# RESEARCH ON DATA ANALYSIS AND SPREADING OF COVID-19 IN BANGLADESH

## BY

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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 Research titled "**Research on Data Analysis and Spreading of Covid-19 in Bangladesh''**, submitted by **Injamam Ul Haque Apu**, **KM Abdullah Al Muhit** and **Md.Zahid Hossin** to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation will be held on 11th September 2021.

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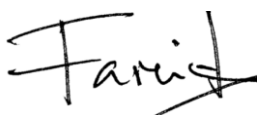Faculty of Science & Information Technology
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# DECLARATION

We hereby declare that this research has been done by us under the supervision of **Md. Sazzadur Ahamed, Senior Lecturer, Department of CSE,** Daffodil International University. We also declare that neither this research nor any part of this research has been submitted elsewhere for award of any degree or diploma.

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We really grateful and wish our profound indebtedness to **Md. Sazzadur Ahamed**, Senior Lecturer, Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of "*Machine Learning*" to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior drafts and correcting them at all stages have made it possible to complete this project.

We would like to express our heartiest gratitude to **Professor Dr. Touhid Bhuiyan** Head, Department of CSE, for his kind help to finish our project and also to other faculty members and the staff of CSE department of Daffodil International University.

We would like to thank our entire course mates in Daffodil International University, who took part in this discussion while completing the course work.

Finally, we must acknowledge with due respect the constant support and patients of our parents.

# ABSTRACT

This particular study is about data analysis of the coronavirus situation in Bangladesh by applying Machine Learning. The sole objective of our paper is to analyze the data and to find out the outcome of people's concern about covid-19. The population density of Bangladesh is 1,116 people per square kilometer. As a densely populated country, it is highly impossible to stop the spreading of the infectious coronavirus. But our study would certainly guide us to ward off as we would be able to identify whether our government is taking the right steps for the rapid spreading of coronavirus. The very first case of covid-19 in Bangladesh was reported on 8th March 2020. Since that day, the transmission of the virus has been growing. The growth has sometimes been upward and sometimes being downward. COVID-19 was declared a Public Health Emergency of International Concern (PHEIC) by the World Health Organization (WHO) on January 30, 2020. It has always been so hard to detect the actual state of the spreading of the virus. The study would help the authorities to take advance action by interpreting the patterns which have been collected from various types of people in all over Bangladesh. This would find out the infected risk on coronavirus depending on the human behavior. On the other hand, using our data analysis, the government will be able to notice what the public want from them.

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# Chapter 1
# INTRODUCTION

## 1.1 Introduction

On December 31, 2019, Wuhan, China announced the first instance of the covid-19 epidemic. The virus has spread to more than 200 nations since then. Bangladesh is also one of those highly affected countries. Our government declared a lock-down after 18 days of the first case report. First death was confirmed due to covid-19 virus was on 18th March, 2020. On 26th March 2020, a 10-day shut-down was declared to fight the spread of corona virus. As a developed country, it was always hard to maintain the lockdowns. Especially for middle- and lower-class people, it was getting tougher day by day. Though our government took many steps to ensure all the facilities for every class of people, so that they stayed home and didn't go out except in emergency cases and get infected. But as the days progressed, it was hard to stop the public from getting out of home. Our government made strict decisions to always wear the mask, maintain social distance and to wash or sanitize hands on a regular basis. The movement of public and private transport was limited. If we talk about our health sector, it took time at the beginning to adjust. There were not enough doctors and facilities to battle against the covid-19 virus. But step by step, the facilities have been improved from city to rural areas. Still we have got scopes to evolve in this sector. This sector has always been a concern for us. Time to time, our government is trying lockdowns to stop spreading the virus. Not always it has been as per planned. Especially during eid vacations, it's been way more difficult. There is always light at the end of the tunnel. The invention of the vaccine of covid-19 was always a positive sign for an overpopulated country like Bangladesh. On 27th January 2021, the vaccine trial in Bangladesh began. Now people are really interested in vaccination. The age limit till now has been set to 25 years and above. The main target of the data analysis of our research would perceive things such as infected risk and death cases from confirmed cases and confirmed rate using previous data.

## 1.2 Motivation

Data analysis is always interesting. It will always help to find out thousands of possible outcomes. So, we choose machine learning algorithms to analyze the data. As the covid-19 virus is new and mutating constantly, authorities are facing issues to take proper steps. Due to lack of analysis, the government and related authorities are sometimes bewildered and sometimes react late to take actions as well against this covid-19 outbreak. We certainly motivate to clear out these confusions by doing data analysis on covid-19 which will influence the authorities to make appropriate decisions.

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## 1.3 Objective

Our main objective is how the overall covid-19 situation has reflected on the public from day one till now. It will help us to predict a lead for the future effect and spreading of covid-19. This paper will give a clear and better idea to fight against covid-19 to the people who are working in this area. Government and authorities who are trying their best during this tough time will get clear indications whether they are following the correct path accordingly. This paper will also find out if the public are reliable to the authorities' actions or not.

## 1.4 Expected Outcome

We have designed a Google form for our research purpose where we collected various information from different people's perspectives. All these data will come to a conclusion to make a decision about a person's affected risk in coronavirus by Machine Learning Algorithm. We also examined data of confirmed cases to find out death cases.

## 1.5 Research Questions

Are the government and authorities taking appropriate actions accordingly during the outbreak of covid-19 virus to reduce the infection rate and death rate?

**1.6 Overview of The Paper**

**Chapter 1: INTRODUCTION** (1.1 Introduction, 1.2 Motivation, 1.3 Objective, 1.4 Expected Outcome, 1.5 Research Questions)

**Chapter 2: LITERATURE REVIEW** (2.1 Introduction, 2.2 Related Works, 2.3 Scope of the Problem, 2.4 Challenges,)

**Chapter 3: RESEARCH METHODOLOGY** (3.1 Introduction, 3.2 Research Subject and Instrumentation, 3.3 Research Analysis, 3.4 Data Collection Procedure, 3.5 Implementation Requirements)

**Chapter 4: CONCLUSION** (4.1 Summary of the Study, 4.2 Conclusion 4.3 Further Implication of the Study)

# Chapter 2
# BACKGROUND STUDY

## 2.1 Introduction

There have been numerous study articles published on various aspects of covid-19 since its origin. Aside from studies in the areas of vaccination, pharmacological therapy, and other clinical issues, a significant amount of research is being done using patients as the fulcrum—patients who have recovered; patients with comorbidities; viral incidence, and so on. The people who have recovered have been thoroughly examined in order to get information on how to deal with the active instances. Data scientists around the world are working hard at work deciphering the available data and forecasting the near future. For the past few years, digital technologies have played an increasingly important role in key health-care issues, such as disease prevention. The current global health emergency, COVID-2019, is also seeking technical assistance. Finding trend patterns, selecting features, and forecasting methodologies are all used to come at a conclusion. Our study is also a very small endeavor among all the hard work.

## 2.2 Related Works

Authors described that corona viruses are a broad family of viruses that can infect humans and cause serious sickness. The first known severe epidemic, Severe Acute Respiratory Syndrome (SARS), occurred in 2003, while the Middle East Respiratory Syndrome (MERS) outbreak began in 2012 in Saudi Arabia (MERS). The current coronavirus outbreak was first detected in the last part of December 2019. This virus is very infectious and has outspread fast throughout the globe. As the outbreak has spread to 18 countries, WHO labeled it as an emergency on January 30, 2020. WHO designated this as "COVID-19" on February 11, 2020. Apart from China, the number of COVID-19 infections has surged almost fourteen times since March 11, with over 118,000 cases in 114 countries and over 4000 deaths. Article described the four transmission phases of Covid-19. People who have come into contact with the person arriving from the affected regions are notified of cases in stage one, while those who have come into contact with that person are notified of cases in stage two. It is possible to identify those who have been impacted at this time. The situation deteriorates significantly in the third stage, when the source of transmission is lost and the disease spreads to those who have

not traveled or come into touch with the ill individual. This situation demands a rapid lockdown across the country in order to limit individual social contacts and thereby manage the transmission rate. The fourth stage is the most dangerous, as the transmission becomes out of control. Support Vector Regression (SVR), Polynomial Regression(PR), and other methods have also been discussed by the authors [1].

The 2019 novel corona virus (2019nCoV) has come into focus following a recent pneumonia outbreak in Wuhan, China. This new corona virus, known as 2019nCoV, belongs to the Orthocoronavirinae subfamily and is unique from the Middle East respiratory syndrome corona virus and the severe acute respiratory syndrome corona virus (SARSCoV) as described in [9]. The situation was becoming direr by the day, and a greater understanding of its pandemic character is critical for further prevention and management. COVID19 was proclaimed the sixth public health emergency of international concern by the World Health Organization (WHO) on January 30, 2020, following H1N1 (2009), polio (2014), Ebola in West Africa (2014), and Zika virus (2016) and Ebola in the Democratic Republic of Congo (2019).

Authors of [3] have made predictive modeling using SIER- Susceptible Exposed Infection Recovered. SIER is used to predict time & rate taken for the spreading of disease throughout the globe. This article also includes a sentiment analysis of recent confirmed news to understand people's psychological, political, and economic reactions in a better way. Along with SIER, the authors of [10] have also discussed Exploratory Data Analysis (EDA).

In [7] the researchers have found out about public concern during the covid-19 outbreak of three countries India, Italy and USA by using Gaussian Mixture Model. [7] They suggested two different strategies for modeling the number of persons who become infected with the novel corona virus in this research (COVID-19). To begin, a mathematical model is used to capture several parameters that are important in influencing the virus's propagation, and appropriate values are estimated from available data. Disease Outbreak Response System Condition (DORSCON) categorized infected areas into four colors which are green, yellow, orange and red from best to worst respectively in [11].

## 2.3 Scope of the Problem

This paper is about finding out the risk of getting infected by the covis-19 virus by analyzing the data using Linear Regression, Decision Tree and Random Forest. Though we collected data sets according to our project, the amount of data collected could have been larger. More data gets more accuracy. We studied SVM and KNN algorithms, but applied Linear Regression, Decision Tree and Random Forest which was more accurate for our dataset. If we could have more time for our research, the outcome would be more accurate.

## 2.4 Challenges

To complete a task, you always have to face challenges. We also have no exceptions as we have faced so many obstacles. Our paper is about covid-19 for which the authorities have been deciding to lockdown the whole country and sometimes red zone areas only. This lockdown was for the betterment of the public as we all know. But we faced problems while collecting data properly because of the lockdown. Although we tried to maintain all the safety precautions advised by the authorities while gathering the data. All of us, the three group members, stay outside Dhaka. As our university is off physically, following the education ministry's notice, we have been staying in our hometowns since the beginning of the Covid situation and our hometowns are miles apart from one another. It was not always favorable for us to call up a meeting and come to a conclusion about the analysis. Internet connection has always been a major hiccup for group study. We divided our tasks among ourselves to avoid such issues regularly. But still while analyzing the data and applying the Machine Learning Algorithms, group work is always best. We tried our level best to work as a team. We read out so many papers related to our work so that we can make our task different from other tasks. One more thing we would like to say is though our supervisor has helped us thoroughly via online, but we feel a bit unlucky that we couldn't be supervised physically. These are the challenges we faced throughout our study.

# Chapter 3
# RESEARCH METHODOLOGY

## 3.1 Introduction

The SARS-CoV-2 virus causes Coronavirus Disease (COVID-19), an infectious disease.

The majority of patients infected with COVID-19 will have mild to moderate symptoms and will recover without any additional therapy. Some, on the other hand, will become critically unwell and require medical assistance.
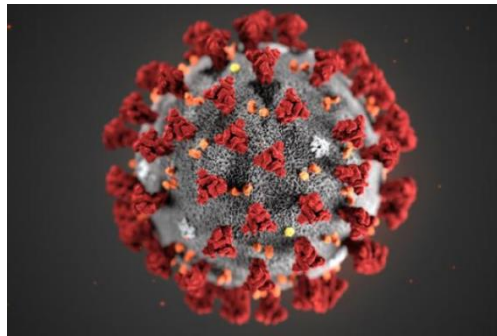

Fig.3.1.1 coronavirus

When an infected person coughs, sneezes, speaks, sings, or breathes, the virus spreads in microscopic liquid particles from their mouth or nose. These particles vary between bigger air droplets and tiny aerosols.


Fig.3.1.2 Affected lung by coronavirus

Anyone can contract COVID-19 by inhaling the virus while near someone who has it, or by contacting a contaminated surface and then touching their eyes, nose, or mouth. The virus spreads more easily in closed as well as in packed areas.

**3.2 Research Subject and Instrumentation**

Our paper is about "RESEARCH ON DATA ANALYSIS AND SPREADING OF COVID-19 IN BANGLADESH" and throughout this paper we have, first, found the possibility of future death case by coronavirus using linear regression algorithm. We have also predicted the infected risk on coronavirus depending on human behavior by using random forest and decision tree algorithm. The accuracy for both the algorithms are almost same. Finally, we have tried to find out what the government should do for the people by taking participants point of view regarding covid-19 issue.
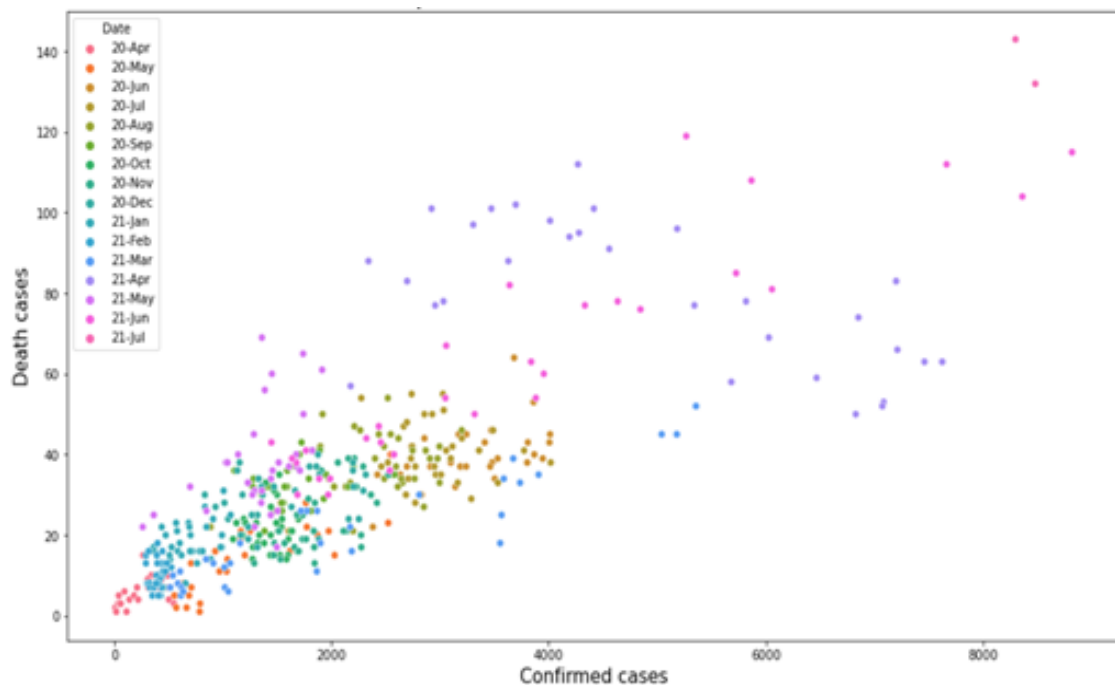
**3.2.1 Prediction of Future Death Case**



Fig. 3.2.1.1: Death case vs confirmed case

This scatter plot shows the death cases and confirmed cases on a monthly basis from April 2020 to July 2021 of all over Bangladesh.
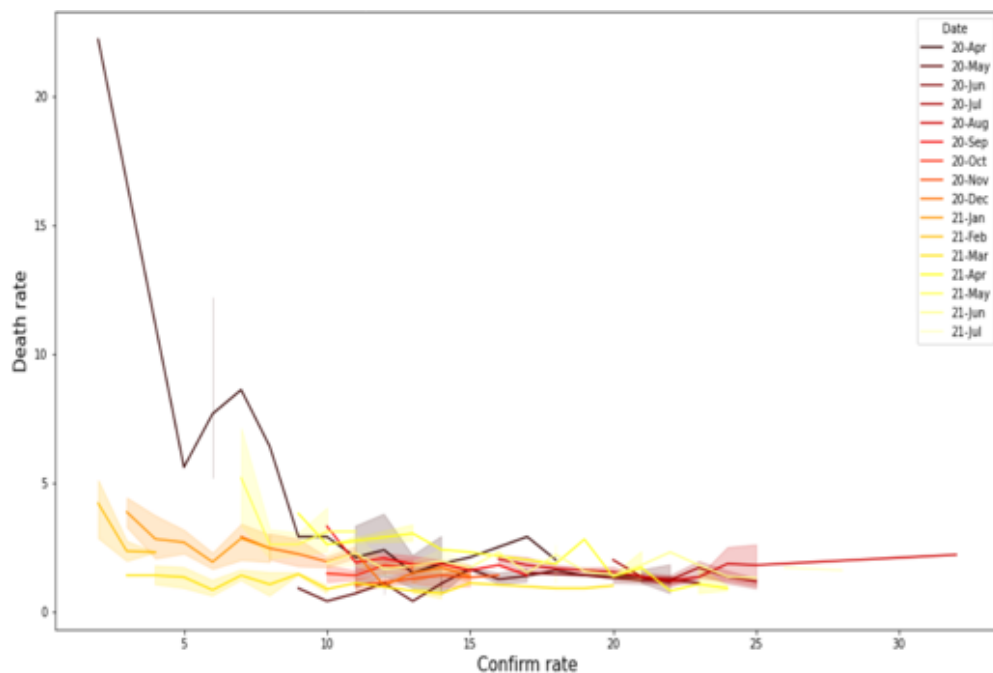
Fig.3.2.1.2: Death rate vs confirm rate

This line plot demonstrates the number of death rates and number of infected confirmed rates on a monthly basis from April 2020 to July 2021 of all over Bangladesh.

## 3.2.2 Linear Regression Model

```
In [ ]:    1
In [26]:   1  reg = linear_model.LinearRegression()
In [27]:   1  reg.fit(df[['Confirmed_cases','Case_rate']],df.Deaths_allover)
Out[27]: LinearRegression()
In [28]:   1  reg.predict([[15000,20,]])
Out[28]: array([196.30654728])
In [29]:   1  from sklearn.model_selection import train_test_split
In [30]:   1  xtrain,xtest,ytrain,ytest = train_test_split(x,y,test_size=.25,random_state=0)
In [31]:   1  from sklearn.linear_model import LinearRegression
In [32]:   1  regressor = LinearRegression()
In [33]:   1  regressor.fit(xtrain, ytrain)
Out[33]: LinearRegression()
In [34]:   1  pred = regressor.predict(xtest)
In [35]:   1  regressor.score(xtest,ytest)
Out[35]: 0.6085902537196204
```

Fig.3.2.2: Prediction result

The result of this algorithm suggested that by applying confirmed cases and confirmed case rate as input and get output as the number of deaths.

### 3.2.3 Testing Infected Risk on Coronavirus Depending On Human Behavior

In our next examination, we have tried to track the rate of infected risk of a person on the basis of safety and precaution about covid-19 that he/she followed. Two of the most popular algorithms of machine learning have been applied which are Random Forest and Decision Tree.

For both random forest and decision tree algorithm we have taken some inputs from the users where the parameters have been converted from string value to numeric. The parameters are:

- Age (<25=1, 25-35=0, >35=2)
- Knows about contact tracing or not (Yes=1, No=0)
- Wear mask or not (Yes=1, Not Always=0)
- Vaccinated or not (Yes=1, No=0)
- Gender (Male=1, Female=0)
- Maintained social distance or not (Yes=2, No=0, Not always=1)
- Maintained lockdown properly or not (Yes=2, No=0, Not always=1)
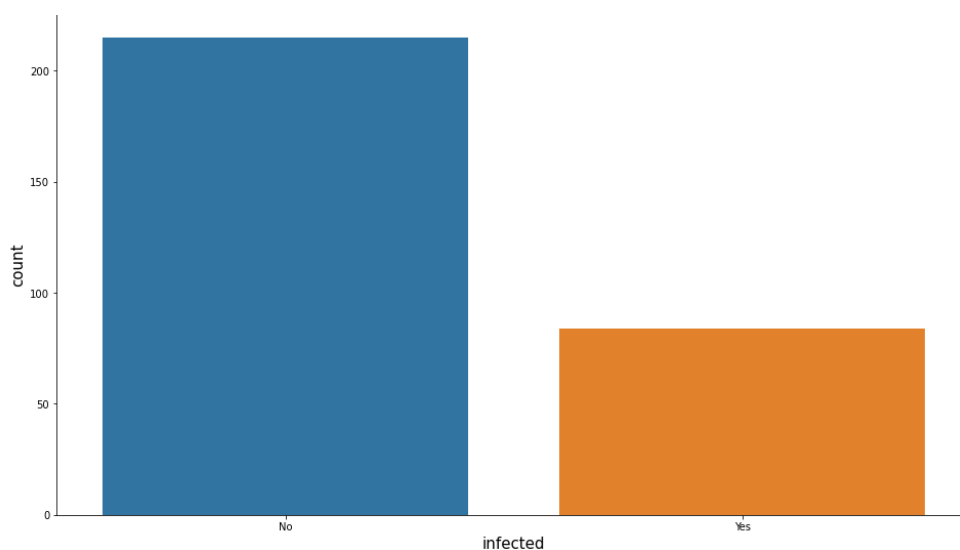- And the result gives us in Yes/No format



Fig.3.2.3.1: Infected-Yes/No

From the raw data that was collected by us from different people, we have found out the total number of people infected with coronavirus and vice versa.
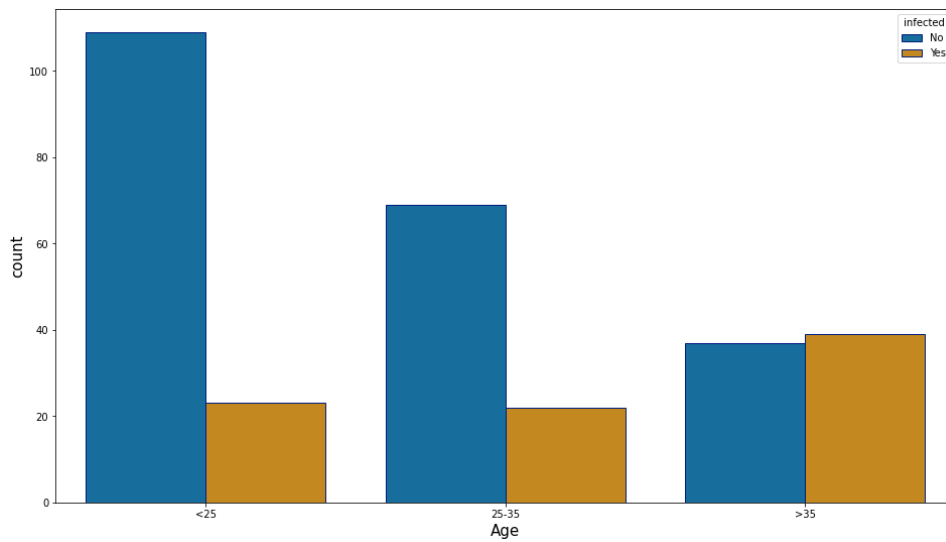
Fig.3.2.3.2: Relationship between age and infected cases

Here in Fig.3.2.4.2 age has been separated into three different parts which are less than 25, between 25 to 35 and greater than 35. Infected rate has been shown of these ages from our gathered data.
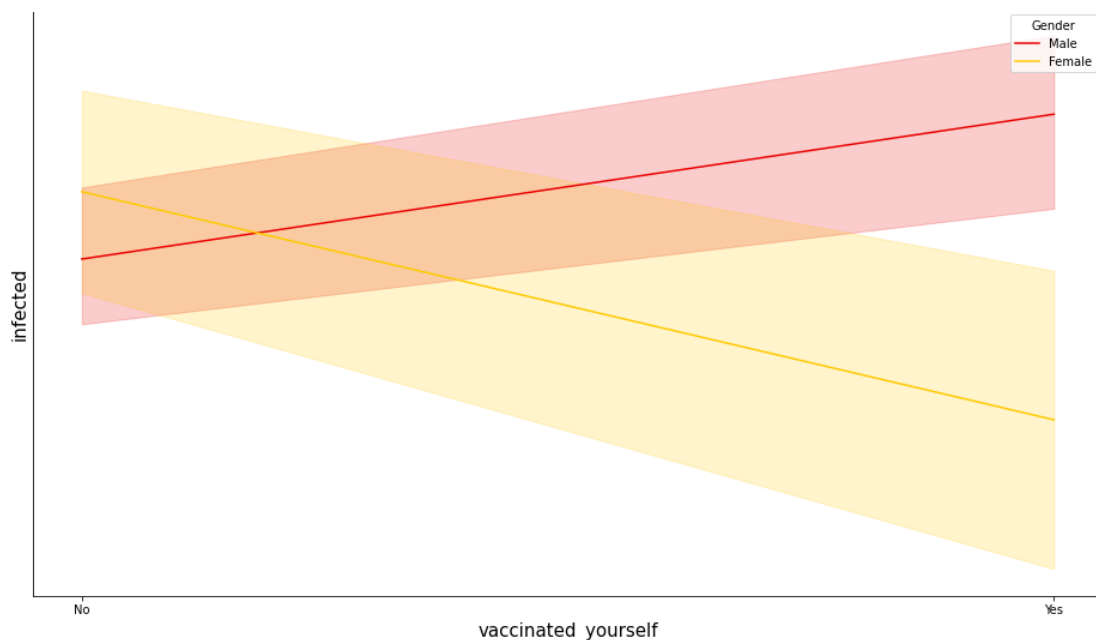


Fig.3.2.3.3: Line Plot of infected or not according to vaccination (male-female)

This figure shows the result of infected cases of vaccination for both male and female. Those who vaccinated themselves, the infected rate is less compared to those who have not.

### 3.2.3.1 Applying Random Forest Algorithm

```
In [26]:    1  from sklearn.ensemble import RandomForestClassifier

In [27]:    1  Rnfclf = RandomForestClassifier(n_estimators = 100,criterion='gini')

In [28]:    1  Rnfclf.fit(xtrain,ytrain)
Out[28]:  RandomForestClassifier()

In [29]:    1  Rnfclf.score(xtest,ytest)
Out[29]:  0.8666666666666667

In [40]:    1  user1 = [2,1,0,0,0,0,2]

In [41]:    1  user1 = np.array([user1])
            2  user1
Out[41]:  array([[2, 1, 0, 0, 0, 0, 2]])

In [42]:    1  Rnfclf.predict(user1)
Out[42]:  array(['Yes'], dtype=object)
```

Fig.3.2.3.1.1: Implementation of Random Forest Algorithm

### 3.2.3.2 Applying Decision Tree

```
In [43]:    1  from sklearn.tree import DecisionTreeClassifier

In [44]:    1  Dtclf =  DecisionTreeClassifier()

In [45]:    1  Dtclf.fit(xtrain,ytrain)
Out[45]:  DecisionTreeClassifier()

In [46]:    1  Dtclf.score(xtest,ytest)
Out[46]:  0.844444444444444

In [47]:    1  x_input = np.array([2,1,0,0,0,0,2])

In [48]:    1  y_Predict = dtf.predict([x_input])

In [49]:    1  y_Predict
Out[49]:  array(['Yes'], dtype=object)

In [ ]:    1
```

Fig.3.2.3.1.2.: Implementation of Decision Tree Algorithm

In our examination, we see that the random forest algorithm gives the accuracy of 86.67% whereas the decision tree gives the accuracy of 84.44%. Though the result is same but if we compare, we see that the random forest has shown a better output for this case.

## 3.3 Research Analysis:

Through this analysis, we tried to find out what would be most effective action for the people of our country related to coronavirus. These actions must be taken immediately by the government and other related authorities.
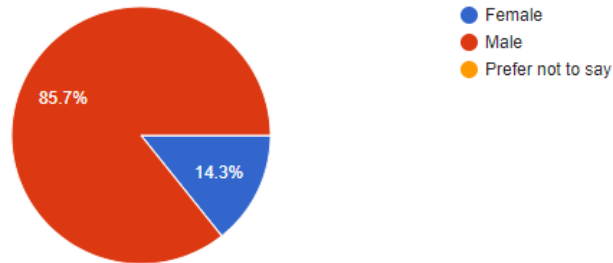


Fig: 3.3.1 Gender

85.7% is male in total number of participants in our study and the rest is female. We have taken all the required information from these participants by some questions.
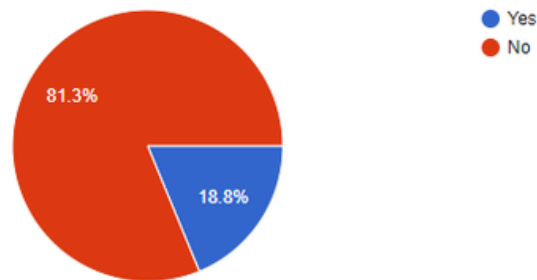


Fig: 3.3.2 Infected Rate

Among all the participants, we see the infected rate where almost 19% people got infected with coronavirus.
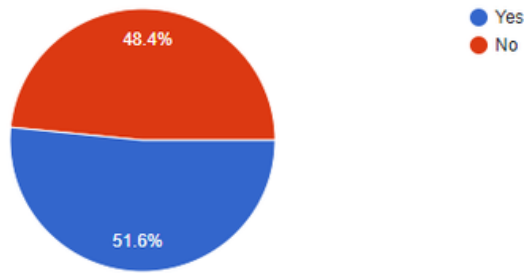
Fig: 3.3.3 Knowledge about Contact Tracing

As we can see that almost 50% of people do not have knowledge about contact tracing. But it is a very important fact to know for everyone as coronavirus is a highly infectious disease. We have to obey this to decrease the infection rate.
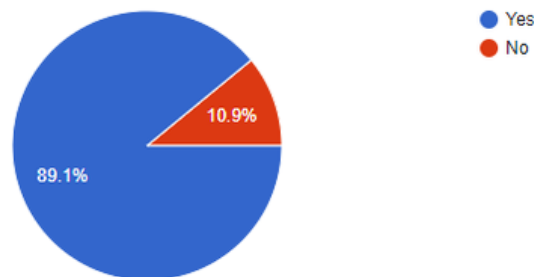


Fig: 3.3.4 Effect on Income Source

From this pie chart it is observed that coronavirus has put a huge effect on the income which is 89.1%. Number of people have lost their jobs and made a huge loss in business. This is not a good sign in terms of our country's economy.
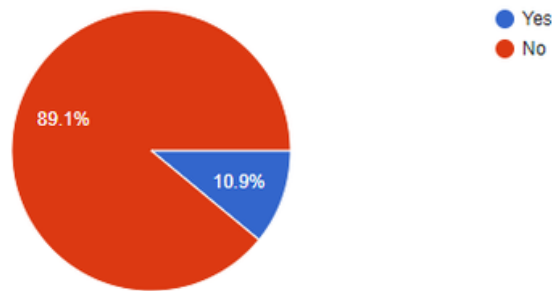
Fig: 3.3.5 Enough Doctor or not

Almost 90% of our participants think that there are not enough doctors compared to the general public. Authorities should recruit more qualified doctors to fight against coronavirus for our country's people.
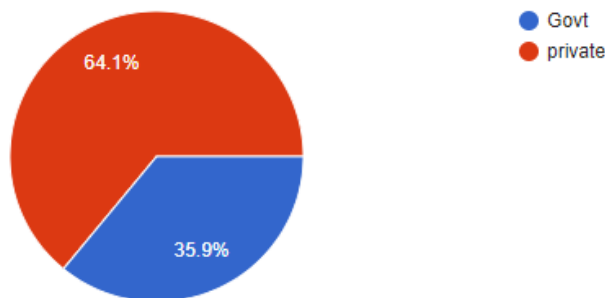


Fig: 3.3.6 Hospital preference

This pie chart gives a shocking result which shows that people mostly prefer private hospitals over government hospitals. We can see that two-third of our participants have faith in private hospitals. Government should be really concern about this matter and they must improve the public medical sector.
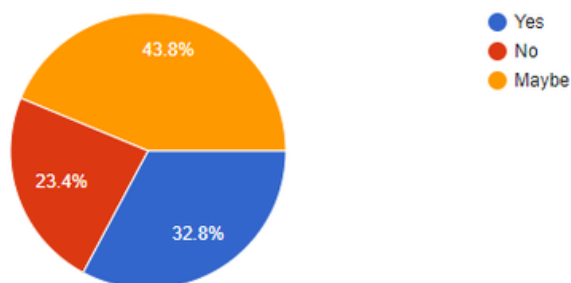


Fig: 3.3.7 Is the government doing their best?

In this pie chart a mixed result has been obtained. We can see a different opinion on government's action to handle covid-19 situation.
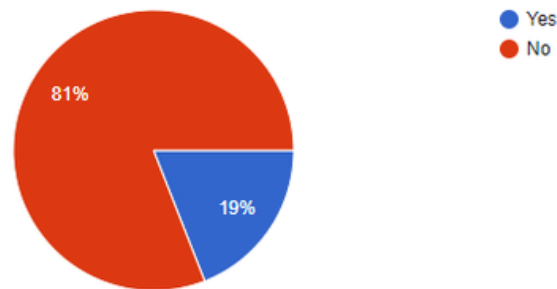
Fig: 3.3.8 Vaccinated or not

As we have gathered our data from people of different occupations, it is seen that a large number of people have not taken the vaccine yet. Government has to ensure that everyone above 18 years of age must take a vaccine.
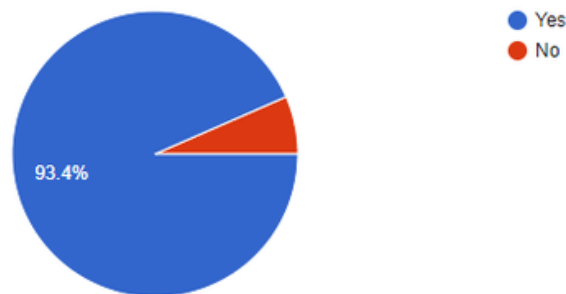


Fig: 3.3.9 Interest on Vaccination

Most people who have not vaccinated themselves yet are interested in vaccination. In contrast to developed countries where people are not willing to take vaccines, Bangladeshi people are really interested in getting vaccinated. This is a very positive sign in the context of our country.
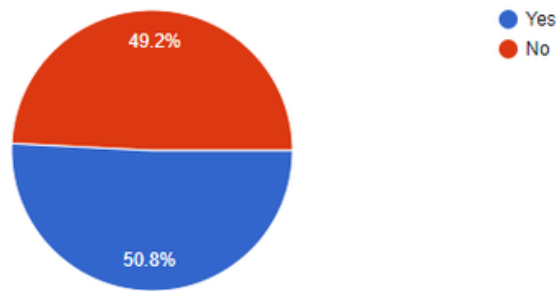
Fig: 3.3.10 Lockdown- a right decision or not?

Half of the people think that lockdown is not logical to prevent the spreading of coronavirus whereas the other half think vice versa.

While collecting all the data, we also have taken the participants comments about government action that what should be better for them. Some important comments are shown below.

"There are many poor people in our country, Government should give them food for free. It's necessary because they are poor. If they can't go outside and find a work, it becomes tough for them. They spend the day without food. Also there are some other reasons too"

"Government have to ensure fulfilment of first three basic needs for every human being before imposing lockdown."

"A lockdown in Bangladesh is lockdown by name, not by its deed. It's not only the government, I believe public are more responsible for the worsen scenario"

"Support financially lower-income people & stop all activities for the long term. Also, confirm vaccine given process strictly for mass people & maintain it properly within a short time."

"To strict the rules and help the poor so that they don't have to go outside for earning"

"First of all govt. Should take step to aware the ordinary people as much as possible about Covid-19 ugliness. After that manage vaccine for all the people very fast. Need some emergency booth for Covid-19, these are 24 hours available & do their duty with cordiality. If badly need lockdown, then govt. Should maintain proper guideline"

"Impose more volunteers to make people aware and strict the laws as well as ensure people's health and food."

"The health department needs to improve, corruption must stop and need to take any decision wisely and after analysis"

"Since all government institutions are closed, therefore, 25% of the salaries of all working people should be deducted, food should be delivered to all the houses and the whole country should be closed for 1 month. The Corona pandemic will be 90% cured."

## 3.4 Data Collection Procedure

For our first experiment, we have collected our data set from kaggle which is known as a worldwide trusted data source. From this data set, we gathered the total number confirmed cases and death cases which is in csv format.

And for our second experiment, we have collected various types of information from different users by using our specially designed google form. Some specific questions were being asked to get the data and we got the results from their answers. We converted that information as per our requirement.

## 3.5 Implementation Requirements

Here we will show the graphical representation of how three of the algorithms **Linear Regression, Random Forest, Decision Tree** have predicted our result.

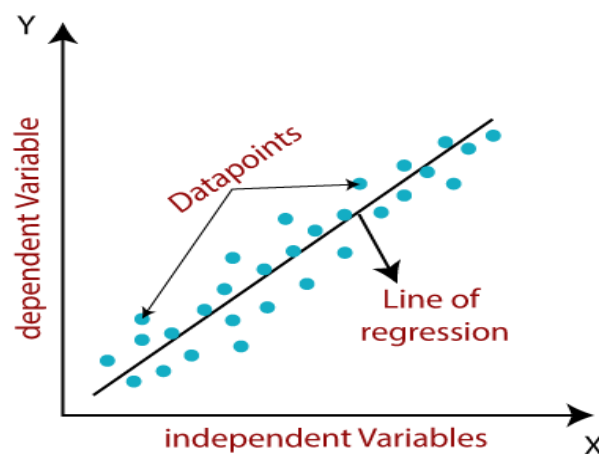## 3.5.1 Implementation of Linear Regression Equation



Fig.3.5.1: Linear Regression Equation

In the figure 3.5.1, we can see how the linear regression equation predicts.

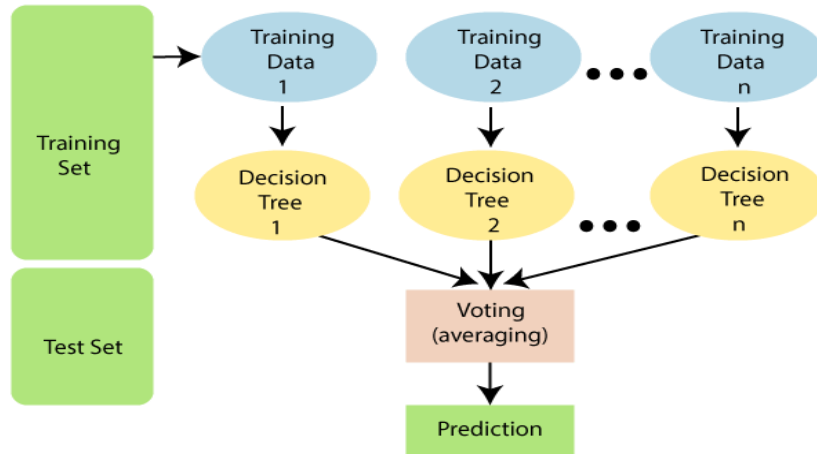### 3.5.2 Implementation of Random Forest Algorithm



Fig.3.5.2: Random Forest Algorithm

The above figure shows that how random forest algorithm makes prediction by traversing tree.
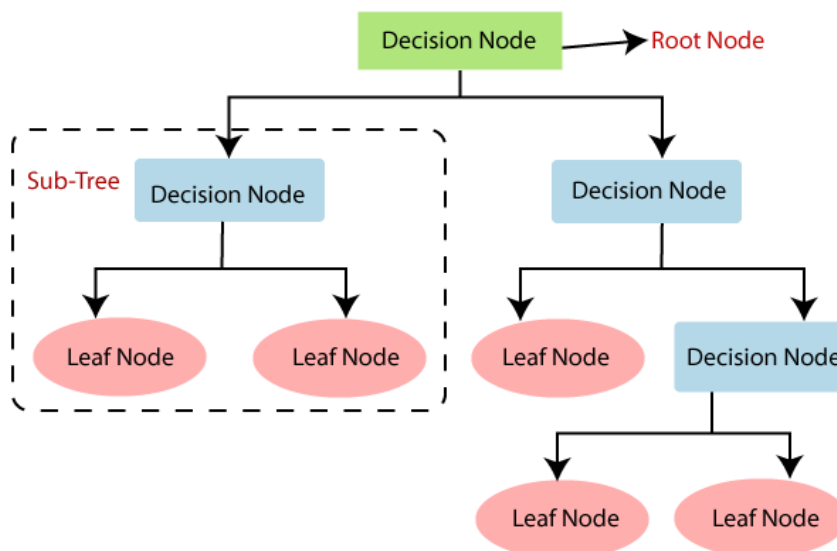
### 3.5.3 Understanding the Mathematics Behind Decision Trees



Fig.3.5.3: Decision Tree

The prediction of how decision tree algorithm works by traversing has been shown in the figure.

# Chapter 4

# CONCLUSION

## 4.1 Summary of the Study:

We have analyzed the data to find out if humans are following the right steps to avoid the risk of not getting infected. We have taken all the required information from participants by some questions and we got some more information like contact tracing, effect on income source, doctor ratio, preferable hospital, people's thoughts on vaccination, people's opinion on medical sector and government action towards covid-19 issue.

This paper is about implementing ML Algorithms- Classification Algorithms such as Linear regression, Decision Tree, Random Forest. For implementing these algorithms, we have used Jupyter Notebook. By applying these algorithms, we have predicted a certain outcome from various data.

## 4.2 Conclusion

There are numerous research projects underway in the areas of vaccinations, economics, precautions and so many other terms related to Covid-19 instances. We have been to different stages of transmission of covid-19 situation. On a daily basis, Bangladesh is witnessing an alarming increase in the number of cases. We don't know yet if we have reached the peak or have crossed the peak. At some point there was upward growth and followed by downward growth. Every day, new facts and a vast volume of data are released. A variety of different machine learning and deep learning-based prediction models were also employed to forecast the results of our data analysis. Eventually only proactive measures taken by sensible individuals can prevent the virus from spreading fast. We can all work together to make sure that all of the laws and regulations are followed. The only way is to maintain social distance and take the lockdown seriously. Also the government should provide all the facilities to maintain these especially for the lower and middle class people. We also looked at the sentiments from the Google form to get a better understanding of how individuals felt about the epidemic. This research is based on real-time data and will assist higher officials such

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as government authorities and healthcare personnel in developing a combat plan that includes strict measures. The research will also aid mathematicians and statisticians in more accurately forecasting outbreak numbers.

## 4.3 Further Implication of the Study

This research is only the beginning of a long journey ahead. We have a plan to make this project more informative and richer for further implication. In the future, our number of data will be larger. We have a plan to make this project more informative and richer for further implication. In the future, our number of data will be larger. Many developed countries have face trouble to control the covid-19 situation. We want to analyze for under developed countries so that they can control the infected risk.

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