet connectivity have severely broken down the academic lives of poor students. A huge number of students all over the world are now deprived of basic education because of the Corona pandemic. This situation then leads into a

phobia. Even before the pandemic situation, the condition of college and university students with mental health disorders was increasing at an alarming rate. Over 75 percent of university students expressed anxiety about their health during the pandemic.

In our country, the mental health of students or others is not a serious issue among the general population. Students from other countries are particularly vulnerable due to academic pressure and uncertainty about their professional careers. The pandemic has aggravated these mental and health problems. The psychological problems of students in our country are getting worse by the day.

To prevent the spreading of viruses, the government decided to close the educational institutions. The school, college, and university authorities promoted online education. As a result, online learning systems became the new way of acquiring knowledge. But many university students suffer from "session jam phobia," which impacts them acutely. University students in many countries have identified dissatisfaction with the quality of online classes during lockdown. So students' academic performance declined harshly. In our country, the psychological health of female students depends on many social factors. The impact of this pandemic has worsened the mental health of female students by aggravating the previous situation. Because of the long-term influence of educational institutions, early marriage is now practiced at random. As a result, the outcomes of the COVID-19 pandemic, long-time university closeness, and socio-economic factors would be manageable for the poor mental health of the students.

In this research, we investigated and analyzed the potential result of the COVID-19 pandemic on students' mental health and academic condition. Our report shows that there is a huge gap between the situation and policy making in this regard. Moreover, our findings can help healthcare policymakers identify the causes of poor mental health and design effective guidelines for the well-being of students.

## **1.2 Motivation**

The mental health of the students has been a major concern for many years, and this epidemic has increased the rate greatly. According to data, more than half of university students have experienced worsening during pandemic and ongoing periods. The ongoing pandemic has affected the health and well-being of the students in many ways. We aimed to investigate the associated factors causing mental illness. Our research can assist healthcare policymakers in putting their plans into action.

This report involves educational and residential components to provide steps students can access. It was hypothesized that students who took part in this survey would suffer negative consequences as a result of conflict-related disruptions.

We all know that the crisis was extremely disruptive, and the government took only a few steps to address it. There were also persistent negative impacts on students' behavioral and emotional functioning and attention problems. These findings are important for those students who have experienced natural disasters. Psychiatric problems often manifest in early adulthood.

To prevent this situation, the government declared a national lockdown and a social gathering prohibition. Unfortunately, many people didn't maintain a proper social distance. As a result, Corona Pandemic has wreaked havoc on people's daily lives. Academic collapse, fake news in the media, medical equipment shortages, and uncertainty have instilled fear, anxiety, and mental anguish among students. Poor and less privileged families, on the other hand, suffer the most, and financial hardship contributes to mental health upheaval. The students at higher levels run into danger because of the uncertainty of life.

Furthermore, the vulnerable groups of students are prone to psychological distress during the panic.

Given these situations, it is necessary to analyze the students' mental health and situation during panic to inform psychological interventions. So our report also documented potential risk factors for poor mental health. Our brief but significant study on student mental health was carried out. Also, this investigation aimed to estimate the students' perceived stress of the students. Students' academic and mental health during the COVID-19 pandemic is currently regarded as an important and hot topic among nations, which is why we chose this topic.

### **1.3 Rational of the study**

Covid-19 pandemic has been a global issue that largely affected students mental health academic purposes. Thousands of students around the world have experienced a lot of problem which impacts on their mind and future career. This type of anxiety, depression may default their life at the early age. To identify these challenges and findings which can protect themselves from this situation is necessary.

Since the beginning of the covid-19 pandemic, most educational institution have moved their activities into online but this is not enough for the students which makes them more depressed. So they can receive the support they need as soon as possible. To ensure their solution, this findings may help them properly. Sometimes it is crucial to identify the risk factors to prevent mental health issue and academic damage related problem.

In this case, a scientific report has been proposed and prepared an informative database to solve the mental health issue and academic life of the students during covid-19 pandemic.

## 1.4 Objectives

During Covid-19 pandemic students of our country faced several obstacles in their academic life and mental health issues. Reasonable findings can help students to mitigate their problems. Our proper affords and analysis would be effective in this moment because appropriate information about mental health and academic situation is not easy to gather. To collect the vital data students from door to is quite impossible for government in this epidemic. So this of research or survey can assist the government to take necessary steps or help health policy makes to make out right decision. On the other side, the studies reviewed the questionnaires about students' attitudes, anxiety, depression or their ability to maintain the blockage.

Due to the pandemic, a huge number of mental health information is available on the internet but this overload of information is responsible for a burden. People and students need to know the false information and take the accurate information. So the main objectives of this report are following:

- Provide the scientific methods improve students' mental health and facilitate academic related areas to alleviate academic damage.
- Understanding the proper mental health and take action can mitigate the anxiety and depression.
- Describe the psychological impacts of this pandemic and these spreads among people.
- Provide the proper information about students current academic financial and mental health condition.
- Establish a effective network Between students and policy makes to prevent the massive damage.
- To investigate how depression, anxiety or illness differ by age, gender or family condition.
- Help to improve people's and students' knowledge about corona virus and how to study safe from this.
- Increase mass awareness among general people and students about Covid-19 pandemic.

## **1.4 Report Layout**

There are six chapters in this report. Every chapter provides a good number of necessary data from various aspects and every chapter has divided into several parts. These parts describe the topic in detail. The contents of this report are as follows:

### **Chapter 1: Introduction**

Chapter 1 of this report describes the introductory information about student's mental health condition and academic situation during covid 19 pandemic. This chapter provides an easy about ongoing pandemic situation and its Impact on student's life. It also again discusses the acute problem and shares possible solutions some sections of this chapter are about introduction part, motivation of this report.

Research objective of this report, rational study of this report and report layout process.

### **Chapter 2: Background and Literature review**

Here we discuss a computer description of this research background. Depending the result of this research analysis. We provide a numerous information and thoughts about our report. Our related activities were created by these research study. This chapter's contents are related work and challenges of this report.

### **Chapter 3: Research methodology**

In this chapter, we describe the working process of data collection. Then discuss the data set describing, data preprocessing, naive bayes classifier, random forest classifier, random tree classifier, ada boost classifier and multi-layer perceptron classifier. Given are the main describing parts of this chapter.

### **Chapter 4: Results and Discussion**

Here, we narrate the experiment and result discussion of this research. The main them of this chapter are classification of the report, predictions and confusion matrix.

### **Chapter 5: Impact on Society and Sustainability**

Chapter 5 of this report composes its impact on society and ethical aspects of this report. Here, we also deliver several sustainability plans.

## **Chapter 6: Future scope and Conclusion**

Chapter 6 contains the conclusion part of this report. In this segment of this report, we have outlined the future scopes of this report and how this report affects students future research work.



## **CHAPTER 2**

### **BACKGROUND & LITERATURE REVIEW**

#### **2.1 Related Works**

Several studies have been driven in regard to the impacts of COVID-19 on students' mental health condition and academic situation during the COVID-19 pandemic. Mental health has a boundless effect on one's physical health by influencing health.

We started this experiment by reading multiple literature reviews. Our researches are founded on sentiment analysis of these thesis papers. To investigate the impact of COVID-19 on students properly, we went through several papers. The activity we have gone after analyzing the report has been discussed below: Here the author emphasized the pandemic's effect on population's health in 2020, as well as how these effects are interrelated. They focused on the problems of controlling infections on campuses and keeping track of disease patterns in students. They have experimented the issues with psychological and mental health that have been made worse by the pandemic. [1] Another study focusing on the university student's social distancing skills. This study examined whether undergraduate COVID-19 related coping techniques were linked with depression, anxiety, and stress [2].

Another study found where the Bangladesh Government imposed a lockdown that may help people to serene mental health among residents, university students and working professionals. They exposed nearly 70% of respondents were afflicted with high anxiety levels about 43.82% were afflicted with moderate stress level. [3]

(Ashis Pathak et al.2020)[4] in his research he focused on mental health of the students all over the world. This paper showed more interest in lockdown system to mitigate the rare of spreading infections. He also notified about students' mental stress and the mental balance of the students.

(Jasminka Talapko et al.2021)[5] here the authors conducted a study among 823 students from the University of Osijek in Croatia. Approximately 59% of students in health-related sectors were insufficiently active. Female students of this university had a higher level of depression and anxiety. They considered it a crucial mental health issue during the pandemic.

(Rahman M.M;Asikunnaby ;Khan S.J; Arony A; Mamun Z.A; Prochesta N.F;Sakib M.S; Aryal K.R; Rahman F;Islam A.R.M.T)[6] they gather students' opinions by an online survey. They reports

that female students are more anxious than male students. They also predict that financial and mental help can mitigate the negative psychological impacts.

(Rajib Ahmed Faisal et al.2021)[7] this article shows that pandemic has affected people of all ages both physically and mentally all over the world. In this report author focused on students anxiety, depressive symptoms and mental health status in Bangladesh. Their analysis shows the worsening condition and lack of knowledge about COVID-19 aggravated the problems. Tertiary level students are also more vulnerable because they are in the transition stages of their life.

(Kunal Chaturvedi; Vishwakarma D.K;Nidhi Singh et al.2021)[8] the impact of Covid-19 on student of various ages was identified in this articles,social life and mental health both are important. Furthermore, this study discovered that in order to cope with stress and anxiety. This article suggests that public officials take necessary steps to improve the learning expensive by mitigating the negative effect of COVID-19.

(Zebun Nahar and Md.Sohan et al.2022)[9] According to the article, the prevalence rate of loneliness, anxiety and depressed symptoms among female students of Bangladeshi university was 55.88%, 69.18% and 45.23% respectively. The long term closing period of the university classes was liable for the weak mental health of students. Promoting good health has become a public health concern during Covid-19 pandemic.

(Eqbal Radwan;Afnan Radwan et al.2020)[10]this article shows that responsible authorities are closing the education institution as a preventive procedure. May be this decision can bring a short term positive results but pandemic aggravate the worsen situation of the students.

This movement restrictions, closures and stay home lead them to rise in the rates of domestic violence loneliness, depression and fear among students.

(M.Kharul Alam et al.2022)[11] in this article author focused the four main category of the students who suffered from mental health imbalance. Corona virus facing insecurity using social media and smoking habits increased the rate highly. In contrast, begin worried about study, future career and participation in household reduced the disruptions. Sleeping time and participation instruction were preventive factors. (Miraz Uddin and Burhan Uddin et al. 2021)[12] the research paper focuses economic factors, socio factors and education factors which have a acute significant on the students mental health during epidemic. Here author promotes alone of government and their agencies effective strategies to mitigate and solve the worsen situation of the students.

Financial contribute and educational facilities may help the student to recovery their previous position immediately.

## **2.2 Scope of the problem**

We applied a several machine language algorithm and test datasets. By finding correlations between attributes in our dataset. We were attempting to discover particular contributions to depression risk factors.

In Bangladesh, the poor management in the health sector has been a matter of heavier headache. Proper treatment during covid 19 pandemic is considered a time-consuming matter. But better symptom analysis algorithm permit the system to recommend the authorities and mass people.

## **2.3 Challenges**

Our report has to do with a long-time survey. A research paper imposes several problems. There were different types of barriers that you can faced when you complete the study. In practical research, investigation something is always a tough path.

We collected research data from person to person by using google form in online. We effort a lot to collected raw data of during COVID-19 pandemic. So it was quite impossible to go outside in the time of look down. Sometimes students and their family members did not agree to share their situation with our team. Because of their personal privacy, a shortage of staff and proper privileges we suffered a lot. We the people of our country not so much conscious about our mental health. We often not humble to share our financial condition with others. As a result, we have never been so benefited from students.

Hiding their personal privacy, our team have successfully collected useful information from the students of many schools and college. To identity the real environment of our educational institution we were helped by the authority. We conducted our surveys and interview among students and teacher of higher educational institutions in four major cities. So we faced economical and transportation crisis during the lockdown. But finally we completed our mission and created a well performed report.

# CHAPTER 3

## Research Methodology

### 3.1 Proposed Model

Every study has a unique approach, and ours is no different. We'll now go over every step of our work in detail. The architecture of the system is explained in this section. First of all we need a dataset for conclude our goal. After data pre processing those data go through various type of model. Evaluating all model we find the best model for our dataset.

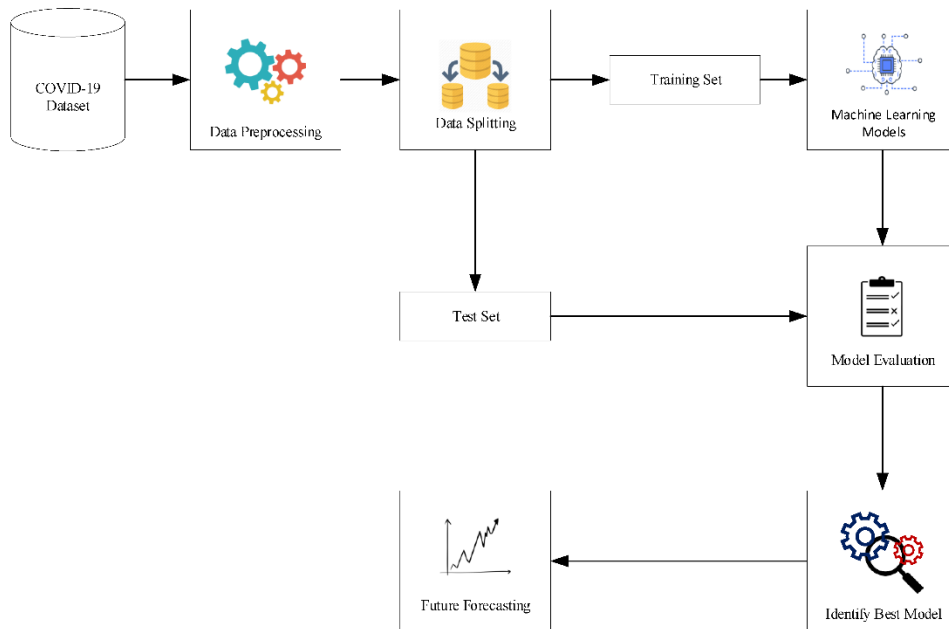


Figure 3.1.1: Proposed model

### 3.2 Data Collection

We have collected our dataset from kaggle. This is a survey related dataset of the students of several universities and all the dataset attributes are the parts of their personal information about Gender, Age, Department of studies, Year of studies, CGPA, Marital status and mental condition status during COVID-19.

#### 3.2.1 Dataset

We have collected a survey related data set from kaggle about the personal information of the students from several universities. After analyzing and evaluating the proposed model, we've

applied 10 fold alongside with K-fold cross-validation. The number of rows in the dataset was truncated to a caliber that was adequate for applying different Machine Learning Algorithms by gathering it into a single CSV file. In machine learning algorithm, It needs meaningful data in order to prophesize anything. The following figure shows our dataset with some values in several rows and columns.

	Timestamp	Choose your gender	Age	What is your course?	Your current year of Study	What is your CGPA?	Marital status	Do you have Depression?	Do you have Anxiety?	Do you have Panic attack?	Did you seek any specialist for a treatment?
0	8/7/2020 12:02	Female	18.0	Engineering	year 1	3.00 - 3.49	No	Yes	No	Yes	No
1	8/7/2020 12:04	Male	21.0	Islamic education	year 2	3.00 - 3.49	No	No	Yes	No	No
2	8/7/2020 12:05	Male	19.0	BIT	Year 1	3.00 - 3.49	No	Yes	Yes	Yes	No
3	8/7/2020 12:06	Female	22.0	Laws	year 3	3.00 - 3.49	Yes	Yes	No	No	No
4	8/7/2020 12:13	Male	23.0	Mathemathics	year 4	3.00 - 3.49	No	No	No	No	No
...	...	...	...	...	...	...	...	...	...	...	...
96	13/07/2020 19:56:49	Female	21.0	BCS	year 1	3.50 - 4.00	No	No	Yes	No	No
97	13/07/2020 21:21:42	Male	18.0	Engineering	Year 2	3.00 - 3.49	No	Yes	Yes	No	No
98	13/07/2020 21:22:56	Female	19.0	Nursing	Year 3	3.50 - 4.00	Yes	Yes	No	Yes	No
99	13/07/2020 21:23:57	Female	23.0	Pendidikan Islam	year 4	3.50 - 4.00	No	No	No	No	No
100	18/07/2020 20:16:21	Male	20.0	Biomedical science	Year 2	3.00 - 3.49	No	No	No	No	No

Fig 3.2.1: Collected Dataset

### 3.2.2 Data Set Description

There are several questions related to students mental health condition and academic situation during Covid-19 in the dataset. There are ten questions on the dataset. We successfully figured out our perspectives and goals of all the responses of those questions in the dataset. Those questions are answered by the participants about Gender, Age, What is the department of their studies, What is the year of their studies, What is their CGPA, What is their marital status and several questions about their mental condition during Covid-19. The structure of the dataset is shown below.

Table-3.2.2.1: Students mental health condition and academic situation attributes during COVID-19

S. No	Attributes	Type
01	Gender	Nominal
02	Age	Numeric
03	Department/Course	Nominal
04	Year Of Study	Nominal
05	CGPA	Nominal
06	Marital Status	Nominal
07	Depression Related Issues	Nominal
08	Anxiety Related Issues	Nominal
09	Panic Attack Related Issues	Nominal
10	Special Treatment Related Issues	Nominal

### Gender

According to the dataset, there are 75% of female and 26% of male. Each value is defined by their individual input of data.

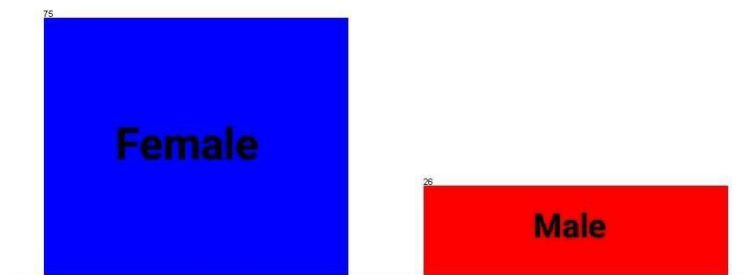


Figure 3.2.2: Graph of Gender

## Age

There are several ages of students have imputed data in our dataset. The analysis displays that the maximum participants are between the ages of 18 and 24.

Table-3.2.2.2: Frequency table of age attributes

Age	Age Count
18-20	59
21-22	5
23-24	36

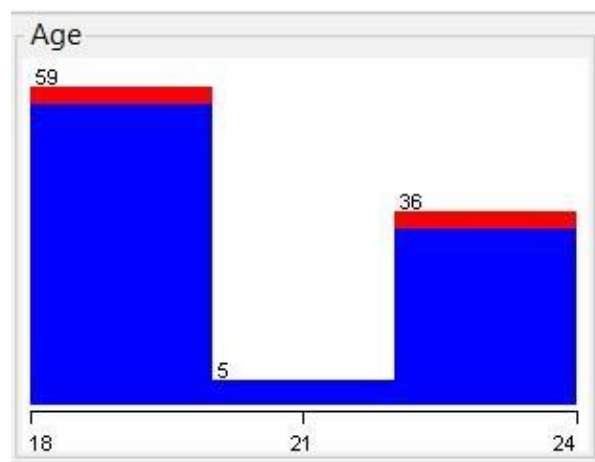


Figure 3.2.3: Graph of Age

## Department/Course

According to the dataset, there are 49 types of courses or departments among of those students. After analysis, the maximum participants of those data are BCS candidate and students of Engineering. The rest are the students of Law, Mathematics, Biotechnology, Accounting, Islamic Education, Business Administration, Psychology etc. The structure is given below.

No.	Label	Count	Weight
1	Engineering	17	17
2	Islamic education	1	1
3	BIT	10	10
4	Laws	2	2
5	Mathemathics	1	1
6	Pendidikan islam	1	1
7	BCS	18	18
8	Human Resources	1	1
9	Irkhs	1	1
10	Psychology	1	1
11	KENMS	1	1

Figure 3.2.4: Structure of Department/Course

### Year Of Study

There are 1st to 4th year students in the dataset. After analysis, the maximum participants are 1st year students and the rest are 2nd, 3rd and 4th year students.

Table 3.2.2.3: Frequency table of year attributes

Year	Count of Students
1st	43
2nd	26
3rd	24
4th	8

### CGPA

In the dataset, there are several grades of participants. After analyzing, the majority of those participants grades are at the range of 3.50-4.00. The number in that range of students are 48. The rest of the grades are divided by the rest of the participants.

Table 3.2.2.4: Frequency Table of CGPA attributes

CGPA	Count of Students
0-1.99	4
2.00-2.49	2
2.50-2.99	4
3.00-3.49	43
3.50-4.00	48



### Marital Status

After analyzing, the maximum numbers of participants are unmarried in the dataset. The percentage is 85%. The rest 16% are married. The structure is given below.

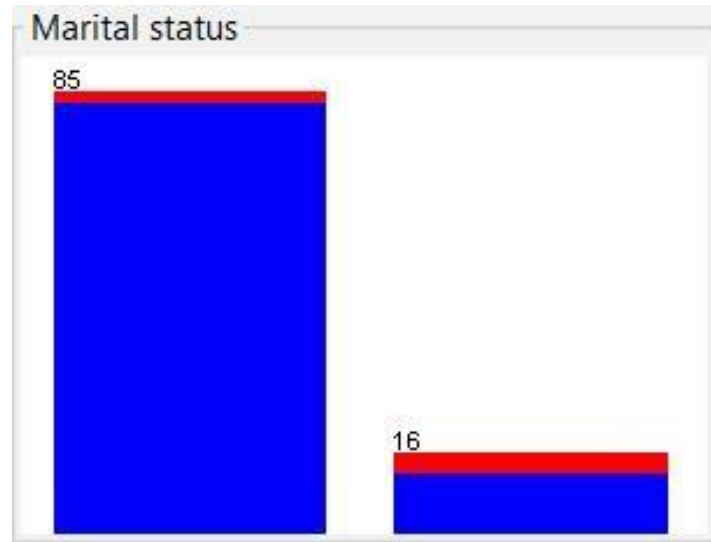


Figure 3.2.5: Structure of Marital Status

### Depression Issues

After analyzing, the majority of those participants are given negative answer to the following criteria. The rate is 66%. The rest were suffering from depression and the rate is 35%.

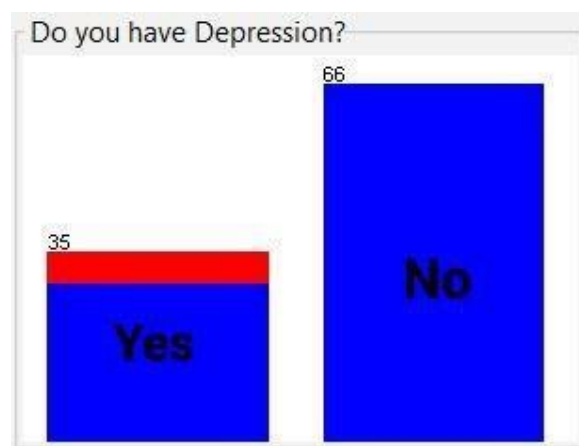


Figure 3.2.6: Structure of Depression issues

### Anxiety Issues

After analyzing, Maximum 66% of the participants are given opposite answer of this portion in the dataset. The 34% of participants are given yes answer and they were suffering from anxiety issues.

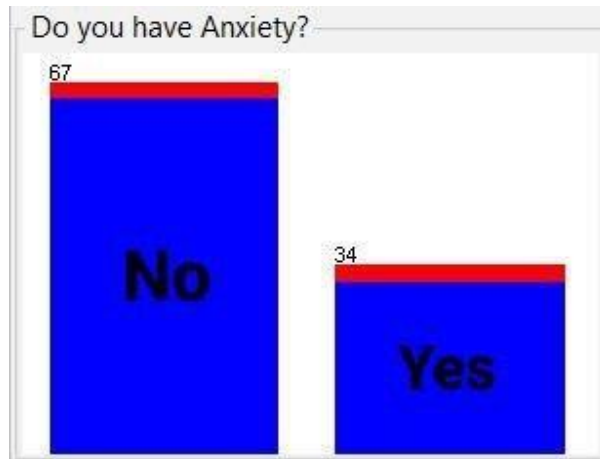


Figure 3.2.7: Structure of Anxiety Issues

### Panic Attack Issues

Maximum of 68% students have no panic attacks during COVID-19. Other 33% of participants had a panic issues.

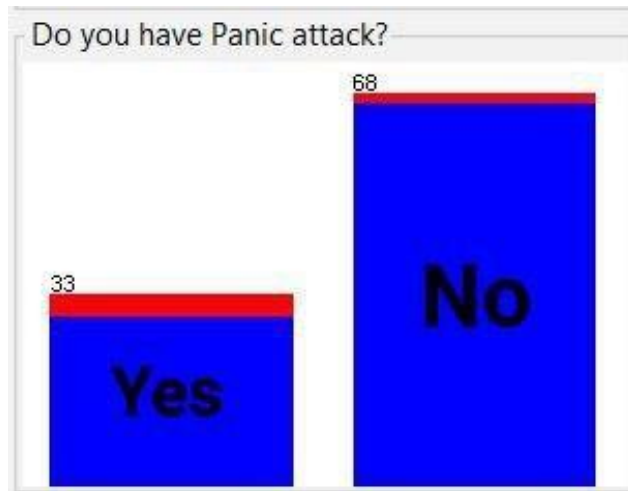


Figure 3.2.8: Structure of Panic Attack

## Specialist Treatment

Maximum of 95% participants didn't need to have a specialist treatment during COVID-19. The rest 6% of participants have had a specialist treatment and rate is 6%.



Figure 3.2.9: Structure of specialist treatment issues

### 3.2.3 Data Pre-processing

There are all the necessary values in order to conduct the research work and in order to do that, we need to develop a prediction model and also to prepare data for analysis. The success increases well if the transformation of all the data goes in a proper way. It needs more accurate data to find a satisfactory and perfect answers and also to achieve all the successful findings. There are a little missing value in the dataset. Because, some participants aren't given proper answer which cause some missing entities. We used weka tool to solve our difficulties. As we know, weka is a collection of machine learning algorithms for data mining tasks. It contains tools for data preparation, classification, regression, clustering, association rules mining and visualization. We manually edited those missing values with proper instances. Also, we did it to balance all the attributes in our dataset.

After entering in the weka tool, we have imported our dataset and we find some missing values. For this, we were facing problems to pre-process our dataset. Then we used a filter named

unsupervised to solve the problem. In unsupervised filter, there is a option attribute and in that option, there is a filter named Replace Missing Values and after using this feature, we manually edited those missing values and also compare it with all other attributes in order to accord the dataset. By this, we filled missing and null values. Also all the attributes in our dataset are nominal except one is numeric and that is the Age attribute. We used machine learning classifiers to solve our lacking. After pre-processing, we find all thenecessary values to conduct our further process.

### 3.2.3.1 Missing Value Handling

There are some missing and null values in our dataset. We used unsupervised filter and in that filter, thereis a attribute option and after clicking that option, we found ReplaceMissingValues and we used this function to fill the missing values. Also, we handled all those missing values using Numerical Cleaner. This option configures all the data and mark all the missing value portions. Then we manually editedthose missing values with string value. Then we capitalize all those outputs and set it on those respective attributes.

**Unsupervised Filter:** This is a filter in weka tool. To pre-process a dataset, It needs to use for finding several things including missing value, add attribute and so on.

**Replace Missing Values:** This is a filter of unsupervised filter in weka tool. We can replace any values of attributes by using it.

**Numerical Cleaner:** This is a filter where it can mark all the missing value portion and configures all the data If any value is missing there in the dataset.

### 3.2.4 Splitting Dataset

To use any machine learning technique, There needs to divide the dataset into two parts and those are model training and model testing. The model training would contain the data which will be victualued into the model. In simple terms, The model would learn from this data. For instance, a Regression model

would utilize the examples in this data to find gradients in order to truncate the cost function. Then these gradients will be habituated to minimize the cost and sooth-say data efficaciously. The model testing contains the data on which we test the trained and validated model. It tells us how efficient our overall model is and how likely is it going to presage something which does not make sense. There are a plethora of evaluation metrics like precision, recall, precision, etc. which can be

habituated to quantify the performance of our model. There is also another way and that is cross-validation. Cross-validation is a technique for evaluating Machine Learning models by training several ML models on subsets of the available input data and evaluating them on the complementary subset of the data. Cross validation uses 10-fold validation and invokes the cognition algorithm 11 times in weka. It uses one for each fold of the cross-validation and also happens a final time on the entire dataset. It actually better because of the reduction of variance. It can produce more accurate data and can estimate the verification of all the values in the dataset properly. We used some cross-validation in our dataset to find the accuracy and success rate of the whole dataset and also cross-validation smoothly configures all the data given by the respective participants.

### **3.3 Learning Classifiers**

we have used several classifiers in order to achieve the prediction for data analysis. Those classifiers are Naive Bayes, Random Forest, Random Tree, AdaBoost and Multi-Layer Perceptron.

#### **3.3.1 Naive Bayes Classifier**

Naive Bayes Classifier are a family of simple probabilistic classifiers based on applying bayes theorem with strong independence assumptions between the features. The classifications of naive bayes are highly scalable and also requiring a number of parameters linear in the number of variables. There are two types of function in naive bayes and those are simple bayes and independence bayes. It is also a simple technique to construct several classifiers. Mostly, It is used for sentiment analysis, spamfiltering, recommendation system etc. The most positive thing of naive bayes is, It is fast and easy to implement any kind of dataset and helps to find the respective result by using less amount of time. We used this algorithm to find the proper prediction in a way.

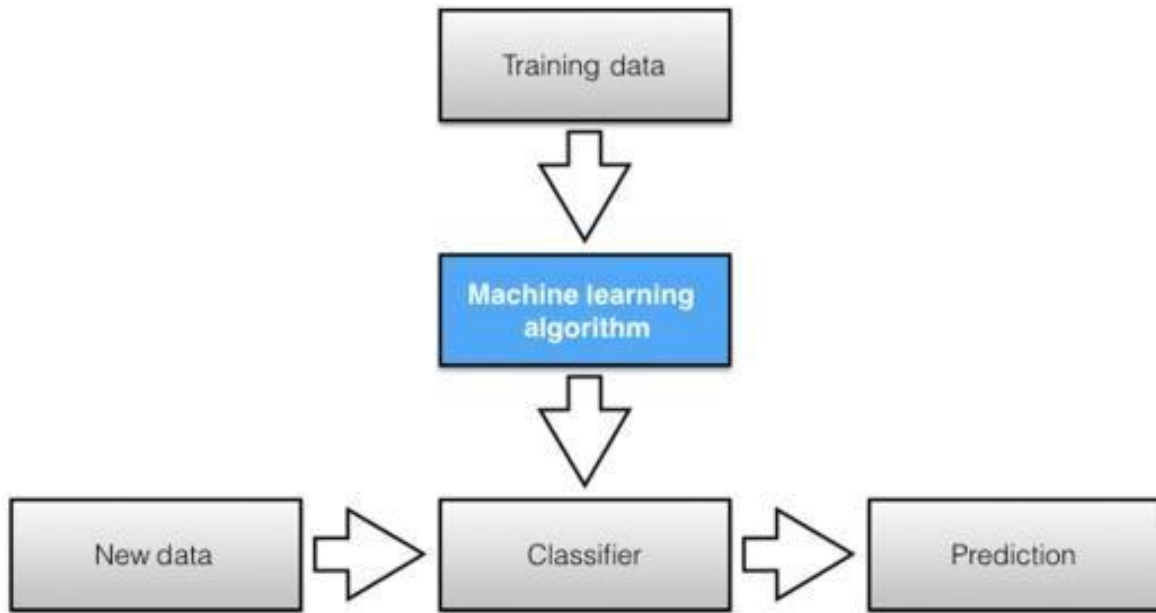


Figure 3.3.1: Structure of Naive Bayes

### 3.3.2 Random Forest Classifier

Random Forest is a type of classifier to solve regression and classification problems. It is also made up of a collection of decision trees. Each tree is assembled for comprised data samples and is drawn from a training set with replacement. It utilizes both bagging and feature and creates subset of respective values. The advantage of random forest classifier is It can perform both regression and classification at the same time. Also It can handle large dataset and after classification, It gives more accurate and proper result. It also produces more accurate predictions that can be understood easily. It also provides higher level of accuracy in predicting outcomes. We used this algorithm for proper result and prediction.

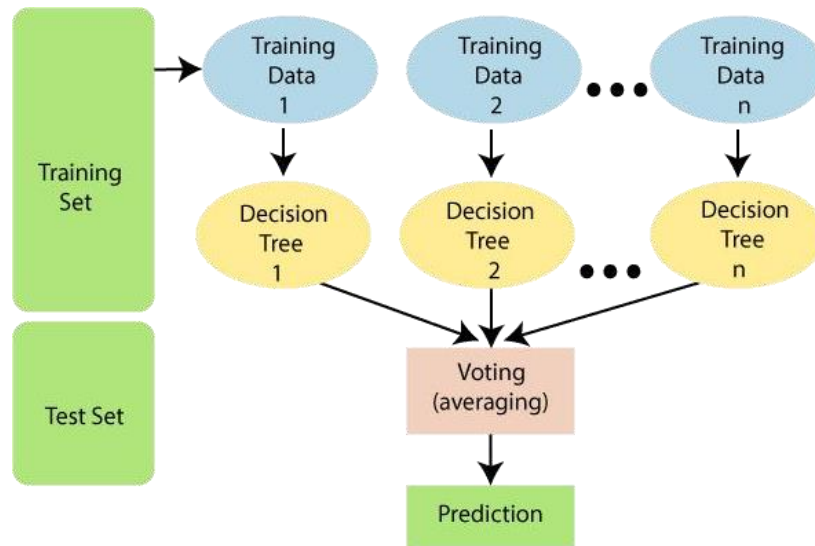


Figure 3.3.2: Structure of Random Forest

### 3.3.3 Random Tree Classifier

It is a supervised machine learning algorithm for its extreme popularity and is used for both regression and classification problems. It produces a decision tree where all the nodes of a dataset are decorated like the roots of a tree. We used this algorithm in order to achieve proper prediction.

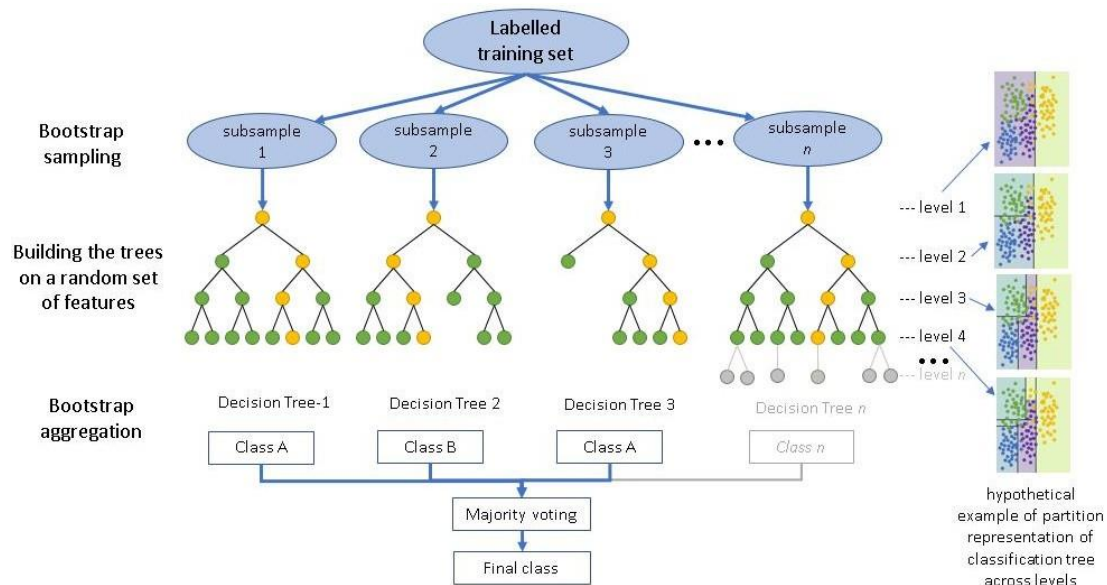


Figure 3.3.3: Structure of Random Tree Classifier

### 3.3.4 AdaBoost Classifier

It is a kind of algorithm that fits a classifier and it begins on the original dataset and then fits additional copies of the classifier on the same dataset. It also measures weights of incorrect classified instances and adjusts it with correct classified instances. AdaBoost is the short form of adaptive boost. We used this algorithm for the better accuracy of result and prediction.

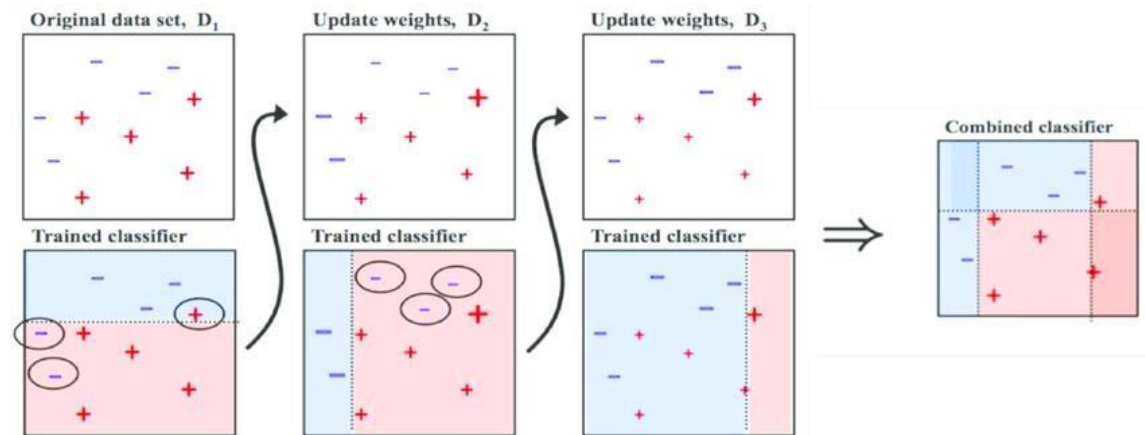


Figure 3.3.4: Structure of AdaBoost Classifier

### 3.3.5 Multi-Layer Perceptron Classifier

MLP Classifier is a neural network and it consists of three layer. Those are input layer, output layer and hidden layer. The input layer receives the input signal and processes it. The tasks such as prediction and classification is presented by the output layer. Between the input and output layer, there is a computational engine which is called hidden layer. It helps to calculate and balance both input and output layers and compatible the whole neural network system. We used this algorithm in order to find the proper result and prediction to conduct our research work.



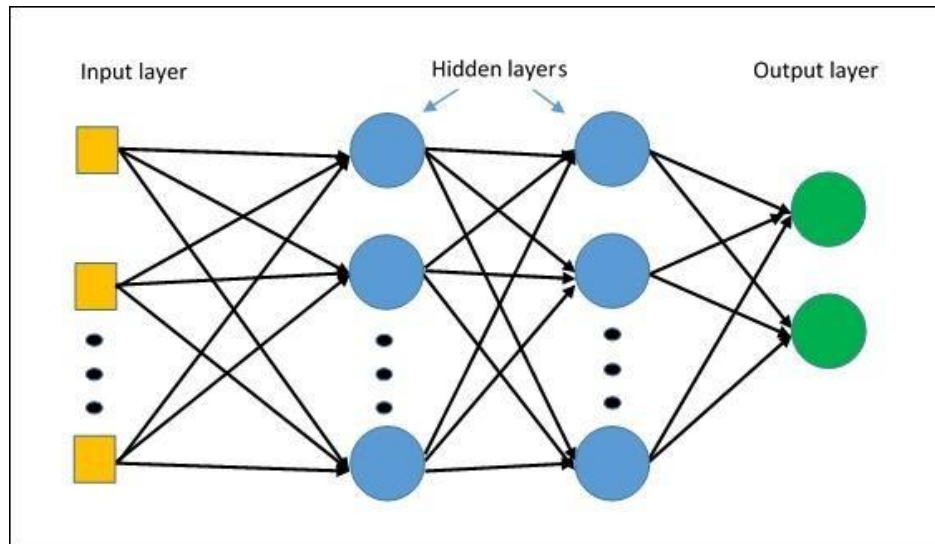


Figure 3.3.5: Structure of Multi-Layer Perceptron Classifier

### 3.4 Training Model

Training Model is very important to all the data scientists and researchers to conduct the work properly and accurately. The model we trained and executed using weka tool and performing some machine learning algorithms and classifications. As we know, it needs more systematic and repeatable techniques in order to build a proper training model. It also requires more accurate data and findings that will meet all the requirements of a model. Without a model to do a research work, it's like finding a needle in a haystack. Also, our dataset contains a limited amount of data which needs to be used wisely otherwise there will cause a lot of problems to find the accuracy and prediction. In order to do proper research and also avoid difficulties, we spitted our dataset into two portions. First of all, we trained our dataset in some various ways and tests them for the betterment of the research work.

We are researching a survey related data and we found it from kaggle. In order to conduct the research, we need to find the accurate result and best solution to get the appropriate prediction. For this, we used weka tool and conduct our research work with machine learning algorithm. There were some missing values in the dataset and after doing pre-processing, we find the solution of our problems. Then we worked on the data to find the best and accurate result from this and for this, we used several machine learning algorithms. After finding all the results from those algorithms, we collect those results and compare each and every of them to find which is the better algorithm to conduct with.

### 3.5 Evaluating Model

It is a process of using different types of evaluated metrics to understand a machine learning performance. We can also find its strengths and weakness by evaluating a model. It is very important to access the efficiency of a model during research work, classification, pre-processing and so on. There are various ways to execute a evaluated model. Those are confusion matrix, accuracy, precision, recall, specificity, PR curve and ROC curve. We can also compare the results of true positives, false positives, true negatives and false negatives.

After performing all those things, we can finally find an evaluated model to conduct the research work on it. This will help to increase the success rates and predictions more drastically.

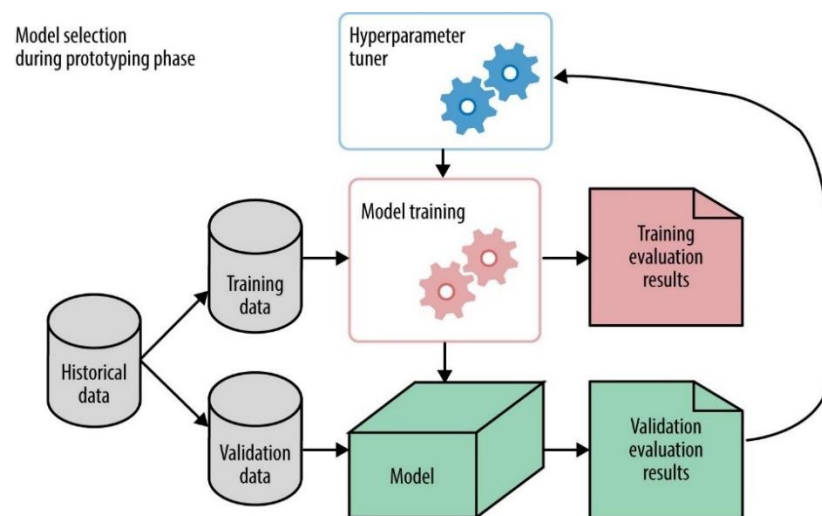


Figure 3.5.1: Structure of Evaluation

#### 3.5.1 Cross Validation

We employ k-fold cross-validation to provide an unbiased evaluation of the model's performance when there is just a small quantity of data available. In k-fold cross-validation, the data is split into ten pieces of equal size. Ten models are built, each with one of the training subsets left out and used as the test set. The term "leave-one-out" is used when k equals the sample size.

There are two sections to the model evaluation:

- Classification Evaluation
- Error Detection

### 3.5.1.1 Classification Evaluation

The number of accurate and inaccurate predictions generated by the classification model in relation to the actual outcomes (target value) of the data are shown in a confusion matrix. The matrix has dimensions (N×N), where N is the number of expected values (classes). The performance of such models is usually evaluated using the matrix data. In the table below, a 2x2 confusion matrix for two classes is shown (Positive and Negative).

Table-3.5.1.1.1: Confusion Matrix

	Predicted Class		
		1	0
Actual Class	1	TP	FP
	0	FN	TN

Accuracy, specificity, and precision were determined using the Ramana et al. (2011) formula, which may be expressed as follows –

- Accuracy =  $\frac{TP+TN}{TP+FN+FP+TN}$
- Precision =  $\frac{TP}{TP+FP}$
- Sensitivity / Recall =  $\frac{TP}{TP+FN}$
- F1 - Score =  $\frac{2*Precision*Recall}{Precision+Recall}$

All of the measurements are calculated using four values: true positive, false positive, true negative, and false negative. These values are discussed more below.

- FN = false negatives: the number of cases projected negative but found to be positive.
- TP = true positives: the number of positive cases that were expected.
- FP = false positives: the number of cases predicted positively but turned out to be negative.

- TN = true negatives: the number of expected negative cases that are truly negative.

### 3.5.1.2 Error Detection

We have utilized Mean Absolute Error, Root Mean Squared Error, and Relative Absolute Error among other criteria for assessing and contrasting categorization models once they have been built.

#### 3.5.1.2.1 Mean Absolute Error

Only models with the same error units can be compared since the mean absolute error (MAE) is assessed in the same units as the original data. Although it is significantly smaller, its magnitude is typically comparable to RMSE.

$$\text{MAE} = \frac{\sum_{i=1}^n |p_i - a_i|}{n}$$

Here, a = actual target, p = predicted target

#### 3.5.1.2.2 Root Mean Squared Error

The root mean square error (RMSE) is a popular approach for determining a model's error rate. It can only be contrasted with models that have equivalent error units, though.

$$\text{RMSE} = \sqrt{\frac{\sum_{i=1}^n (p_i - a_i)^2}{n}}$$

#### 3.5.1.2.3 Relative Absolute Error

The relative absolute error (RAE), like the RSE, may be used to compare models whose mistakes are quantified in various units.

$$\text{RAE} = \frac{\sum_{i=1}^n |p_i - a_i|}{\sum_{i=1}^n |\bar{a} - a_i|}$$

## CHAPTER 4

### EXPERIMENTAL RESULTS & DISCUSSION

#### 4.1 Classification Report

Each algorithm's accuracy and scores were evaluated after Machine Learning Model Creation was successfully implemented in order to determine which algorithm was the most successful at predicting depression risk variables. Finally, the experimental findings constitute an analytical section in which each potential score for each algorithmic application and technique may be assessed.

Table-4.1.1: Performance analysis of confusion matrix.

Classifiers Name	Parameter						
	Accuracy	Sensitivity	Specificity	Precision	Re call	F1-Score	Efficiency
Naive Bayes	87%	95%	18%	95%	95%	93%	66%
Random Forest	94%	94%	100%	94%	94%	96%	96%
Random Tree	92%	94%	33%	93%	94%	95%	73%
AdaBoost	93%	94%	50%	94%	94%	96%	79%
Multilayer Perceptron	88%	93%	14%	93%	93%	93%	65%

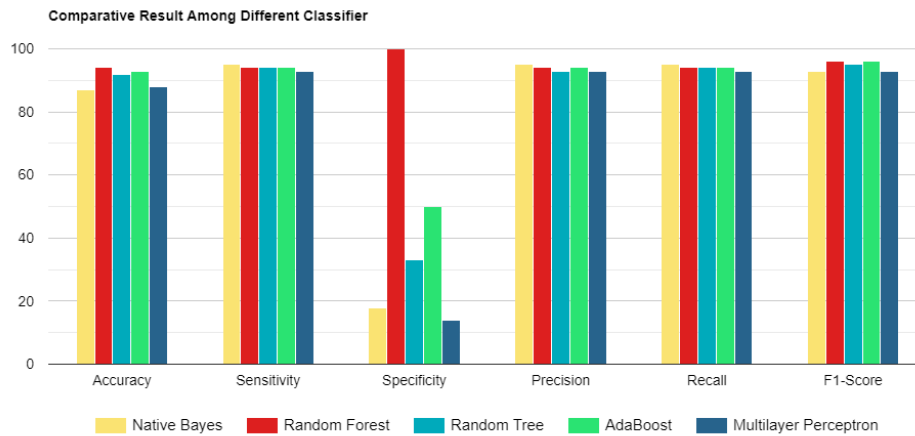


Figure 4.1.1: Comparative result among different classifiers

Random Forest offers the best accuracy rate, as well as the highest percentages of precision, sensitivity, and specificity, as shown in this graph of accuracy, sensitivity, precision, specificity, and efficiency. On the other hand, Naive Bayes has the lowest accuracy while Random tree and MLP both have the lowest sensitivity and precision. MLP also has the lowest specificity. Because it has the best parameter in comparison to the other four algorithms, Random Forest performs the best on our dataset.

Table-4.1.2.: Error rate of all classifiers in our dataset.

Classifier Name	MAE	RAE	RMSE
Naive Bayes	13	111	30
Random Forest	11	93	23
Random Tree	12	100	28
AdaBoost	8	70	24
Multilayer Perceptron	10	87	29

Figure 4.1.2: In this figure, we've depicted the error rates of all algorithms. The decision tree has the highest error of Mean Absolute Error, Relative Attribute Error and Root Mean Square Error among all. On the other hand, Random Forest has the least Mean values in each error.

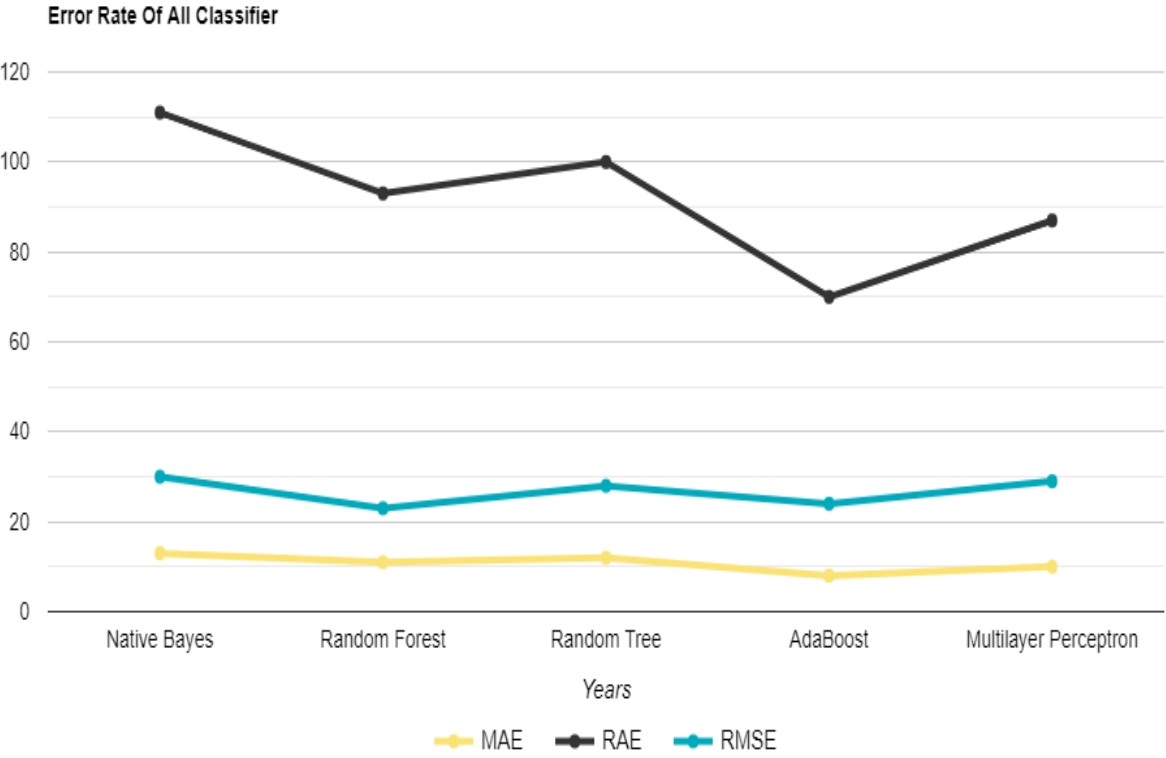


Figure 4.1.2: Error rate of all classifiers in our dataset.

### 4.2 PREDICTIONS

In this study and other studies, the effectiveness of machine learning algorithms is evaluated by forecasting various iterations. For data analysis prediction, many classifiers, such as Random Forest, Multi-layer Perceptron Classifier, AdaBoost, and Random Tree Classifier, may function independently.

The best algorithm for our model can be chosen by comparing them based on accuracy levels attained.

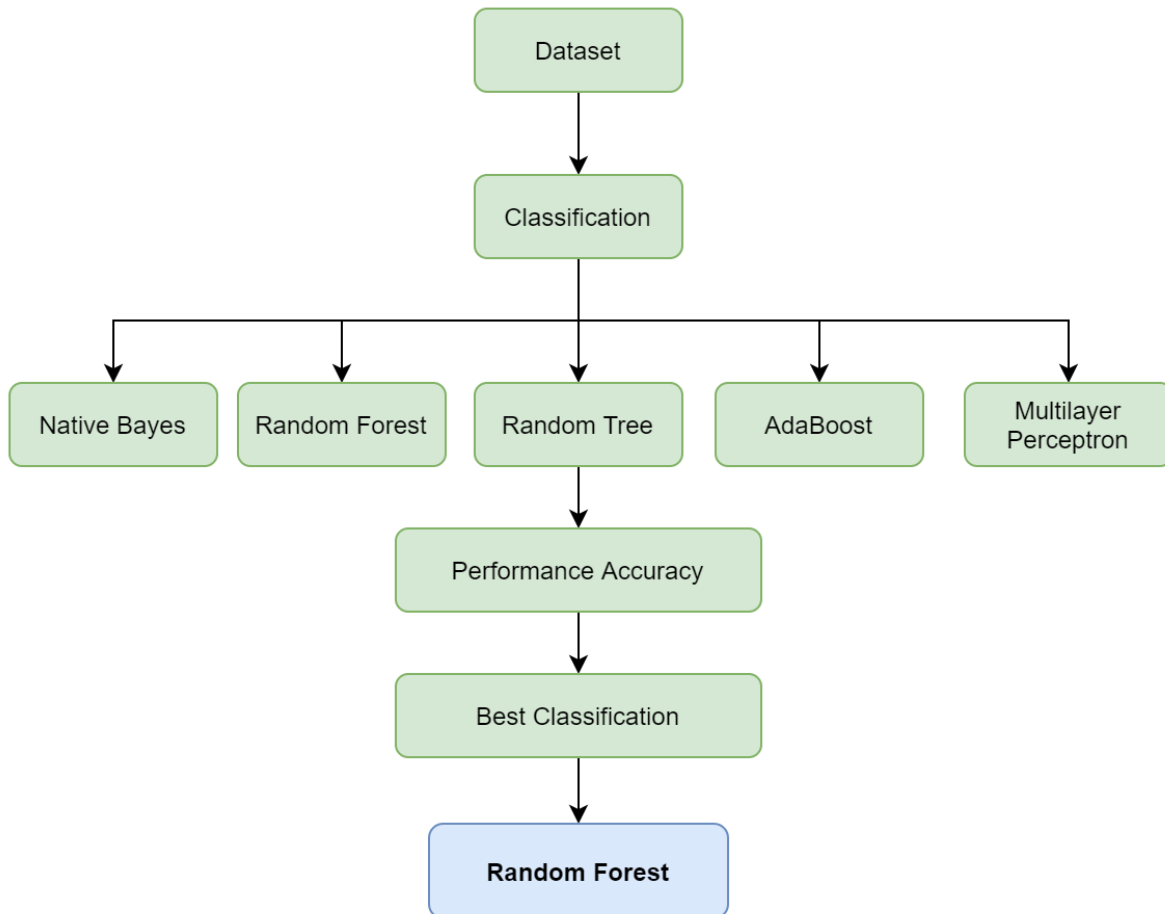


Figure 4.2.1: Flow diagram of the best classifier.

From the above Figure 4.2.1, we can see that the best algorithm for our model is Random Forest Classification.



### 4.3 Confusion Matrix

Table-4.3.1: Confusion Matrix of Random Forest Classifier

Actual	Predicted		
		Positive	Negative
	Positive	95	0
Negative	6	1	

Table-4.3.2: Confusion Matrix of AdaBoost Classifier

Actual	Predicted		
		Positive	Negative
	Positive	94	1
Negative	6	1	

Table-4.3.3: Confusion Matrix of Random Tree Classifier

Actual	Predicted		
		Positive	Negative
	Positive	93	2
Negative	6	1	

Table-4.3.4: Confusion Matrix of Native Bayes Classifier

Actual	Predicted	
		Positive
Positive	86	9
Negative	4	2

Table-4.3.5: Confusion Matrix of Multilayer Perceptron Classifier

Actual	Predicted	
		Positive
Positive	89	6
Negative	6	1

## **CHAPTER 5**

### **IMPACT ON SOCIETY & SUSTAINABILITY**

#### **5.1: Impact on Society**

We are in the age of information technology, and information technology permeates every aspect of our society. Our discoveries will have a major impact on society. In this study, we used Machine learning algorithmic techniques to classify impact of the student mental health condition and academic situation during COVID-19. Our method has some impact on society. We talk to each other every day, but we cannot understand their true feelings. Our model is useful for this type of text classification.

#### **5.2: Ethical Aspects**

From an ethical perspective, our way of working and the way we work do not violate basic human rights or confidentiality obligations. We collected the data from Kaggle, which is always available online. Therefore, the data we process cannot be used to identify or harm anyone. We did not harm or threaten anyone in the course of our duties to perform our duties or collect data. Our work relies on data, so we take special care in collecting and storing it. While completing our work, we did not claim the work of other organizations or individuals as our own. We used our own computer. We have never used someone else's equipment or stolen information or data from anyone else. We conducted our investigations with integrity, compliance, honesty, legality and transparency.

#### **5.3: Sustainability Plan**

Our main goal is to classify impact of the student mental health condition and academic situation during COVID-19, using machine learning algorithms. Many changes in companies and organizations can be made sustainable with our program. Only certain datasets work in the model. Therefore, a large number of student mental health problems and academic situation during COVID-19 related datasets are required to advance and sustain this work into the future. In the future, this model could be applied to fields such as education and mental health as datasets on student mental health and academic performance are expanded and improved as needed during the COVID-19 pandemic. Our proposed new model will be useful for other large datasets and other datasets in the future.

## **CHAPTER 6**

### **FUTURE SCOPE & CONCLUSION**

#### **6.1 Summary of the Study**

In this research, all work was related to sentiment analysis. We used machine learning algorithms to conduct work on the impact of student mental health and academic conditions during COVID-19. Our work is very helpful for the education and mental health of our students. Good results were obtained with all models on our own dataset. It took three months from the start of data collection to the completion of the research. we had to follow a series of steps in order to complete this. The entire working steps are summarized and listed under -

**Step 1:** Data set collected from kaggle.

**Step 2:** Splitting Dataset.

**Step 3:** Data Preprocessing

**Step 4:** Use Weka

**Step 5:** Use naive bayes classifier, random forest classifier, random tree classifier, adaBoost classifier and multi - layer perceptron classifier.

**Step 6:** Result.

We followed these steps in order to complete the task. This model supports our sentiment classification regarding the impact of student mental health and academic status during COVID-19.

#### **6.2: Future scope**

We have accomplished this report with a high desire and we have some expectation. We show the impacts on student's mental health condition and academic situation during covid -19 pandemic. Through it was a massive tough work sometimes we enjoyed a lot. According to this report, it has numerous negative impacts on student but we analyze and provide some though which can help to mitigate the situation. By using this research anybody can realize the environment during pandemic. These research findings ensure the possible solution. Our survey can assist the authorities to take essential steps to gain the previous pandemic free world properly. It would also be important asset to the students when they research about this topic. The data and information in

this report will be contextual in every direction of research in the near future. So with the help of this report, we are hoping that there will be many scopes to develop such type study.

### **6.3: Conclusion**

In our survey, our analysis and finding implement that the covid 19 pandemic has made a massive impact on the student's mental health condition and academic situation during pandemic. The covid pandemic interrupts our daily life but the damage of the student's life is unthinkable. This study shows students experienced of high levels anxiety, depression symptoms and low mental health condition. Especially university students are in more vulnerable situation than others. This corona virus has risen into a phobia in education sector of Bangladesh. Mental health of the students has been a major concern for many years. The outbreak of this pandemic also aggravates the rate highly. It is disturbing that such rate of mental and academic discomfort can create a huge damage of the nations.

In shortly, this report indicates the real fact about the negative impact on students' life as a result of this pandemic. The tremendous condition should be alleviated immediately. At the same time, our study can be beneficent to mitigate the damage of this pandemic. By using this findings and predictions, government, educational authorities and health policy makers can take necessary steps to recover from this tragic period. We also highlight the importance of public awareness in this regard.

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# IMPACT OF THE STUDENTS MENTAL HEALTH CONDITION AND ACADEMIC SITUATION DURING COVID- 19 THROUGH MACHINE

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