`EFFECT OF ONLINE EDUCATION IN UNIVERSITY LEVEL BASED ON MACHINE LEARNING

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APPROVAL

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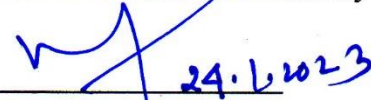Faculty of Science & Information Technology
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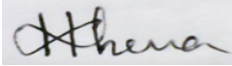Department of Computer Science and Engineering
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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Most. Hasna Hena, 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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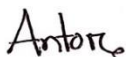Department of CSE
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ABSTRACT

In the time of pandemic, the whole world faced many new problems. Education system had to be undergone major changes. Students were forced to take Education through online. At that moment, they were not accustomed with online education as the context of Bangladesh. Our study explores the effectiveness of online education system on the students who studied in Daffodil International University in Bangladesh. Here finding the positive and negative impact of online education. In this study the primary objective turned into to explore the effect of on-line education and to investigate the web training on students getting to know technique. This study helps to understand that which category is to help that the education of online needed and the impact of traditional education. We collected data through online survey with 30 questions. In this research more than 700 student participate during online survey and collecting data. Using simple random technique, we select 30% data for the sample size. The close-ended questionnaire become used for records series. The link of on-line schooling with computer literacy, creativity among college students, motivation of college students in the direction of mastering, and overall performance of students turned into evaluated by using the manual method. Result suggests that some students who are technology updated and motivated can perform better in online education and it depends on the facilities. As in Bangladesh online learning term comes in the COVID-19 pandemic situation the financial issues also be the part of issues to move on the academic success. Talented student also be hampered due to technical issue as well as financial. Cities areas are consequently ahead rather than other side. By using machine learning algorithms on the dataset, we got the result. Through the result, we got students perceptions about the online education system. This work shows us the advantages and disadvantages of the online education system.

TABLE OF CONTENTS

LIST OF TABLES

TABLES	PAGE NO
Table 3.1.1: Data overview	10
Table 3.1.2: Process of our research studies	11
Table 4.2.1: Adaptability level accuracies	28
Table 4.2.2: Concentration level accuracies	30
Table 4.2.3: Understanding level accuracies	31
Table 4.2.4: Effective level accuracies	32
Table 4.2.5: Online Exam Experience level accuracies	33
Table 4.2.6: Better Result accuracies	34
Table 4.2.7: Algorithms accuracy output in satisfaction level	35
Table 4.2.8: Preferable Education System Accuracy	36

LIST OF FIGURES

CHAPTER 1
INTRODUCTION

1.1 Introduction

Online education is very common in Bangladesh. During covid-19, people face many new problems. At that time, Education was also affected. To run education properly, the education process was conducted online. In all over the world, all educational institutions were forced to take education online in 2020. So, in Bangladesh, this educational system went online. Online learning process is actually a big challenge. Creating right environment for learning, ensuring participation, proper assessment in online are the most difficult part. Because of pandemic situation, teachers had to deliver their instructions in online. Teachers structured lessons for students according to online process. Students can take their education safely without face to face program. So, we collect datasets from university. From that dataset, we can easily analysis the effect of online education of university students.

1.2 Motivation

Pandemic situation has changed human's life style. Student could not go school, college, university for education during that time. So, online education was found out for alternative to avoid the interruption in learning process. Students could continue their studies at that difficult situation. This online education is important. We want to identify the impact of online education system. Because of that, we choose this topic to research.

1.3 Rationale of the Study

We learned machine learning Algorithms. It will help to find our result. Those Algorithms can predict of effect in online education by analysing dataset. We try to collect data from students by questionnaire. We try to collect accurate data. We have read some online

education related papers. It helps us to understand how to write paper. In the history the main motive of this topic is to find the positive and negative effect on students. We made several attempts to enrich our knowledge about our topic, so that we can apply proper algorithms to reach our goal. We analysis covid-19 situation.

1.4 Research Questions

Our research topic is the effect of online education. We have studied a lot of paper for understanding what to do. We have to find perfect algorithms for better result. For proper understanding the effect of online education, we have to find huge amount of data from students. Collecting data from student is not easy for us. We have faced some questions during the works.

Such as,

- ➢ How can we collect raw data from students?
- ➢ Which type of questions we can add in form for data collections?
- ➢ Which algorithms are perfect for understanding the effect of online education?
- ➢ How can we reach our expected outcome?

1.5 Expected Output

Finding the effect of online learning is our priority job. We apply some model and algorithms to predict the positive and negative side of online learning process. We hope, we can successfully find out the effect of online education on students.

1.6 Project Management and Finance

First of all, our plan a project for research and thesis. We had to learn how to create project plan and how to control or manage it perfectly. Then we learned to execute it. Research question is the core of our work. So, we identified questions for research. According to

that, we execute project so that we can reach our goal. We created our work schedule. We learned useful machine learning algorithms to apply in our work. We try to finish every particular work within deadline. We read a lot of papers related our topic effect of online education. We fixed our priorities that means what we need to do. We learned planning skills. Communication is very important. So, we communicate time to time. We take notes and measure progress regularly.

For research, we also need financial support. We read many paid research papers. When we collect data using form, the print cost was 2000 taka only. We had also journey cost.

1.7 Report Layout

Chapter 1:

It's shows the introduction of the research. In this chapter introduction, motivation, rational of the study, research question, expected output, project management and finance and page layout are described.

Chapter 2:

It's all about background of oue studies. In this section preliminaries, related works, comparative analysis and summery, scope of the problem, challenges are described.

Chapter 3:

It's all about methodology of the research. In this section research subject and instruction, data collection procedure, statistical analysis, proposed methodology, implementation requirements are described.

Chapter 4:

It's about the outcome and the discussion. In this section experimental setup, experimental result and analysis, discussion is described.

Chapter 5:

In this chapter Impact on society, environment and sustainability plan and ethical aspects are described.

Chapter 6:

In this section summary, the conclusion, recommendation and implementation of future studies are described.

CHAPTER 2
BACKGROUND

2.1 Preliminaries

In the interests of health and safety, educational institutions around the world had to temporarily suspend their live education programs in covid-19. Meanwhile, more and more colleges and institutions offer this learning method with great flexibility, helping a greater number of students busy with their careers and families to engage in advanced, professional studies. With the increasing application of online education, there have been conflicting results on this topic, especially due to the outbreak of COVID-19. This research paper seeks to answers such as What level of students did online classes; What kind of problems did students face while doing online classes; In online learning, how well students were able to focus and how well they were able to adapt; Above all, this research paper seeks to reveal the impact of online education.

2.2 Related Works

Some research paper shows the effect of online education using various types of algorithms and techniques. A paper shows difference between face to face education and online education using machine learning algorithms [1]. Here we can also see e-learning is capable for delivering good education of higher learning institutions. The effeteness of e-learning was tested through this research. For showing effeteness, here some methods are used. This paper compares the passing rates, of online and face to face education system. This paper also measures the online enrolment rate.

This paper [2] aimed to information of the effects of teaching English online as a foreign language during covid-19 pandemic. This paper analyzed mainly four things educational assessment and practices, outcomes of learning, affective factors and perceptions of student about the positive and negative effects of online learning. Online education system is unfamiliar. Some students faced many problems to learn properly. On the other hand, some

students feel comfortable to continue their study in online at home. Here it is showed that, online learning is very effective at that situation. Some mixed methods are employed on 480 students to find the impact of online learning process. During pandemic situation, online education is best solution to continue study.

By the questionnaire survey, this paper [3] try to weigh up the impact of online education system learning of dental schools in various countries in Asia during the covid-19 pandemic situation. 510 students from 13 dental schools in 7 Asian countries responded the questionnaire survey. 495 students gave valid response. From this survey, online learning was held in the 94.5% of dental schools in the pandemic. 69.5% students prefer to physical class. 23.4% student prefer to blended learning. This paper shows that, students are prepared to do online classes. The union of offline class and e-learning class will be future tends of Dental education system in the sense of concerning Blended Learning Courses.

Basically, this paper [4] is about online learning platforms and their impact in our educational system. Where this research shows a lot of advantages in online education. On the other hand, there is a little bit disadvantages which is not impactful in educational system. In this research the online platform used edX. Data was taken from that platform. Where edX is the online portal where students can enroll them in this portal and choose their interested subject and they can learn from this educational portal. In this platform all over the country students participate to learn something new. The major students are from USA, UK and India. This edX is an international platform where students can enroll from all over the world. They can take Assignment, Quiz and also, they can take practical lesson from the internet by seating there home easily. In edX every student should at least 60% grade to pass. Caused every 100 college students, 34 already had a Bachelor's degree, 26 have a master's degree, 6 have a Doctorate, 4 had enhance the general revel in of a student who has just handed out of school. considering the second one highest variety right here is excessive faculty students, this will be a super opportunity for them to interact with the ones who have already handed via the ranges of higher schooling. therefore, edX has accrued an international student base which is also numerous and massively knowledgeable.

Due to the impact of Covid-19, [5] the government was forced to close all educational institutions. The educational institutions have introduced online education system so that the educational activities are not disrupted. The objective of this research was determining the impact of learning purpose and e-learning media on student acquisition in the department of Business and Economics, Warmadewa University. The sample of this study was 55 students of management department in University. Using Partial Least Square (PLS) quantitative analysis data has been collected. The study reported that almost 90 percent use e learning. There are many e-learning platforms such as WhatsApp group, zoom, workplace and google meet, this faculty has used Google Classroom. The results of this survey revealed that 63.64% were female and 72.36% were in the age between 18-21 years. The challenge of online education is the availability of internet services. This study reported two challenges are internet connectivity and the obstacle in financing online learning. The study said that when the university was closed, almost all students returned to their homes and had problems with networks in their living areas, and signal was not well. Some students accessed using the internet of cellular service and a small number used of Wi-Fi services.

This paper indicates [6] distance learning of covid-19 situation in Indonesia. This research paper analyse data from school students in coastal and mountainous areas. Using random sampling method, samples are collected from 150 students of total 13 elementary schools. Namely distance learning and student learning independence are the two variables of this study. This study used two algorithms were descriptive analysis and regression. To analyses data, they used a program name IBM SPSS Statistics 20. The results showed the effect of distance learning on students of elementary schools and distance education is also more flexible in implementation as it is not limited by distance, place, and time. Distance learning provides some benefits according this paper such as it can be implemented anytime and anywhere, students can learn whatever they want, there is flexibility in scheduling for the teacher implementation of learning. But there are challenges such as geographical condition of Indonesia, there are thousands of islands and it was very difficult to access online materials to enroll distance learning. This research indicating about online education but the research papers are analyses data from only elementary school students in specific states or areas.

In Covid-19 pandemic situation, [7] Online education has grown rapidly in many countries around the world at every academic level. This study proposed a research aimed at Embry-Riddle Aeronautical University (ERAU) to identify the effect of online learning system through academical performance of students. The primary type of data was collected by a survey. Research team created that and subordinate data has been collected by contacting the concerned departments in the form of accessible datasheets through the format of Microsoft Excel. For analysis, t-test and regression techniques were used to define statistically important effects on student performance in online versus physical classes. The results provided the allusion of the relationship between students' academic performance (GPA).

2.3 Comparative Analysis and Summary

We have studied a lots of research papers for our work so that, we can amass important information and knowledge about required algorithms. This related to research paper is really uncommon in Bangladesh. In comparative way of our research work, there are some differences and some similarities with other papers. Different research paper used different types of Algorithms. Some researcher used deep learning algorithms. Some used machine learning algorithms. Here we have used machine learning algorithms. In some papers, researcher collect data broadly like from 7/8 countries. Data were collected on the specific subject or course in some papers. We have collected data from university students during pandemic situation. The impact of online education system during the war has been discussed in some case. But all of them had the same motive how the online education affects the students.

2.4 Scope of the Problem

We worked with many various types of algorithm to find out the effect of online education. Here machine learning based algorithms were used for extracting the essential information from the data and detecting the effect in education. We collected student's perception

through the dataset. Collect quality data from the students was very challenging part. The more appropriate the dataset the accuracy will be high for our model. During collecting data, we had to be very conscious. We tried to collect proper data from Universities. Collecting appropriate data is a scope of the problem in this work.

Some research works have already published but those are not for our country Bangladesh. The research work has done in Covid-19 related but not directly worked in educational sector that how much effect this covid-19 in our educational system and how

much effect in our students. So, to find out this problem there should more research work. And also, to find the accurate information we need to used accurate algorithm. So, finding a quality and right algorithm is also a scope of the problem for our work.

2.5 Challenges

Quality dataset is our main capital. Collecting large number of data was very tough and difficult part. We were conscious about collecting the quality data. We need quality not quantity. We have to be sensible when we organize our question to collecting data. Making proper question is also a very challenging part of this research. Not only this but also selecting proper algorithms is also a challenge. We have studied various types of machine learning algorithms. After some evaluations, the appropriate algorithms were selected for our research. We can say, making right questions to collect data and collect data from students is difficult for us and also selecting right algorithm was very much challenging to this research.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Research subject and instruments

We are working the impact of online education by using machine learning algorithms. We use python as machine learning language in google colab. We use Logistic Regression, Decision Tree Classifier, Random Forest Classifier, MLP Classifier, KNeighbors Classifier, XGB Classifier and SVC algorithm and learning rate in it. We train our data and test it. First, we selected 700 students using simple random sampling from the virtual university and then divided the 700 students into two strata and using simple random sampling we selected the same percentage which was 30% student sample size in each stratum. And it is proportional stratified random sampling when we take the same percentage from each group. We use google drive to store and quickly access data. Our model needs to be trained on Google colab. Sample population that will accurately represent student responses. Here we find out the adaptability level that how much students can adapt in online to study and their effect. For this we use google colab, we collect data form the students and train that data. And apply some various algorithm to find out the accuracy.

Table 3.1.1: Data overview

Total Data	700
Training Data	490
Testing Data	210

Table 3.1.2: Process of our research studies

Step-1: Topic selection	At first, we find out our research topic based on machine learning in the effect of online education.
Step-2: Data Collection	We collect data from the students of university by using google form.
Step-3: Data Processing	After combining all data, we had to process dataset to use in model for better result. We had to deal with missing and invalid data.
Step-4: Model selection	We used various machine learning algorithm like Logistic Regression, Decision Tree Classifier, Random Forest Classifier, MLP Classifier, KNeighbors Classifier, XGB Classifier and SVC algorithm
Step-5: performance Evaluation	All of the results from the applied model on the dataset are analyzed in this section. Following the training and testing of those processes, we can get accuracy graphs which included accuracy and validation loss.
Step-6: Conclusion and Future Work	The shortcoming of the work and future scope are included in this section.

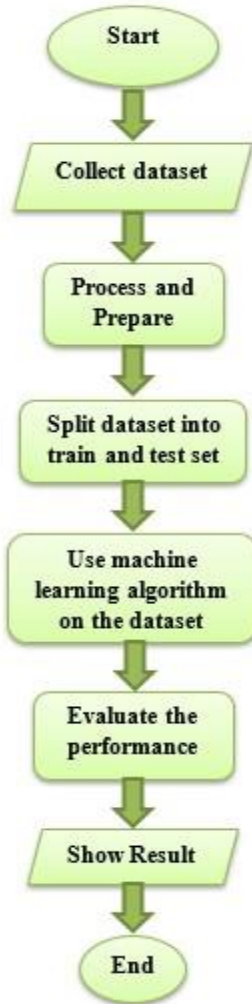We followed some steps for completing our work. Here we show a diagram:

Figure 3.1.1: Workflow Diagram

3.2 Data collection procedure

For proper finding result, data is very important. Because we apply algorithms and models on data to reach our goal. We made some questionnaire on the form. We carefully made the questions so that, students can fill up form without any confusion. We kept Bengali subtitle also for understanding properly. Then we delivered that form DIU students. When they filled up form, our expected data would be collected. We tried to reach more and more students to collect data. We had to deal with missing and inappropriate values. Then we ensured that, data is appropriate or not.

3.3 Statistical Analysis

We collect 700 data. But all data weren't useful for our work. Some data are not reasonable some are missing and some data are null value. For this reason, we have to apply the data preprocessing technic. For preprocess our data first we drop some column which wear not useable to find the adaptability level. And then we apply level encoder to use machine learning algorithm. We select our column Adaptability Level as a x axis and y axis value. Our survey result was extracted in a csv format. Different algorithms were then performed to find correlations between different models. All models analyzed the correlation between perception of online learning, the dependent variable, and student self-perception, the independent variable. That model analyzed the correlation between perceptions of online learning, the dependent variable, and course evaluation, the independent variable. The control variable for both models was students' adaptability level.

3.4 Proposed Methodology

Education is one of the basic human needs. All people should be educated. Our government also working in this sector. In every year government doing this task excellently. With government we all should take part of this responsibility. Naturally we know that education means students comes to the school, college or university and take the lesson from there which is called actually Offline education. And it is very impactful also in our society. But our focus is different. We want to find more impactful system. Which can be online education. In Covid-19 pandemic situation this online education system comes to us very largely. In fact, this system comes more popular in all over the world. Our main target is to find out whether this system is impactful or not in our educational system. The study was descriptive in nature. The population of this study consisted of 700 students of Daffodil International University. A simple random sampling technique was used and 30% of the students were randomly selected for a sample size of 210 students. Considering the resources in terms of time and money available, the following sample was taken from the university. A great way to find out the effect of online education on building a machine learning algorithm such as logistic regression, decision tree classifier, random forest

classifier, MLP classifier, KNeighbors classifier, XGB classifier and SVC. The study shows that learning outcomes are similar for both virtual and conventional learning, although the assessment method is different. We include testing student learning outcomes and quantitative versus conventional research. The survey findings are described below. An independent samples t-test was used to compare the mean overall online learning performance. Logistic regression, decision tree classifier, random forest classifier, KNeighbors classifier, XGB classifier, SVC and MLP classifier algorithm were used to determine the impact of online learning on the overall performance score. Factor analysis was used to study the interrelationships between learning characteristics and to compare online methods. Here we show our whole methodology process:

Figure 3.4.1: Methodology

3.5 Implementation Requirement

3.5.1 Logistic Regression

Logistic regression is a statistical evaluation technique for predicting a binary final result, like yes or no, based on previous observations on information set. After analyzing the relationship among one or greater present independent variables, a logistic regression version can are expecting a structured statistics variable. in the time period of area of system gaining knowledge of, logistic regression has end up a very important device. It allows algorithms to classify incoming facts primarily based on ancient information through the use of machine getting to know applications. As additional relevant records arrive, the algorithms come to be better at predicting classifications inside records units. Logistic regression can also play a role in information preparation activities by way of allowing statistics units to be positioned into specifically predefined buckets at some point of the extract, rework, load system in order to degree the data for analysis. In easy words, it predicts the chance of prevalence of an event by way of becoming facts to a logit function. because the final results are an opportunity, the established variable is bounded between 0 and 1.

Model:
Output = 0 or 1
Hypothesis => Z = WX + B
h(x) = sigmoid(z)
Sigmoid
$F(x) = 1 / (1 + e^{-x})$

Logistic Model

$P = 1 / (1 + e^{-(b0 + b1x)})$
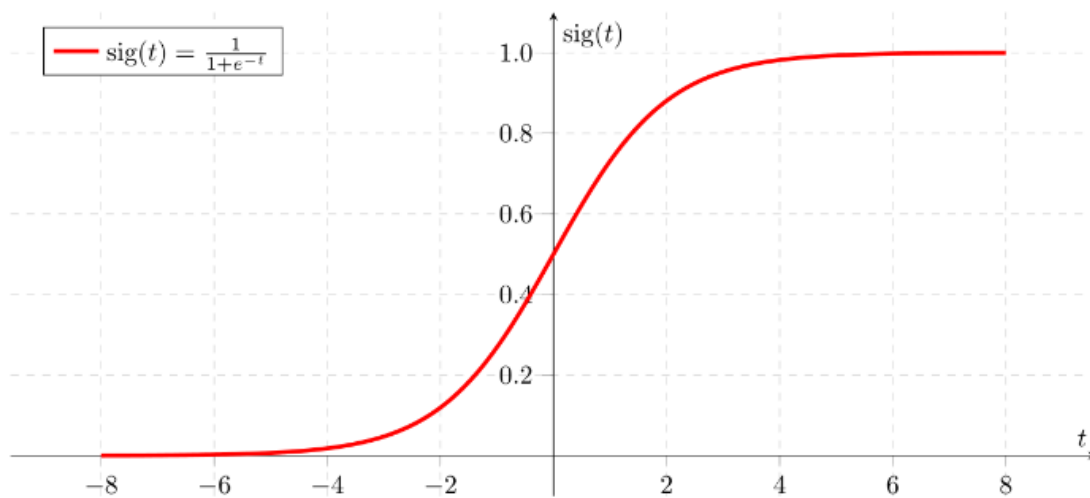
Sigmoid Function

Figure 3.5.1: Logistic Regression

If 'Z' is going to infinity, Y(expected) becomes 1 and if 'Z' is going to negative infinity, Y(predicted) will become 0.

3.5.2 Decision Tree Classifier

Decision tree method is a usually used in device getting to know technique to set up class structures primarily based on more than one covariate or for growing prediction algorithms for a goal variable. This method classifies a populace into department-like segments that shape an inverted tree with a root node, internal nodes, and leaf nodes. The algorithm is non-parametric and might efficaciously address big, complicated datasets without imposing a complicated parametric shape. whilst the sample length is huge sufficient, examine data can be divided into validation and schooling datasets. using the schooling dataset, we can build a selection tree version and a validation dataset to decide on the right tree size had to acquire the top-quality very last version. This paper introduces often used algorithms used to develop selection bushes and describes the SPSS and SAS programs that can be used to visualize tree structure.

Common usages of decision tree fashions include the subsequent:

Variable choice, Assessing the relative significance of variables, dealing with of lacking values, Prediction, records manipulation.

Model:

Information Gain:

Information Gain= Entropy(S)- [(Weighted Avg) *Entropy (each feature)

Entropy: Entropy is a metric to measure the impurity in a given attribute. It specifies randomness in data. Entropy can be calculated as:

Entropy(s)= -P(yes)log2 P(yes)- P(no) log2 P(no)

Where,

- ➢ S= Total number of samples
- ➢ P(yes)= probability of yes
- ➢ P(no)= probability of no

Gini Index:

Gini Index= 1- $\sum_j P_j^2$

$$Accuracy = \frac{(TP + TN)}{(TP + TN + FP + FN)}$$

$$Precision = \frac{TP}{(TP + FP)}$$

Where,

TP = True Positive, TN = True Negative
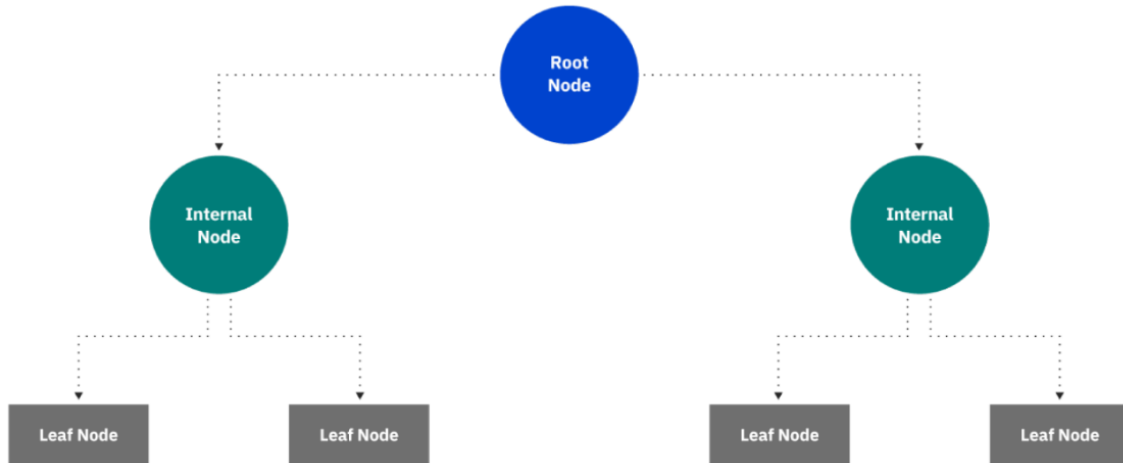
FP = False Positive, FN = False Negative

Figure 3.5.2: Decision Tree Classifier

3.5.3 Random Forest Classifier

Random forest is classification machine learning algorithm. It is consisted many decisions trees. Those decisions trees set to classify. Random forest algorithm makes use of random choice techniques in the construction of a single decision tree: 1. The random selection of schooling samples, and 2. The random selection of the characteristic's attributes of the sample. The final result of classification is made by equal-weight voting method.
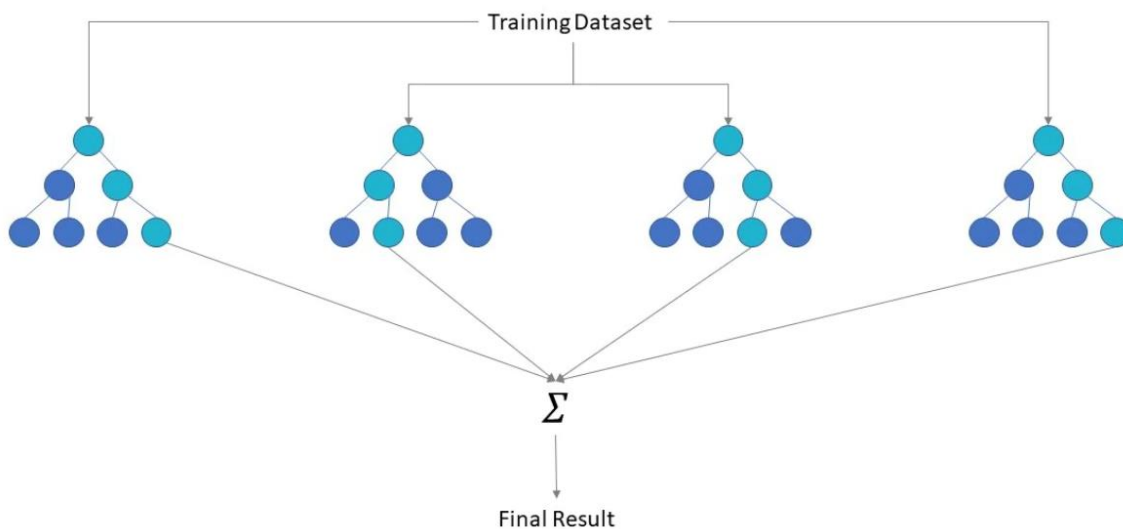

Figure 3.5.3: Random Forest Classifier

3.5.4 KNeighbors Classifier

The k-nearest neighbors' algorithm uses proximity to predict and classify. KNN is known as a non-parametric, supervised learning classifier. The main idea of no-parametric classifier is that an unclassified object is appointed to the class, represented by a majority of its KNN in the sample set.
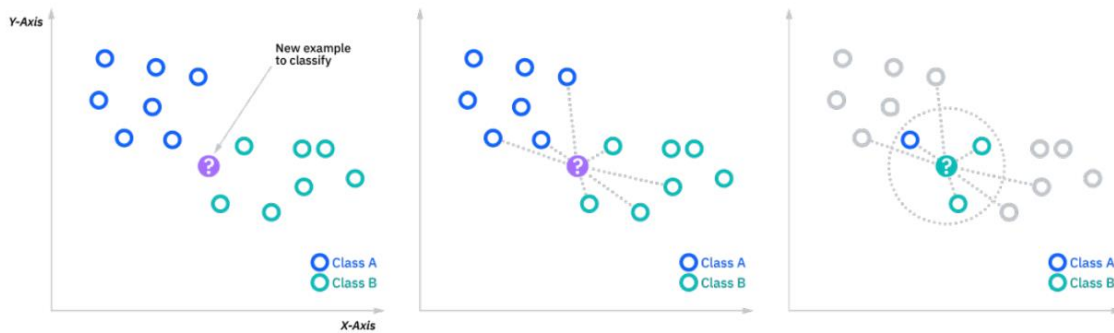

Figure 3.5.4: KNeighbors Classifier

3.5.5 MLP Classifier

MLP Classifier stands for Multi-Layer Perceptron Classifier which as the call itself connects to a Neural network. not like different type algorithms together with assist vector or naive Bayes classifiers, MLPC classifiers rely on an underlying neural network to perform the classification project.

A similarity with other class algorithms of Scikit-analyze, but, is that implementing MLPClassifier requires no extra effort than implementing Sikit-learn's assist Vector or Naive Bayes or any other classifier.
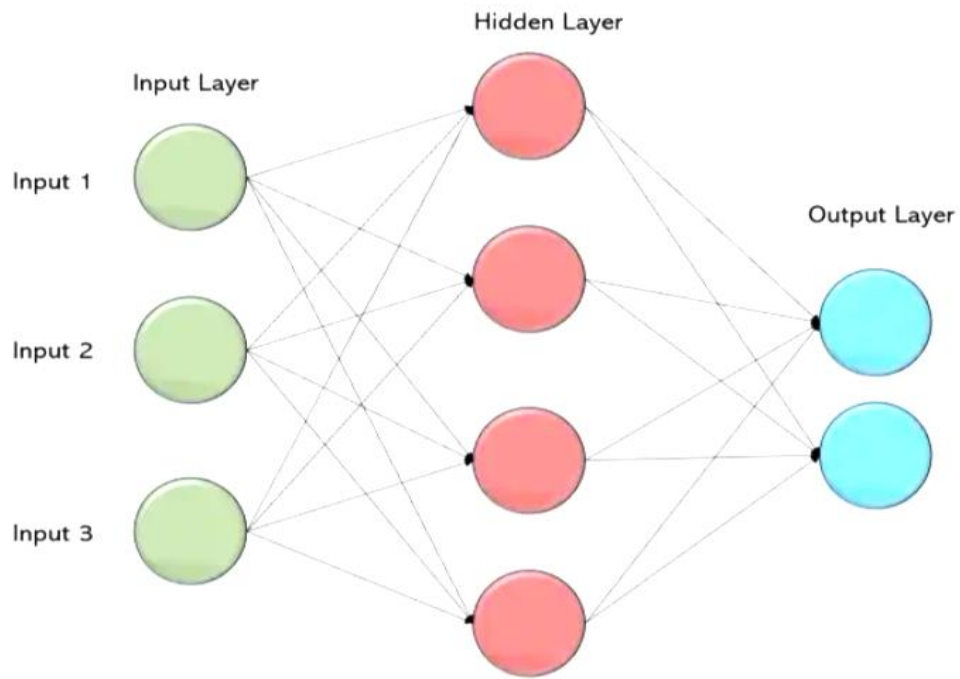
Figure 3.5.5: MLP Classifier

3.5.6 XGB Classifier

The XGBoost stands for extreme Gradient Boosting, that's a boosting algorithm based totally on gradient boosted selection timber algorithm. For reducing overfitting, XGB classifier applies a better regularization approach, and it is a difference from the gradient boosting. Machine learning algorithms are provided by XGB under the gradient boosting methods. It is an open-source library. XGB classifier can parallel processing and handle missing values automatically. XGB also allows to plug in own optimization objectives this makes it very flexible in nature. Compared to other ML algorithms, XGB is the most accurate one.
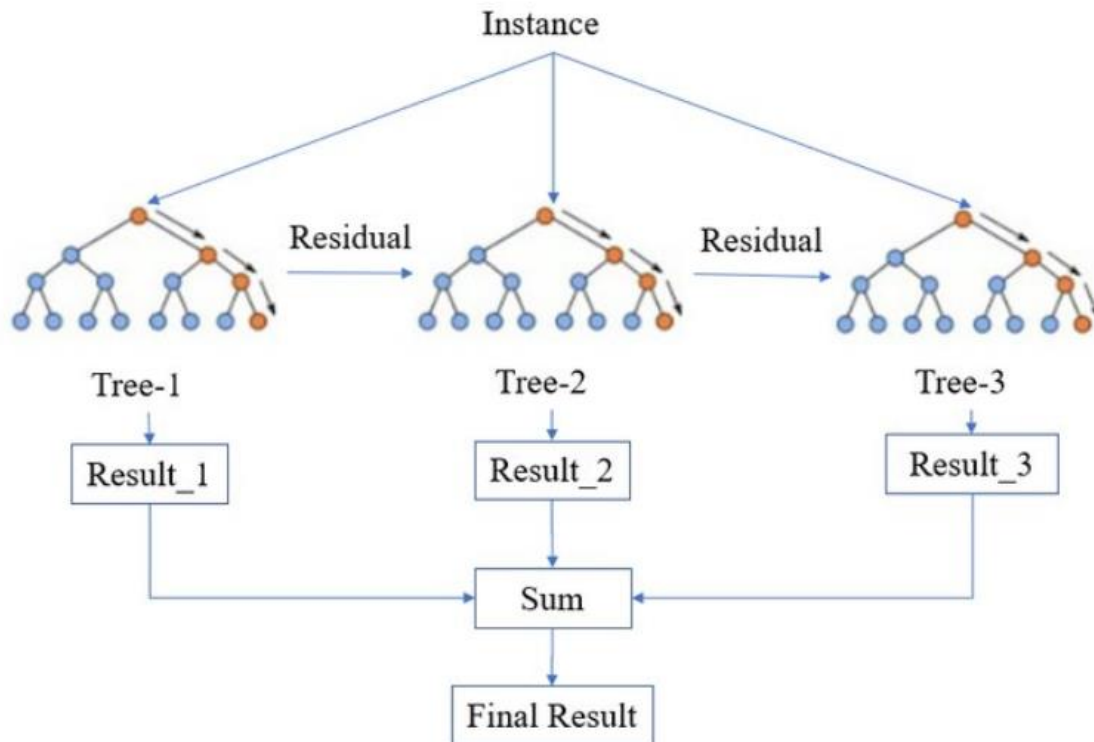
Figure 3.5.6: XGB Classifier

3.5.7 SVC

SVC is a nonparametric clustering algorithm which makes no assumptions on the number or size of clusters in the data. A Support Vector gadget classifier is a discriminative classifier which intakes training records (supervised gaining knowledge of), the algorithm outputs a most effective hyperplane which categorizes new examples. The purpose of the SVC algorithm is to generate optimum strains or decision barriers that separate the n-dimensional space into classes so that we are able to place new information factors into an appropriate category in the future. The purpose of the SVM gaining knowledge of set of rules is to find a hyperplane which can separate the records accurately. There are probably many such hyperplanes. And we need to discover the high-quality one, that's regularly referred because the top-quality hyperplane

Hyperplane:

Let's look at the two-dimensional case first. The two-dimensional linearly separable data can be separated by a line. The function of the line is y=ax+by=ax+b.

We rename x with x1 and y with x2 and we get:

   ax1−x2+b=0   ax1−x2+b=0

If we define **x** = (x1,x2)(x1,x2) and **w** = (a,−1)(a,−1),

 we get:

w· x+ b=0

Once we have the hyperplane, we can then use the hyperplane to make predictions.

 We define the hypothesis function h as:

$$h\,(x_1) = \begin{array}{ll} +1 & if\ w.x + b \geq 0 \\ -1 & if\ w.x + b < 0 \end{array}$$

The point above or on the hyperplane will be classified as class +1, and the point below the hyperplane will be classified as class -1.
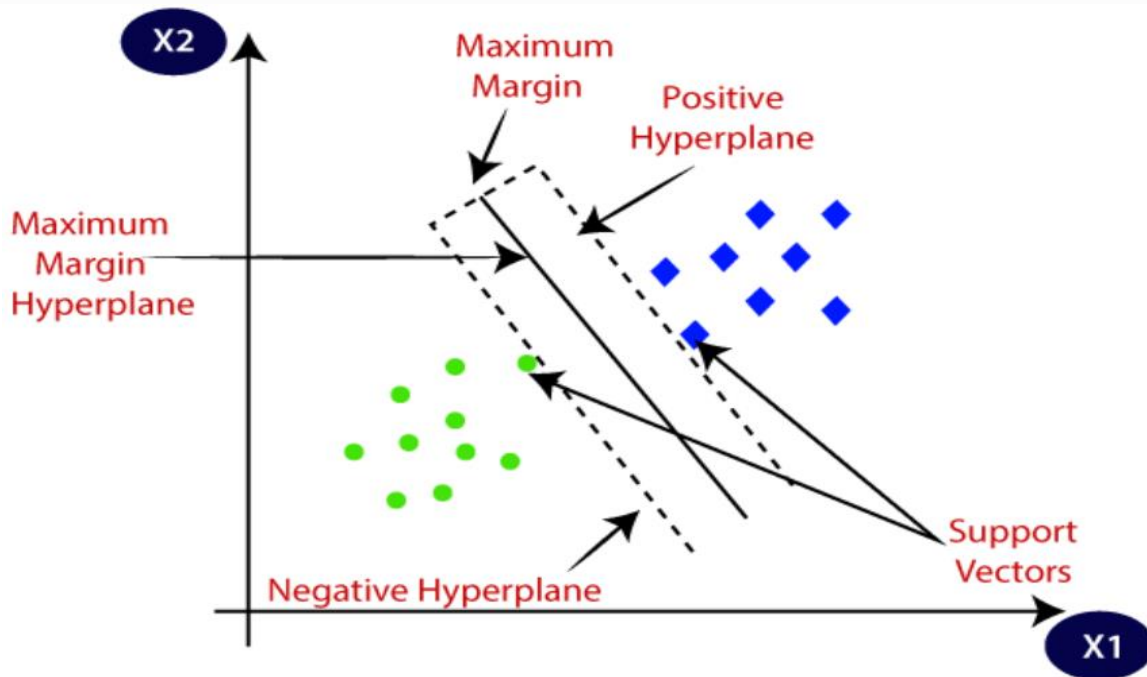

Figure 3.5.7: SVC

CHAPTER 4
EXPERIMENTAL RESULT AND
DISCUSSION

4.1 Experimental Setup

Our research is based on machine learning algorithm. We want to find out the effect on online learning weather it is positive impact or negative impact on our educational system. We do our experiment on the university level. So that we need some proper algorithm based on machine learning and to implement this algorithm we need to the main part of a research which is data. So, for the experiment we have to collect data from the valid student. For the experimental setup our first procedure is to collect data. We collect data using Google Form from the university student. Our second step is to find out the proper algorithm so we review a lot of research paper and find out the proper algorithm and we implement this algorithm in our dataset. Before using algorithm, we train our data and test our data by the ratio of 7:3. Testing data are the most important in the research. After train our data we apply the machine learning algorithm. For this experimental setup we find out the accuracy level from our dataset. And we show some result in the way of graphical visualization. For all of this work we use google colab to code and find out the accuracy and result and we use google form to collect data. Our chosen programming language is python and also, we use various types of library. By this procedure we set up and prepare our experimental setup.

4.2 Experimental Result & Analysis

In the field of machine learning we use various algorithm to see the impact of online learning. From the total number of participant Male 52.5% and Female 47.5%.
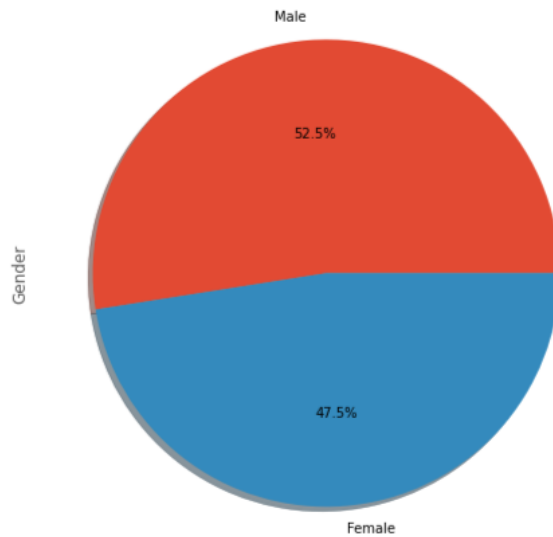
Figure 4.2.1: Percentage of Gender in Dataset

As this research based on the impact of online learning so there all the participant should have a device. And there are various types of device like Smartphone, Laptop, Desktop. Some of student use only one device and some of them used multiple device. So, based on our research we see that Only Smartphone users are almost 25.5% and only Laptop users 10.8% one the other hand only Desktop users 8.3%. That means only Smartphone users are high. And combinedly Laptop and Smartphone are the most users here the percentage are 29.3% and with Desktop and Smartphone combinedly 16.2%.
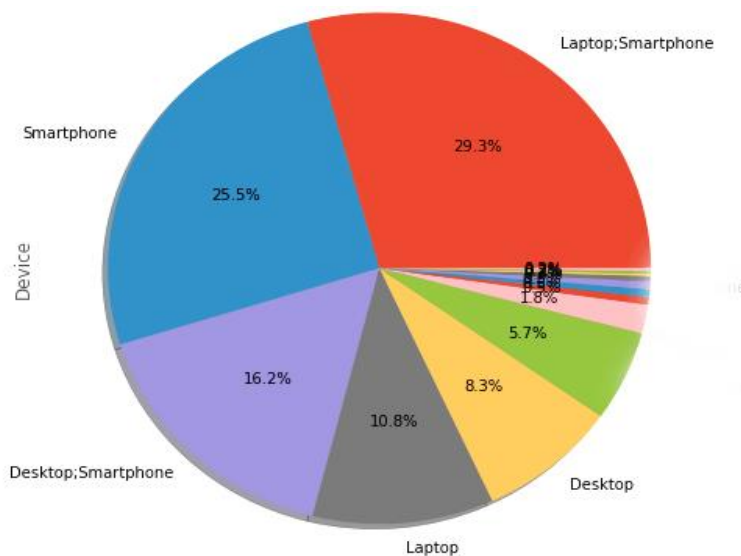

Figure 4.2.2: Percentage of the device using in Dataset

From our research we find out the financial condition also because of in our country online education mainly comes to us in the COVID-19 situations. So, in that case there is also financial issue in our online education. Student needs to adopt in this situation. And this issue impacts a lot. In general, affect Financial Condition in families have middle financial have highest percentage Adaptivity Level then poor families and the rich families have less Adaptivity Level.
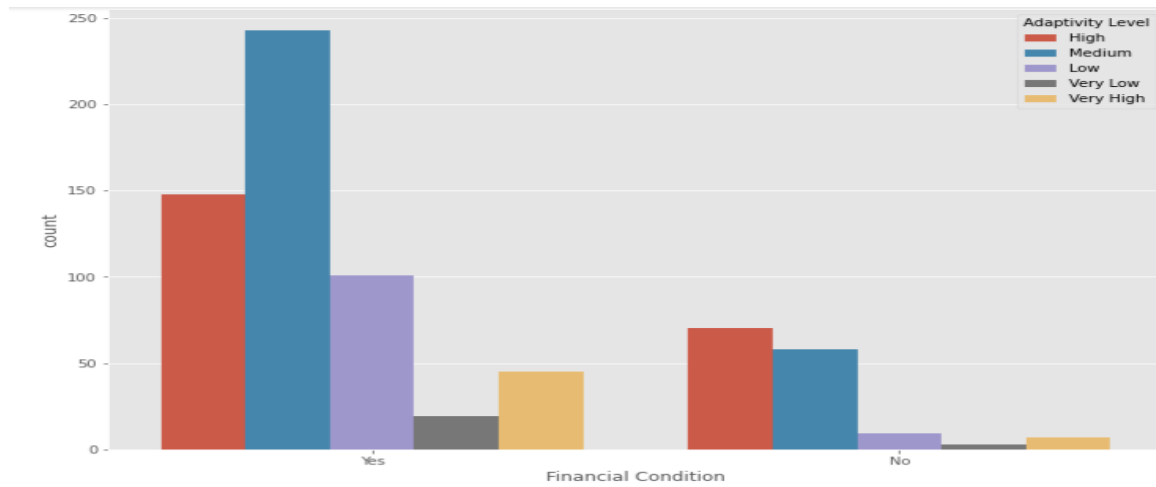

Figure 4.2.3: Financial Condition

In the impact of online education student needs to adopts the online education. Comparing Male with Female None more difference between them.
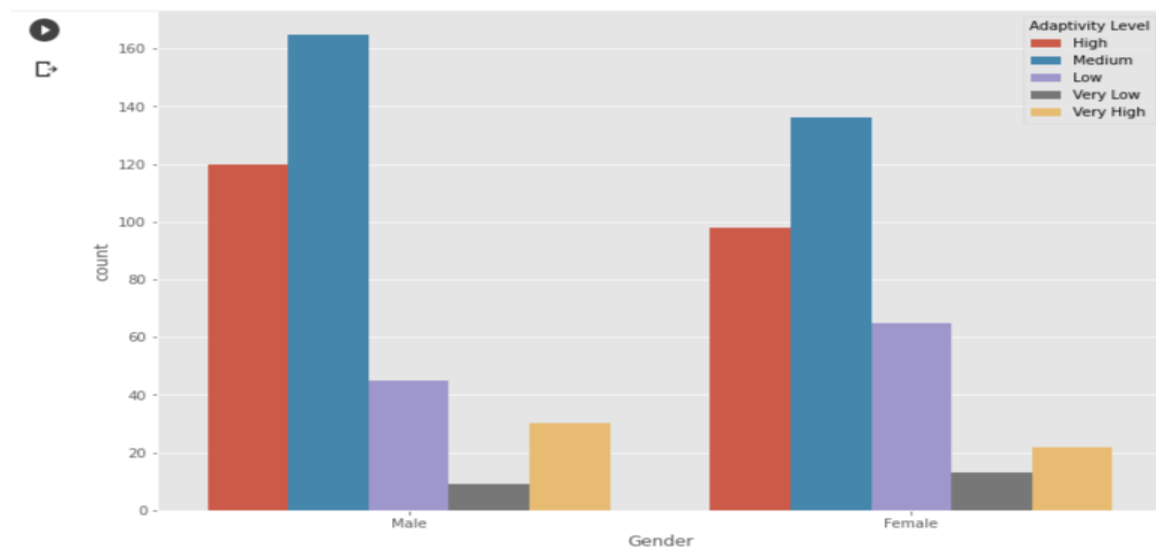

Figure 4.2.4: Gender Adaptability Level

In COVID-19 situations as all the student needs to switch in online education. So, using online education every student needs to use internet because of without internet its impossible to do any class in online. This online education effect with positive and negative both. Those whose network speed high level they can easily do their online class and for this they adopt quickly and easily. And if the network speed is not good but medium level then it also he helpful to understand the online education and it can be impact with positive. But it the network speed is not good and poor like low or bellow average speed then the network issue is a huge problem to adopt online education. And for this online education then effect of online education with negative way and the output is not satisfactory. Networking are the highly impacted in our research.
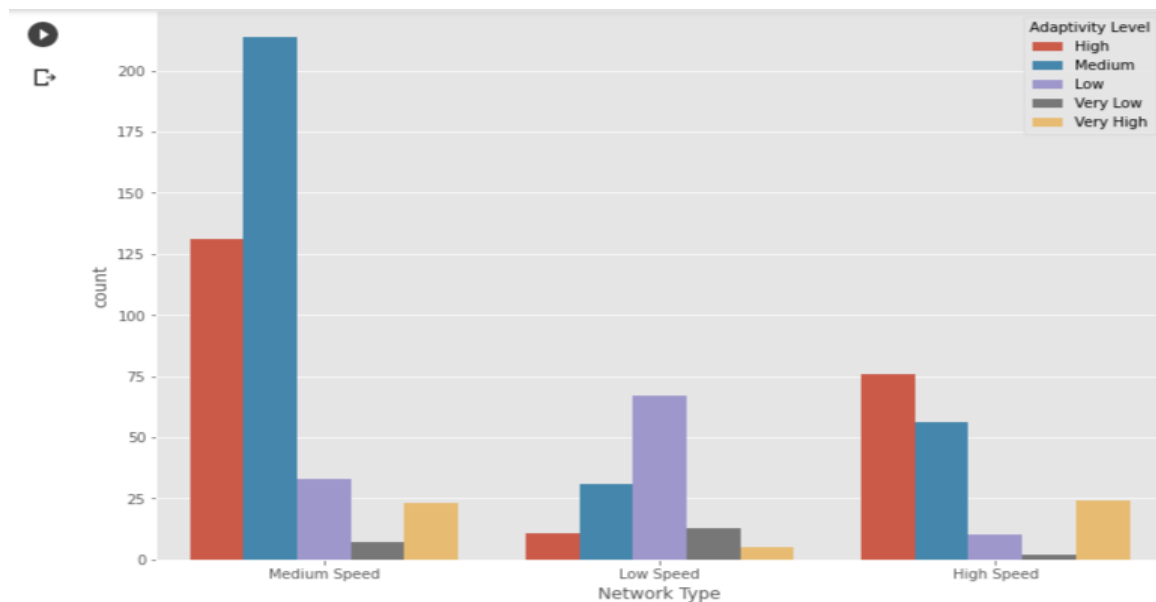

Figure 4.2.5: Network Effect

After made some of this visualization we got some result. In machine learning techniques to predict the output of Students Adaptability level, Concentration level, understand level, Effective level, Experience, Satisfaction status, Preferable education system and Better result platform in online education using machine learning algorithm approaches. The shape of our dataset rows 703 and columns 22.

Analyzing all this factor like network issue, financial condition is highly effect on the adaptability. Dataset shows us then only 7.4% students easily and highly adopt in the online education and 31% students can adapt also but in the number of students cannot adapt properly their percentages are law 15.6% and very low 3.1%. But in the heist number of percentages students are neither adapt highly or none adapt. The percentage of them 42.8%. That means a good number of students still can not adapt online education properly.
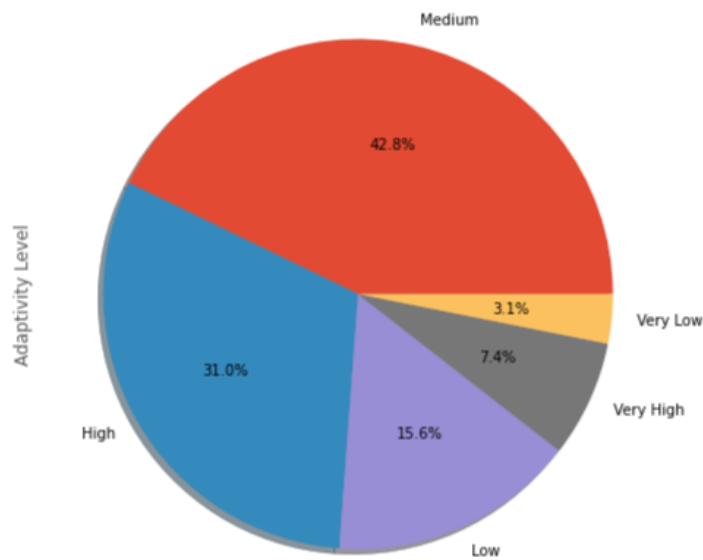

Figure 4.2.6: Students Adaptivity Percentages

We use machine learning algorithm like logistic regression, decision tree classifier, kneighbors classifier, mlp classifier, random forest classifier, svc and xgbc classifier to find out the effect of online education. In Adaptability level machine learning shows the heist number of accuracies is 75.83% which means almost 76% student can adopt in online education.

Table 4.2.1: Adaptability level accuracies

Adaptability Level	Accuracy
Logistic Regression	65.88%
Decision Tree Classifier	60.66%
Random Forest Classifier	71.09%
KNeighbors Classifier	66.35%
MLP Classifier	70.62%
XGB Classifier	75.83%
SVC	69.67%

Student can concern in online class and adopt perfectly only when other some criteria matched smoothly. On of the main concentration issue in financial fact. So, with financial issue concentration impacts a huge. Here, the graph shows this answer.
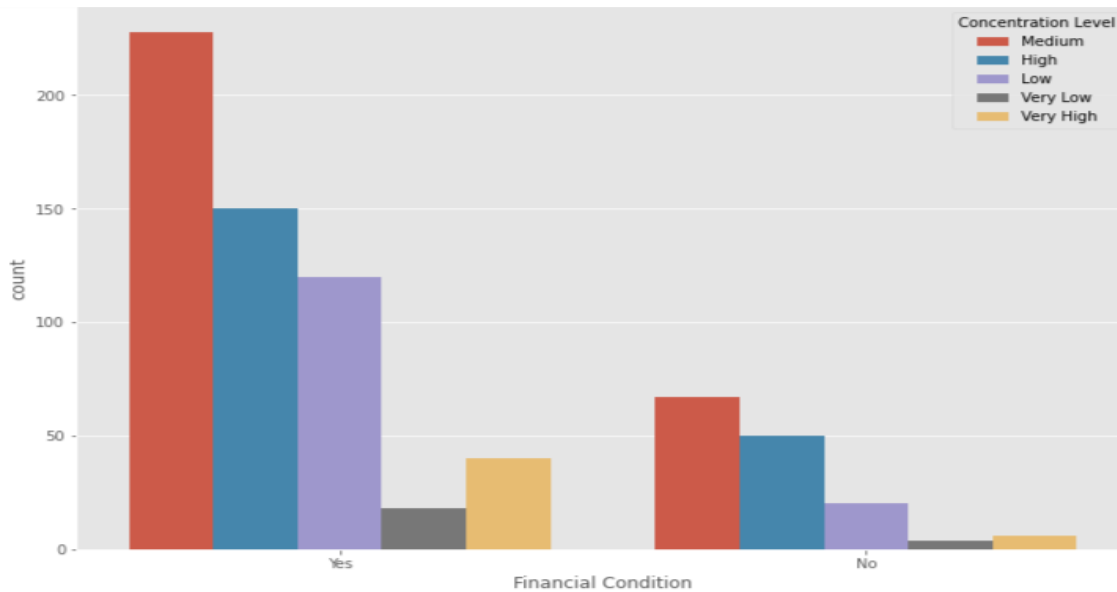

Figure 4.2.7: Concentration cause in financial issues

Those students financially stable can concern in online class better then others. Concentration depends various types of factor. Financial is on of them and another important factor is Network speed. Because for online class internet connection is main factor. Slow internet can derive the concern rather than high-speed internet.
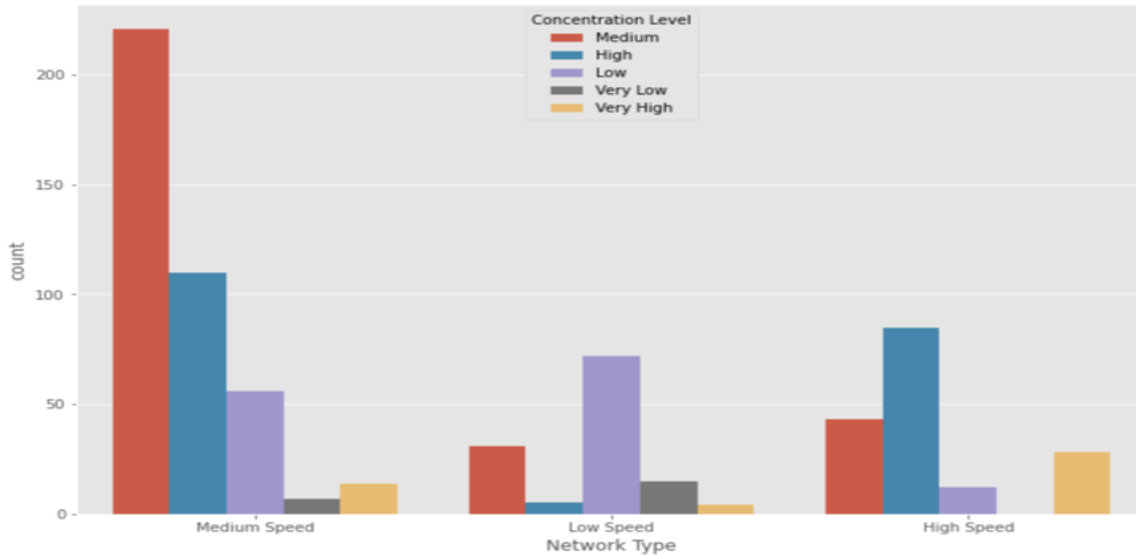
Figure 4.2.8: Concentration cause in network issues

Analyzing all of this factor that our dataset shows us only 28.4% student can concentration highly and very high concentration level percentage is 6.5%. Low and very low percentages are 19.9% and 3.1%. and rest of student 43% are in medium level.
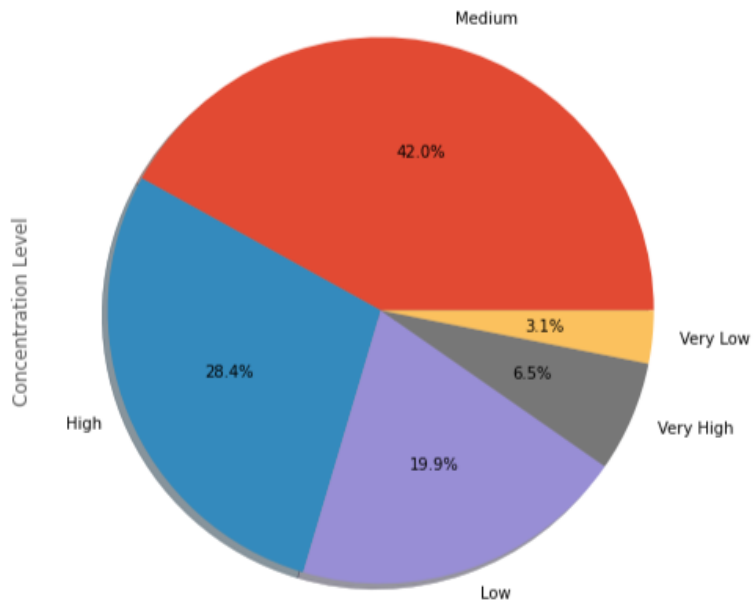

Figure 4.2.9: Students Concentration level Percentages

In this case our algorithm shows the heist number of accuracies is about 66.82%. All of accuracy result are:

Table 4.2.2: Concentration level accuracies

Concentration Level	Accuracy
Logistic Regression	60.19%
Decision Tree Classifier	59.24%
Random Forest Classifier	66.82%
KNeighbors Classifier	56.39%
MLP Classifier	59.72%
XGB Classifier	66.35%
SVC	60.66%

Other important factor is understanding level. Its also depend various types of criteria. Our dataset shows that the understanding level of excellent, very good and good are 6.3%, 29.2% and 38.8%. rest of them are fear and poor. Percentage of this are 20.2% and 5.5%.
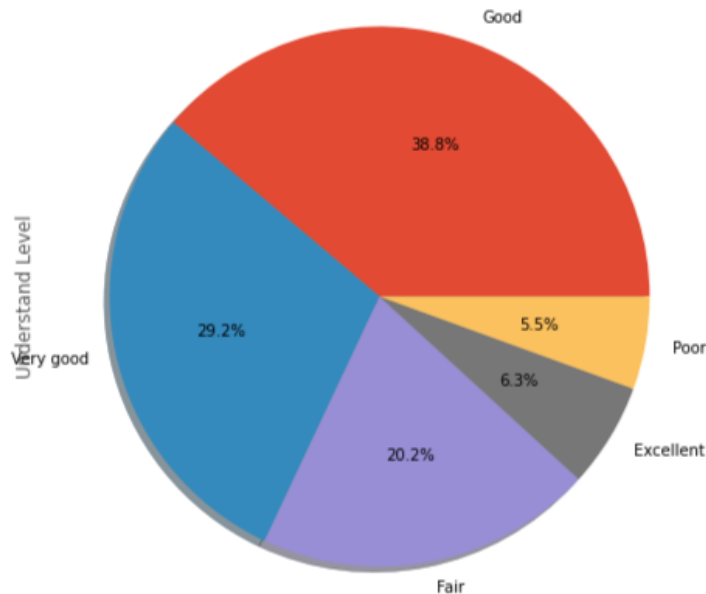

Figure 4.2.10: Students Understanding level Percentages

Applying our algorithm in this factor the heist accuracy is 70.14%. Result of all algorithms are:

Table 4.2.3: Understanding level accuracies

Understanding Level	Accuracy
Logistic Regression	61.13%
Decision Tree Classifier	58.29%
Random Forest Classifier	70.14%
KNeighbors Classifier	65.41%
MLP Classifier	63.03%
XGB Classifier	67.77%
SVC	66.36%

Finding the effectiveness of online education, we need to follow some criteria. Some of them are result performance, experience in online education and the effective opinion. Dataset shows that 56.8% students vote that effective and very effective vote are 16.5% and rest of them are said not much effective and the percentage is about 26.7%.
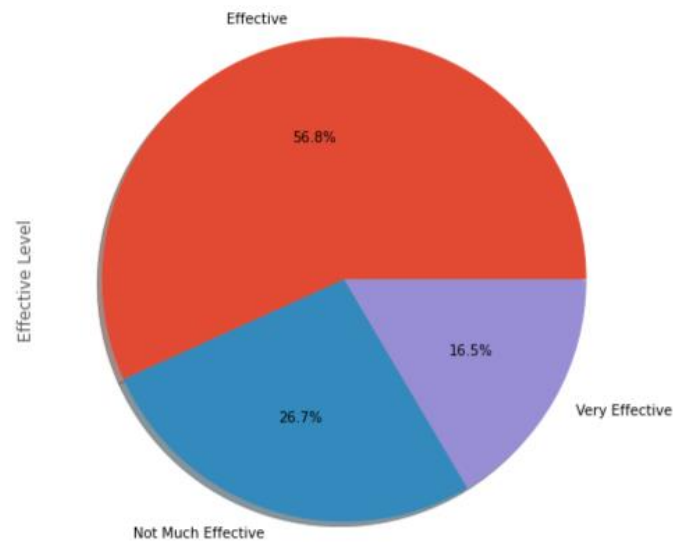

Figure 4.2.11: Students Effective level Percentages

Algorithm shows that maximum accuracy is 77.25%.

Table 4.2.4: Effective level accuracies

Effective Level	Accuracy
Logistic Regression	70.62%
Decision Tree Classifier	71.56%
Random Forest Classifier	77.25%
KNeighbors Classifier	68.72%
MLP Classifier	67.77%
XGB Classifier	76.78%
SVC	72.04%

Comparing experience and better result analyzing in data set that almost 67% students experience satisfied and analyzing result comparing with traditional education system that online education result increases a little bit. 52.8% students say in online there result increase and 47.2% mean that offline result was better because of some essential criteria and opportunity. And depends on environment like internet, financial, concentration, technology sound that's all effect as a whole outcome. Here the experience and result performance graph are given bellow:

Figure 4.2.12: Students Experience level Percentages in online exam
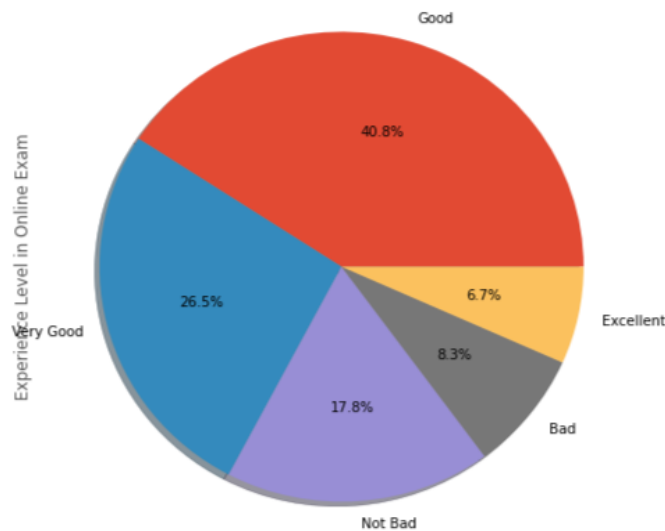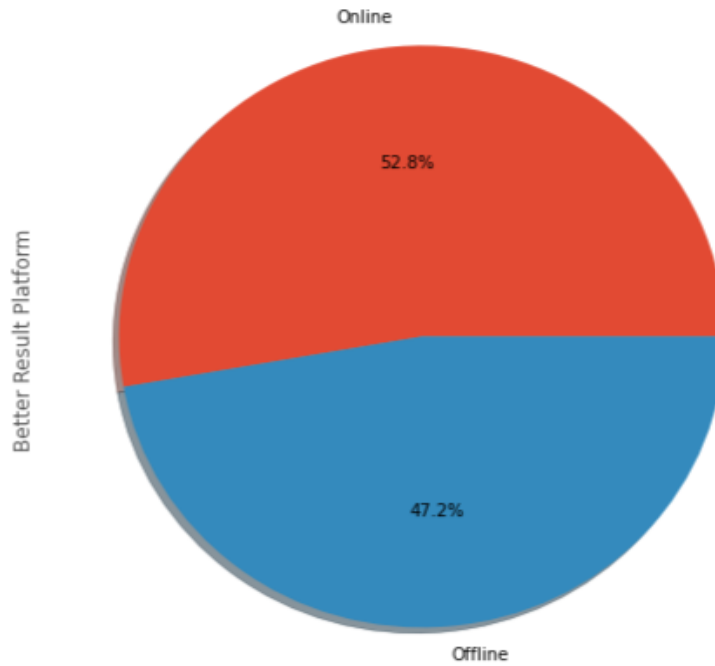
Figure 4.2.13: Better Result Percentages

Table 4.2.5: Online Exam Experience level accuracies

Online Exam Experience level	Accuracy
Logistic Regression	65.41%
Decision Tree Classifier	60.66%
Random Forest Classifier	64.65%
KNeighbors Classifier	61.14%
MLP Classifier	68.25%
XGB Classifier	64.93%
SVC	64.45%

Table 4.2.6: Better Result accuracies

Performance of Result	Accuracy
Logistic Regression	76.78%
Decision Tree Classifier	72.04%
Random Forest Classifier	77.72%
KNeighbors Classifier	71.09%
MLP Classifier	78.19%
XGB Classifier	79.15%
SVC	70.14%

To understand that how much actually online education is effective to us we need to understand that Students satisfaction level. In our dataset satisfaction of online education is 69.7% and in these criteria the heist accuracy is 89.09% that means this 69.7% students are mostly highly benefited in online education. But the problem is here a big number of students cannot satisfy and it's a very disadvantage on online education. This depends on the factor like internet, financial issues, locations, support and facilities.
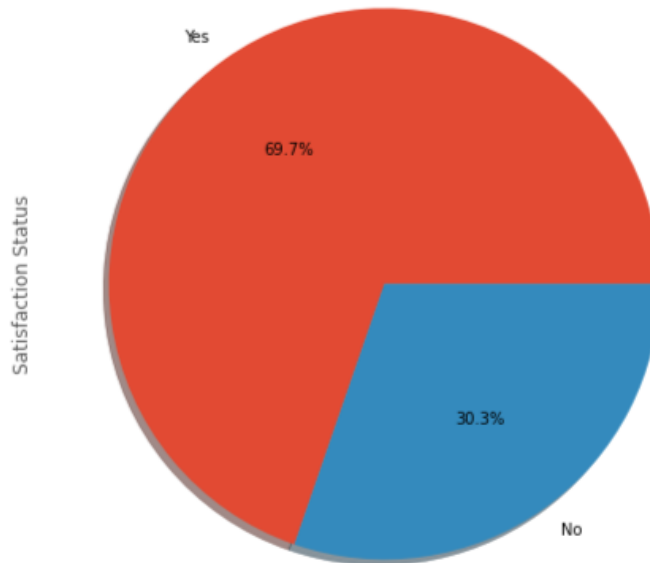

Figure 4.2.14: Students Satisfaction Percentages

Table 4.2.7: Algorithms accuracy output in satisfaction level

Satisfaction Level	Accuracy
Logistic Regression	81.99%
Decision Tree Classifier	81.04%
Random Forest Classifier	87.21%
KNeighbors Classifier	81.99%
MLP Classifier	84.36%
XGB Classifier	89.09%
SVC	81.99%

Analyzing all of the feature when asking student that the preferable education system based on there experienced 75.8% students prefer offline education. And heist number of accuracies is 80.57%. Figure and table are given bellow:
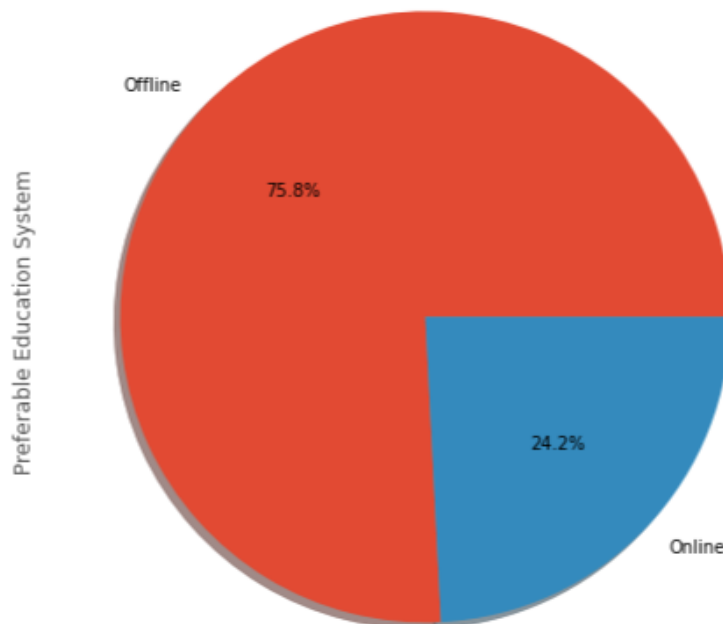

Figure 4.2.15: Preferable Education System

Table 4.2.8: Preferable Education System Accuracy

Preferable Education System	Accuracy
Logistic Regression	79.15%
Decision Tree Classifier	74.88%
Random Forest Classifier	80.57%
KNeighbors Classifier	75.83%
MLP Classifier	79.62%
XGB Classifier	79.62%
SVC	79.62%

Here Analyzing all the essential criteria, we found that adaptability maximum accuracy is 75.83% and the Concentration accuracy is 66.82 it means almost 67% student can concentrate in online class. So, for this data we can say a huge number of students almost above 30% student cannot adopt and concentrate in online education. As a result, effect of online education is not coming to us with positive way because of huge number of students not up to the mark. If we see the understand level the heist accuracy is only 70.14%. In this scenario we can see that the online education is not much effective because of almost 30% student cannot understand the online education and it's a huge bad effect. But those students can adopt the online education their opinion the effect level accuracy is maximum 77.25% and seeing the experience of online education is 68.25% it means the quality of good experience is not satisfactory and their satisfaction status is 89.09%. So, all this criterion we can see that a huge number of students cannot adopt the online education. That means the ultimate goal of online education is not reachable. The effect of online education impact on our students badly. But in some case this online education is also good approach also like using online education many of students can store online class record and whenever they need they can review their online class again. As a result, the quality of education improved a lot. For this the result of the students who can adopt in online is update and they got better result comparing offline. The maximum result performance is about 79.15% that means a huge number of students can improve their academic result. But in online education there is a lot of limitation and uncertain condition which must be

followed by a student as a result those who did not suitable the technology cannot adjust in this scenario. As a result, in many of student vote the offline education for there choice. Preferable Education system the heist number of percentages is about 80.57% and here its clearly shows us that though the maximum number of students can gain better result in online but they prefer offline education. Some case online education is good and well necessary also. Our modern era technology improved a lot. As a result, many of student can use online to learn something new using modern technology. And also, student adopt technology also which is must necessary in our modern generation. Our research shows us that if we choose randomly a student then student might be choosing online education and this probability is less then 20% but the effect of online education based on the particular students and also some essential criteria like student should have well internet and device also and must be adopt in the online technology otherwise student can not permit the good effect of online education. When studying online, students may not develop the necessary communication skills. Additionally, students need to use high-speed Internet access at home, which can be complicated if it is not available. As a new communication medium, the Internet plays an important role in student learning.

In our research we can see the maximum number of students comes from Dhaka about 26.7% our research is only the university level student and those students who took online and offline both education.
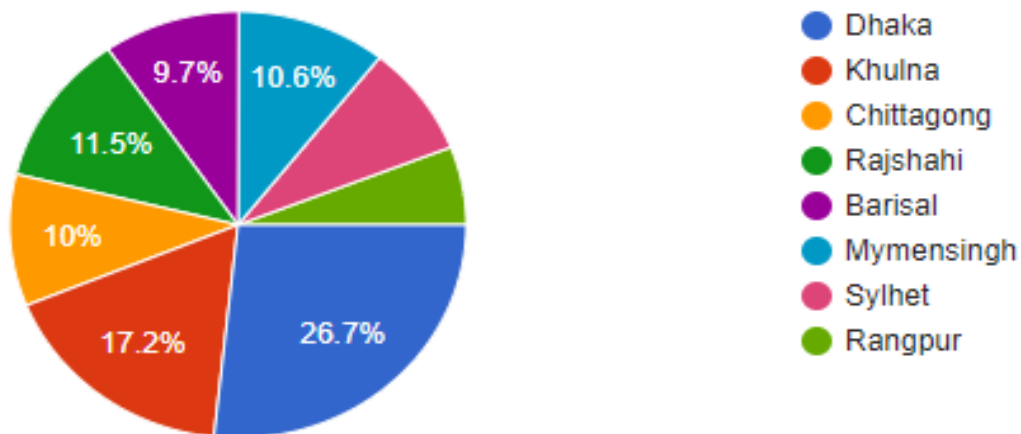

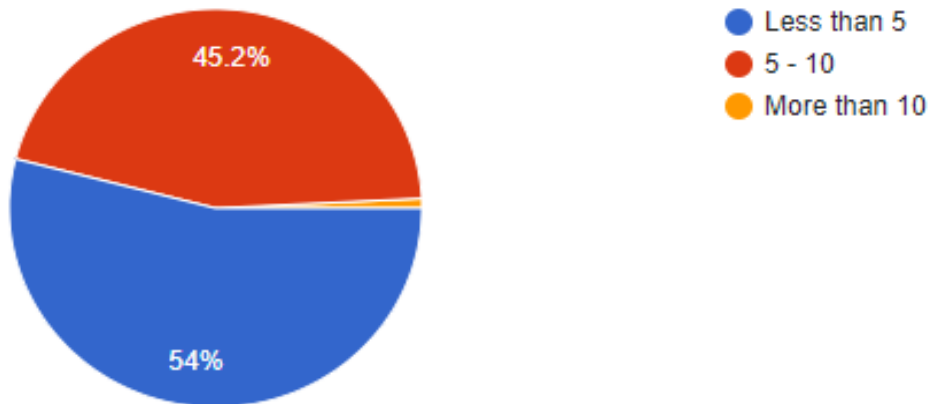Figure 4.2.16: Student participate location

Figure 4.2.17: Online Semester taken

From this figure 4.2.6 and 4.2.7 we can see that student who comes from where and how many semesters they look for online class.

The satisfaction of online education is almost 89.09% but the preferable education system more offline which is almost 80.57%. So, its clear to see that the online education is good for our students those students who does not have any internet issue or any device issue or any financial issues. But In general, Online education is effective if any student can suitable and adopt and its also essential but the tradition education offline system is more meaningful for the students.

So, analyzing all the situation and conditions its clear to that in some case online education is better then offline education but there is a lot of unsatisfactory terms in online education so that the maximum number of students prefer offline education. The effect of online education is very highly positive impactful of those students who can adopt the online and well understand the technology and all the facility which they need to do for an online class than its really impactful for the educational system but its limited. In brightly maximum number of students can not adjust the online education due to uncertain internet, device and financial issues also. So overall the effect of online education is now satisfactory but it's a great opportunity for the long future. In future online education can be more effective

and positive when then device and internet issues will be solved and also our country economic condition more upgrade then people can provide. But as always traditional online education like offline education is always highly prioritize. So, the effect of online education is satisfactory but not acceptable to replace the offline education. It can be used in certain condition which its really a great impactful.

4.3 Discussion

Our model showed very good accuracy for training and testing dataset which is good performance. We had separate test dataset for our model. We had applied different types of Machine learning Algorithms to find out the result. Result showed us, every division's students gave input in dataset. Maximum students used mobile data. In Dhaka, students did not face net problem and load-shedding during online classes. Because Dhaka is the capital of Bangladesh. So here, the speed of network is really good. Meanwhile, students can properly concentrate in class without any interruption. In others divisions, students faced many problems like, network speed issues, load shedding. Maximum students faced financial problems during pandemic. Some students dropped some semesters at that time. Students also faced device problem. It hampered their studies. We found out the concentration level of students during online class. Students who concentrate properly, they adapted their study. When students missed class due to any inconvenience, they could watch recorded class later. It helped a lot to understand studies properly. Recorded classes played a very important role at the time. It impacts in positive. Online exam questions were analytical. For that, sometimes students could not understand questions properly. Most of the students passed in online exam. 56.8% students say, online education system is effective. 26.7% students say, it is very effective. 16.5% students say, this system is not much effective. So, we notice, most of the students say online education is effective. Students who faced many problems and could not adapt lessons properly, they identified this system is not so much effective. On the other hand, students who understand online classes and think this system can save their time, they identified this system is very effective. From the result analysis, 75.8% students preferred offline education. Because

students can understand class in face to face interaction. Practical classes were affected in online classes. Students cannot get right output from online class. In reality, online exams are not evaluated properly. So, majority preferred offline education system is better than online education system.

CHAPTER 5
IMPACT ON SOCIETY, ENVIRONMENT
AND SUSTAINABILITY

5.1 Impact on Society

Online education has expanded the opportunity for students to study independently. Students have had the opportunity to inspect new learning apps and platforms during the class, which has assisted them develop new skills and abilities, step up their growth path and having a great positive impact on society. The development of new skills and capabilities always accelerates the pace of social development and growth.

5.2 Impact on Environment

In offline education, educational institutions are under a lot of pressure on infrastructure, equipment maintenance, electricity and operating costs. Large public structures use large amounts of heat and electricity, with adverse effects on the environment. According to a study, students studying online reduced their carbon dioxide emissions from 90 kg to 4 kg per term. Cutdown our carbon emissions help reverses the effects of global warming overall, but it helps maintain overall quality of air. Online education reduces pressure on the environment and reduces greenhouse gas emissions. And as it is about the finding of effectiveness of online education and weather the online education is effective or not its always impact on our environment in both cases like if the education system goes on online then the use of non-reusable energy will save and as a result our environment also save from the greenhouse effect. On the other hand, if online education is not effective then also people from our society can understand and gain knowledge about the effectiveness and can be aware of the positive and negative both things for the effectiveness and its really impact on our environment.

5.3 Ethical Aspects

Ethically, online education has both positive and negative aspects. In online education system the relationship has created a kind of dynamic and interaction between teachers and students. As we move forward technologically, we need to be aware of the ethical aspects of online education. Everyone can share their ideas if they know how to use the online platform properly. Teachers and students understand that there is another process of learning outside the classroom and the learning that can be achieved through it. However, they depend on the training and the teacher. If the teacher makes the online class student-centered, they will have the opportunity to give feedback independently. This method can be adopted for a short time due to the situation. It is widely accepted as an alternative method keeping in mind all the limitations. Many teachers are student dependent. Many people do not like to receive feedback from students. A classroom that does not create opportunities for questioning and does not give students freedom to express their opinions cannot be called a classroom at all. Students can provide various comments and ask questions in the comment column in online classes. But it also depends on how independent the students are. Discriminatory factors such as clothing, physical appearance, disability, race and gender of students are largely absent in online classes. Violence among students and torture of students by teachers, eve teasing, students hanging out with miscreants, juvenile gangs, drug use in educational institutions and political violence among students can be eliminated through virtual classes. Skills can be gained through spontaneous participation remotely through exchange of views on various discussion topics. But now the question is that all the countries of the world cannot accept these ethical benefits of online classes equally. It depends on the cultural situation and economic conditions of a country.

The main ethical issues are Distancing and Resource scarcity. It is challenging for the teacher to engage the entire class in the lecture. This may be due to the fact that in online classes teachers teach students can't influence behavior. And even if it is initiated, for example, by asking students to turn on their web cameras during class, to provide a sense of connection, many will not be willing to do so because they feel it is a violation of their rights. Physical privacy. Engaging students on an online platform requires a lot of

preparation in creating lecture content. Mix to this, there are certain barriers to communicating effectively online. For example, in a virtual class, students can be identified and asked to respond with questions but with few exceptions, many will not participate. There can be many reasons for this. Many times, students don't participate because of boredom and they get exhausted of listening to online lecture classes from morning till evening. This can cause nervous tension for both students and academics. Also, voice-overs and webcams alone prove to be insufficient in reaching students and can create a vacuum in the teacher-student relationship.

5.4 Sustainability Plan

Sustainability plan is a roadmap to achieve long-term remark of our paper. Actually, sustainability balances the social, economic and environmental needs. For sustainability, we have to focus social, economic condition, environment, establishing priorities, implementation, learning and adapting new things. We find opportunity of our research topic. Then we create a vision. Finally, we implement the changes. We have to identify the future needs of our work. According to that, we have to implement and work. As our topic is effect of online education, so we need to focus the authentic data. And we should choose algorithm perfectly so that, we can get proper result.

CHAPTER 6
SUMMERY, CONCLUSION,
RECOMMENDATION AND IMPLICATION FOR
FUTURE RESEARCH

6.1 Summary of the Study

There is always something gap in any type of research. Provably there is no prediction to give us the accurate result. Something always need to be accurate. But in this research, we have tried our best to get more accurate predictions and the real effect which happened in real scenario to find out from our research. We collect the quality of data from the student from there real-life experience and after collecting data we use hierarchical models for training and validation our dataset. Then using machine learning algorithm give us various types of predication and accuracy based on sequential question. After founding the accuracy, we analyses them and find out our original goal that weather the online education is effective or not. Though some case its good for us and some case its not perfect but the finding our result almost shows the real scenario in real case. So, after the whole research the summery of this research are satisfied and the prediction of our accuracy is also pleasurable.

6.2 Conclusion

Online education has lengthy been on the fringes, but the COVID-19 pandemic has made it mainstream. We conducted a survey of undergraduate students at university and data collected from a survey. The results show that there was a remarkable impact on university students' online learning and offline learning in response to COVID-19. Findings provide observations of the relationship between student academic performance and class delivery methods, whether in class or online. It has many advantages and some disadvantages too. Analyzing all the conditions and conditions it is clear that in some cases online education is better than offline education but online education has many unsatisfactory conditions so

that maximum number of students prefer offline education. Online education has the advantage of being flexible so that students learn easily. As a result, the academic results of the students have improved. Our study has limitations and one of them is that the study involved only universities. Although there are several challenges faced by students and teachers in online teaching, the good news is that there is no doubt that the initiative to introduce online education systems to reduce the damage to the academic performance of students conducting classes online was commendable.

6.3 Implication for Further Study

Effect of online research is important in our field. It will impact future research for further study. From the output of the research, we can find out and predict how effective or impactful online education is. We can predict that; the online education is good or bad for our generation by using machine learning algorithms. It will assist to locate proper way for advanced working in future.

APPENDIX

In September 2021 we started our research to finding the impact of online education. Our main mission is to finding that weather the online education is effective or not and is it possible to replace our traditional education system. For that research we read many various types of online journal and a lots of research paper in this related topic. We collect data from the students and applying this data in various machine learning algorithm. We put in force our assignment on google colab using python programming language. During our project we faced various types of difficulties. One of the main back points was to determining the project methodological approach. Collecting data and applying various model in this dataset was also very difficult task but we overcome and successfully applied various types of machine learning algorithm. This research shows that technology and students concern are also depends on online learning to achievement and highly impact on this factor. Our motive is to find out that weather students can really learn from online platform or not. Based on scenario and situations it depends as well as student's motivation also. After an extended journey and doing difficult work finally we successfully complete our mission.

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