Machine Learning Techniques to Precaution of Emerging Diseases in the Poultry Industry

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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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APPROVAL

This Project/internship titled "**Machine Learning Techniques to Precaution of Emerging Diseases in the Poultry Industry**", submitted by Muhtasim Shafi Kader and Jobeda Akter 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 has been held on 03-01-2022.

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DECLARATION

We hereby declare that this project has been done by us under the guidance supervision of **Dr. Fizar Ahmed, 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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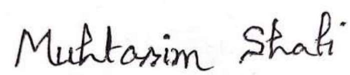

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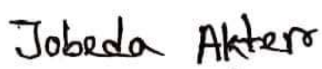

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ABSTRACT

Nowadays poultry is the best production of animal protein. With the amazing food diversity of Bangladesh, poultry chicken has a great impact on our daily life. But some major diseases are hampering this industry frequently. Bangladesh is agricultural country with a huge diversity of agricultural aspects. Poultry Industry is one of the major aspects among all the other agricultural field. So, prediction of poultry disease could be great way to improve the whole production of this industry. Serpentine illness such as infected bursal disease is more prevalent followed by colibacillosis, Newcastle disease, salmonellosis, chronic breathing disease, Avian Influenza, coccidiosis, aspergillosis, omphalitis, fowl pox, nutritional deficiency. Machine learning can be a useful health care way and also poultry disease precaution and detection. In advanced computer science diseases like Avian Influenza, Newcastle Disease are harmful to chicken. In order to prevent harmful consequences, it is important to concentrate about poultry infection on our very initial stage. We use a few qualities to evaluate our analysis regarding poultry illness and this attribute is one of the key items of the following disease. Perhaps we implement eleven machine classifiers to measure analysis by employing the following technologies, Logistic Regression Classifier, Naive Bayes Classifier, Multilayer Classifier, Stochastic Gradient Classifier, r Random Forest classifier, Bagging Classifier, Decision Tree Classifier, K Nearest Neighbor Classifier, XGB Classifier, AdaBoost Classifier & Gradient Boosting Classifier. The method we employed here gives maximum precision. Decision Tree Classifier has the best outcome yet.

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CHAPTER 1
INTRODUCTION

Machine learning is now becoming an essential area in the pursuit for human welfare. Various data mining techniques are implemented in different domains. Machine learning and data mining are the most efficient technique of prediction and prevention. We may discuss examples such as poultry industries, medicinal science, weather predictions and so on. In this poultry platform various illnesses may be recognized using machine and data mining technology, and the implementation of ML and data mining approaches are predictable. Colibacillosis poultry disorders Through such machine learning methods, bacterial illnesses can also be identified. In this current day beef, goat, chicken is one of the main sources of animal and meat protein. The increasing frequency of poultry illness has significant effects on dietary and health habits and economic performance in emerging nations. A rapid increase in common poultry disease like, Colibacillosis, Newcastle disease, salmonellosis, chronic respiratory disorder, Avian flu, coccidiosis, aspergillosis, omphalitis is followed by a serval bursal disease, fowl cholera, fowl pox, nutritional deficiency would result Even deeper responsibilities that emerging countries are unwilling to cope with. Chronic poultry illnesses have been exposed.

These circumstances are largely due to the accumulation of infectious diseases in bacteria and viruses and to lack of awareness within the world's poultry population. It needs greater concentrate and more extensive implementation for wealthy nations, cost-effective and preventative poultry disease policies. Many veterinary facilities maintain data on fowl afflicted by poultry illness in their database. By studying this dataset, several approaches of making decisions can be identified. By use of machine learning and data mining on this data, various sorts of predicted results may be discovered and used to forecast poultry diseases Many farms suffer from different poultry illness.

There is a large number of farms. Maximum worry about the illness in Bangladesh is not. That is why poultry farms are growing more and more. The loss may be controlled if the proprietors of a farm can forecast illnesses and which chicks will be afflicted or impacted. Farm owners might take the required precautions to prevent the consequences of such diseases. Predictive measures can be used to forecast the illness. We use several machine learning techniques and approaches to data mining to forecast data set diseases. We use classification, regression, categorization in this particular investigation. It is obvious to forecast poultry diseases simply after completion of investigation. This poultry illness and chicken health problem will be known to farm owners.

The major goals of the project are using ML Algorithms and implementing the techniques to precaution of emerging illness of poultry industry. Maybe eleven machine study classifiers are used in the prediction of logical recovery, Logistic Regression Classifier, Naive bays, Stochastic gradient descent, Multilayer perceptron, Decision Tree Classifier, Gradient Boosting Classifier, Random Forest Classifier, Bagging Classifier, K Nearest Neighbor Classifier (KNN), XGB Classifier and Adaptive Stocking (Adaboost) Classifier. Following the investigation, we will obtain the accuracy of each method and identify the best results. Attempting the Classification, we will come through a result that will combine that which approach is best to use for this analysis. Eventually many advanced works can be done with the term of data mining. Improving the poultry industry can be huge part for the overall agriculture industry of Bangladesh. It can bring a huge advancement as well.

After using all the machine learning algorithms and implementing them, we will able to find out the accurate algorithms to precaution of the disease that will happen in the poultry farm or shade. By predicting the disease by the provided data set we will able to prevent the disease outrage and make safe space for the poultry farm instead. It will be a huge milestone for the poultry industry and for our agricultural industry as well.

1.1 Background

1.1.1 How Poultry Disease Attack

Many factors can be responsible for poultry diseases. Many variables can cause to infections in your flock. You can lessen the risk of disease by understanding its causes and how it spreads.

Disease can frequently contribute to decreased presentation in platforms like as breeding of the chicks, growth structure, eating ability as well as production of eggs. Sickness may have an impact on the look of show birds as well as the racing abilities of pigeon flocks. Disease can be responsible for lack of breeding capability of the chicken.

While there have been several probable sources of sickness, the frequently an amalgamation of events that leads birds to get ill. Infectious agents are live animals that may transfer from bird to bird and cause sickness or illness. Germs like microorganisms, diseases, and mushrooms, outside parasites like lice and mites, and interior vermin are examples of these like worms, coccidiosis, blackhead. Pathogens are pathogenic infectious agents that cause disease.

By some environmental elements it can be controlled. Environmental elements like temperature, humidity, light intensity, ammonia, noise can be responsible for poultry disease. If these particular environmental elements can be controlled with the proper care, we can be preventing the disease before it causes a huge damage in the poultry farm.
There are a lot of poultry farm owner around here in Bangladesh that are not educated enough about these kinds of poultry disease like avian influenza, Newcastle disease, avian flu and a rapid increase in common poultry disease like, Colibacillosis, Newcastle disease, salmonellosis, chronic respiratory disorder, Avian flu, coccidiosis, aspergillosis, omphalitis is followed by a serval bursal disease, fowl cholera, fowl pox, nutritional deficiency would result Even deeper responsibilities that emerging countries are unwilling to cope with. Chronic poultry illnesses have been exposed.

1.1.2 Environmental Condition of Poultry Disease

Many Birds can become ill as a result of certain environmental circumstances. The disease, unlike infectious pathogens, does not transfer between birds.

Physical stress can impair a bird's capacity to withstand sickness. Flocks rely on humans to provide them with the following that suitable food and hygienic, unadulterated water; acceptable ecological circumstances and housing.

Deprived of these chicks could suffer from pressure caused by anxiety, starvation, sunstroke, overcrowding, filthy environments, and weather extremes.

When the environment has an impact on the health of birds, it is mainly due to the chicken's inability to adjust to the surroundings. Some of the environmental elements that might induce disease are given below:

- ✓ Poisons spread
- ✓ Injury of chicks
- ✓ Nutritional habit or deficiencies
- ✓ Poor air pass capability
- ✓ Temperature
- ✓ Humidity
- ✓ Noise
- ✓ Light Intensity
- ✓ Physical stress
- ✓ Attacks of beetles in the shed.

1.1.3 How Poultry Disease Spread

Poultry Disease could be delivery virus or bacteria from the shed of the poultry or the virus agent that got in to the shed.

Poultry Disease can be outrage by,

- ✓ Uses of hands, foots, and clothing of the people.
- ✓ Through feathers of poultry chicks and got into the nose and mouth.
- ✓ Corrupted parts of cars.
- ✓ Bird’s eggs.
- ✓ Infected air.
- ✓ Food of the poultry shed.
- ✓ House animals like dogs and cats.
- ✓ Mosquitos and flies can spread the disease so fast.

Serval situations of poultry disease, chickens maintain their health and fast to be ill. The disease doesn’t appear ill yet it transmitted illness, frequently undetected. Frequently the poultry disease with infected ones seldom displays visible indications of illness.

1.1.4 Poultry Disease Test

There is serval method to test poultry disease those are given below,

- ✓ For Avian Encephalomyelitis (AE) test is ELISA that Detects antibody
- ✓ For Avian Influenza (AI) test is PCR that Detects virus
- ✓ For Avian Influenza (AI) test is ELISA that Detects antibody
- ✓ For Avian Influenza (AI) test is AGID that Detects antibody
- ✓ For Chicken Anemia Virus (CAV) test is ELISA that Detects antibody
- ✓ For Infectious Bronchitis (IB) test is ELISA that Detects antibody
- ✓ For Infectious Bronchitis (IB) test is PCR that Detects virus
- ✓ For Infectious Bursal Diseases (IBD) test is ELISA that Detects antibody
- ✓ For Mycoplasma Gallisepticum (MG) test is ELISA that Detects antibody
- ✓ For Mycoplasma Gallisepticum (MG) test is ELISA that Detects antibody
- ✓ For Mycoplasma Gallisepticum (MG) test is SPA that Detects antibody
- ✓ For Mycoplasma Synoviae (MS) test is ELISA that Detects antibody
- ✓ For Mycoplasma Synoviae (MS) test is SPA that Detects antibody
- ✓ For Mycoplasma Synoviae (MS) test is PCR that Detects organism
- ✓ For Newcastle Disease (ND) test is ELISA that Detects antibody
- ✓ For Newcastle Disease (ND) PCR that Detects virus
- ✓ For Reovirus (REO) test is ELISA that Detects antibody
- ✓ For Salmonella pullorum (Pullorum) test is SPA that Detects antibody
- ✓ For Salmonella enteritidis (SE) test is PCR that Detects Sal. enteritidis
- ✓ For Salmonella test is PCR that Detects multiple Sal. Spp.

Hints are,

AGID = Agar Gel Immunodiffusion,

ELISA = Enzyme Linked Immunosorbent Assay,

PCR = Polymerase Chain Reaction &

SPA = Serum Plate Agglutination.

1.2 Research Motivation

The poultry disease is a life risking disease for the poultry chickens, if we have proper knowledge about it and how we prevent this then we will save a lot of chickens by affecting to this disease. It has huge economic value as well. By preventing the risk of the disease, we can grow our poultry industry higher than ever.

Every year a lot of poultry chicken died in these poultry disease it will be great motivation for us. The precaution of poultry disease could be a huge for innovation for the rest of the country.

We will implement some machine learning approaches to detect the disease before it spread in the poultry shed. Our concern is to predict the disease and make sure that best accurate machine learning algorithm is working well.

1.3 Problem Description

In this paper, the dataset has been gathered from for the following study 500 poultry The UCI machine learning repository is used for illness datasets. There are 30 characteristics in this data collection, 29 are predictive. After taking the data we manipulated the data for our research purpose with preprocessing. The data manipulation has done here to provide the best performance with the algorithms. The Convert notional qualities to numerical attributes using a mapping capability

We will create the best model of accuracy to precaution of poultry disease with the possible precision, recall, f- measure, t-score among the machine learning algorithms that we have used in our models and evaluating their output and preprocessing their accuracy.

1.4 Research Objective

- ✓ Most ultimate objective for the thesis work that to precaution of poultry disease with dataset and train them into various machine learning algorithm. After that we will get a comparative analysis
- ✓ The train run is preprocessed with a dataset of huge data of poultry chickens and from that the precaution will be generated.
- ✓ Among all the used machine learning classifiers and find the most accurate one. The algorithm is providing the most accurate result with the trained values.

1.5 Research Criteria

Classification-focused machine learning algorithms will predict whether or not poultry Disease will occur. We will achieve a better result by employing machine learning approaches. In the future, we shall make the use of deep learning in our research work to predict poultry diseases.

1.6 Research Outlook

The paper work structure has given below:

- ✓ The Literature Review described at chapter 2
- ✓ The Methodology is described at chapter 3.
- ✓ The findings which have presented at chapter 4.
- ✓ The conclusions and future works have presented at chapter 5.

CHAPTER 2

Literature Review

There have been several studies about poultry industry disease detection with machine learning and data mining approaches.

Zhuang et. al. has presented in their study that, there are seven features are analyzed in order to identify and judge poultry diseases with machine training methods. In this search, after comparison to different techniques. The approach has good widespread skills and is suited for learning from small samples and for diagnosing diseases. In this study, the sample SVM obtains a result rate of 98.46 percent, which is higher than that of the other techniques, utilizing the POLY kernel's function. [1].

Quach et. al. has described in their study that, the A mixed structure on the term SURF with another term called K-means contributes to growth in multi-layer CNN neural networks. Limited data source It contributes to avoid undesired dangers, such as gradients override and disappear. Research will further improve on how the model works, classifies more labels and uses in the poultry sector [2].

Zhang et. al. has expected, improves broiler breeding survival rate, conducts automatic broiler behavior monitoring and analysis. Background recognition and accuracy rate of recognitions. [3].

Neethirajan et. al. has described in their study that, the emergence of rural farming 4.0 encourages the increase in modern animal farming of sensing technologies, large-scale data, and ML. In the real world of pandemics, restrictions make it difficult for farm visitors to veterinarians, nutritionists, and producers, Barns, and feedstocks; a day night insight in the task structure, consumption, and production of cattle is required in real-time. These insights, enabled by sensing technology, generate remotely accessible data to lower costs and improve performance to meet the consumer's requirements. [4].

Walsh et al. has expected, we proved the efficiency of machine learning for generating predictive models for enhancing AIV active monitoring systems. Furthermore, once the models have been trained, predictions for large as well as new sets of data can be done rapidly. For example, the probability of insulating AIVs mode on various farming sampling graphical view of MA & PCR null the rate easily predicted in our model [5].

Borgonovo et. al. has presented in their study that, this study shows, in intensive poultry farms, the techniques that introduced here can do an early recognize the infection of coccidia. It could also be advantageous to apply it to livestock farming. This method is perfectly suitable for methods and precision animal husbandry goals and could provide a day night monitoring System for improving animal health through an alert when the infection occurs the animal doctor behave promptly [6].

Garcia et. al. expected that, in this review, we found that pasturing primarily has focused on sheep 40% and animal, using machine learning approaches in recent years 60% Classification is the most techniques. In terms of poultry health, a common task on improving poultry production has been focused on Their health is monitored. [7].

Hepworth et. al. has presented in their study that, SVM is at the earliest stage of development to analyze observational information in epidemiology. Hierarchical information. Algorithms for machine education are suitable for expert management systems development. It's awesome Building on the data, these algorithms may be adapted to operational interventions or adjustments by poultry producers. Regarding from this information to generate a new classification with the fresh information for poultry health [8].

Ren et. al. expected that, in this review article, we are looking at studies to enable the development of smart agricultural production automation systems, particularly chicken reproduction. As the study mentioned that mechanisms production of chicken meat and eggs image of both criteria of housing and automation. As the objective for the study is get a summary of recent work.[9]

Raj et. al. has expected that, it is possible to monitor and indentions malfunctioning poultry birds that have been affected. Combining image analysis for ill and normal chickens' movement pattern and temperature pattern to improve prediction and classification. For movement and behavioral analysis, we can additionally expand the scanning.[10]

Menke et. al. has described that, Machine learning provides a tool framework that enable personalized clinical prediction. for therapy and identification of persons at or within danger. A prodromal state [11].

Fang et. al. expected that, this study reveals that the conduct of chickens can be further analyzed utilizing profound learning to track certain locations in the chicken body. The six are analyzed and examined in advance Chickens behavioral positions, we have filled with skeletal blanks Feature points for computing hens' behaviors.[12].

Pandey et. al. has presented that, the literature study showed that research on the fruit grading system has been conducted extensively with image processing and machine training applications. Knowledge can be implicitly integrated in training for example in the form of neural networks, or in rules like a fused system based on rules. The problem can be 2-class or multi-class, for example the vector supporters. The precision in classification ranges from 75% to 96% [13].

Kulshrestha et. al. has expected that, we feel that AMR can be a key step in the fight against the algorithm. That could be serve as a prevention technique for AMR.As previously indicated for an ideal model detect any drug's resistance or sensitivity Feedback circuit can be used to enhance new information Maintain patterns and update the system. Like the Models AMR continues to change a feedback loop to maintain the model efficient [14].

Flores Maldonado et. al. has described that, Technology solutions to generate large, reliable and high data volumes. Production of animals and science require a technology to examine massive volumes of data. provided in the literature review. Machine learning technology pledge to interpret today's large amounts of data and is an essential tool for the future [15].

Yang et. al. has expected that, we trained and assessed K Nearest Neighbor and Support Vector Machine model performance with gained data for more efferent classification. Sensitivity, accuracy of both models 93%, and precision when used to classify the behavior of broilers datasets of pure conduct. These good achievements have been attributed here [16].

Deng et. al. has presented that; the feed raw natural foods that has over several decades been recognized as a successful disease control strategic for chicken. the raw fresh food feeding that has been acknowledged for several decades as a beneficial disease management strategy for chickens. [17].

Okinda et. al. has expected that, this work offers early identification and prediction of the development of a chicken. This system should be validated for various types. Perhaps chicken races and forms of illness. Because of the constraints, technique that introduced and have satisfactory outcome. It purposes for the work that was reached despite these restrictions by the technique suggested with satisfactory outcomes. It's quite good necessity of quick detection of an infection in a flock enabling inventors and veterinarians to take appropriate action to avoid big losses and to maintain acceptable animal welfare [18].

Feye et. al. has presented that, Technology will try to progress and the poultry processing industries will open their borders for improving their capacity to protect the public from foodborne diseases. It will therefore be impossible to evolve without realizing the opportunity and becoming more integrative. More advanced integration has to be handled in many ways. Classification and assimilation of the advance tech as follows NGS with microbiome studies certainly reflect a huge summary for this amazing part of study, so that true value of adopting these new technologies is the potential to gather with the previous work that have been done before like plate counts for bitmapping [19].

Chadha et. al. described that, the pathogenicity of viruses remained for a long time an outstanding subject for bioinformatics. Coevolutionary architectures are on the cutting-edge Precision results for many biological issues, however limited efforts are being made to determine H5 AI pathogenicity viruses. We made a big step forward in this paper automated categorization pathogens management of H5 AI Sequences of protein [20].

Clooney et. al. expected that, Bowel illness inflammatory the impact on microbiota composition of known factors, Including longitudinal monitoring during various phase activities of the disease. Our results suggest that fecal microbial abnormalities, notably in CDs, are more pronounced inactive diseases. This corresponds to previous reports from smaller groups [21].

Cihan, P et. al. has said that ML is stage of AI study that seeks to do a machine to execute a work freely & optimally. This is info that extraction and data-driven teach a machine that can learn is capable of make future projections with the help of a machine. Methods of learning as a result, technology contributes greatly to scientific studies by being commonly utilized, primarily in the health division [22].

Okinda, C. et, al, studied that the currently used in bio fileds, as well as the obstacles got into and solve of this issues computer vison and deep approaches was both covered. The five methods for conventional machine learning, including. Due to its diverse background, changes in light, and occlusion issues in an original poultry scenario, a big challenge of poultry observibg resides in foreground recognition [23].

Ben Ayed et. al has described that Agriculture and food industries are two of humanity's most vital businesses. In agricultural first products are utilized as inputs in many multifactor spread comprising four phases of the supply spot.For difficulties in plant based food in the future, as well as various environmental factors, growing populations, and technological progress, It is essential for internet media at various, AI, ML.in order to enhance agricultural monitoring its mediatory here [24].

Rajagopal et. al. presented with ongoing technological innovation. ML will usher in a reunion in rural development. As these items occupy a commonly executed of the agricultural community, the pricing of Internet of things is acceptable for poultry farms. The corporate sector's expansion into the agriculture market is a decent factor for IoT firms but there will still be tremendous demand in the future. Nature's vagaries as a result of climate change effects, combined with a manpower scarcity for agricultural will suppoet by Internet of things [25].

Sallabi, F. et. al. said in this study, a poultry farm is created to gather, store, update, and process data. The system is split into four subsystems, pull that intermediate system. The app system, resource and outlook system. The UAE university completed tests. Farm for research the system offers a safe and straightforward way toa precise methodology of capturing data linked regular operations for farms. Data get is sent in original to inside look, which stores in the system The manager or control authority specialist has access to archived data.in order to make proper judgments at the time of necessity for this outbreak [26].

Lu et.al. has described in the paper provides diagnosis of illness development in poultry chickens. Different of here is retrieved feature variable quantity were explored with time following virus linkup and linkages to the state of health were created. The outcomes achieved imply that the suggested MVS can detect of illness in chickens at an early stage However, this system must be evaluated on many sorts of data. a range of poultry chicks and illness sorts with the limits, the suggested method yielded outcomes the goals of the work [27].

Abd Aziz said in this review paper provides a full evaluation. We have provided the most recent computer development. vision techniques use a number with most critical with pieces used in the systems. Various stuffs have been disputed with depicted all of the elements. at a chicken farm using computer vision the purpose of this research seeks to aid readers in understanding the more sophisticated development along with to notify to the limits in chicken farm for determine potential approaches as well [28].

Chen et. al. presented in this system applies IOT and Big data tech. for the broiler breeding life expectancies, enhances the intensive managerial result of industry of poultry and advance its production as well. The improved neural infrastructure architecture of the automatic detection system for unhealthy hens has achieved single and more background terms as well, with an overall identification percentage of up to 95 percent [29].

Hwang et. al. said the poultry farm has been random forest ML algorithm. The algorithm proposed accurate in forecasting the presence of meteorological situations. The models' outcome showed that climates increase the frequency that Salmonella is bad for poultry farms. For the gave farmers, food production is helpful data and proof to enable them to make educated decisions [30].

Sanchez-Vizcaino et. al. has described that chicken imports reported in peer-reviewed literature, reveals that this pathway provides essentially minimal. If current environment hold, increasing the rate to reduce the rate of spread with entrance with commerce, could be a greater effect on reducing the outbreaks in reducing the volume for chickens produced for other the nation [31].

CHAPTER 3
METHODOLOGY

This part has had many subgroups, for example, the respective research model, description of Algorithms, representation of data set, data pre-possessing, extraction of function, classifier of ML, validation of values, evaluation of metrics of ML, confusion metrics of ML and the most accurate model

The following part is described by a few parts as well. Those are given below,

3.1 The Respective Research Model

This section illustrates the procedures for implementation. The research was performed using Python and Scikit-learn library. In figure 1, create a procedure diagram Model suggested.

In figure 1, we have created a procedure diagram Model suggested.

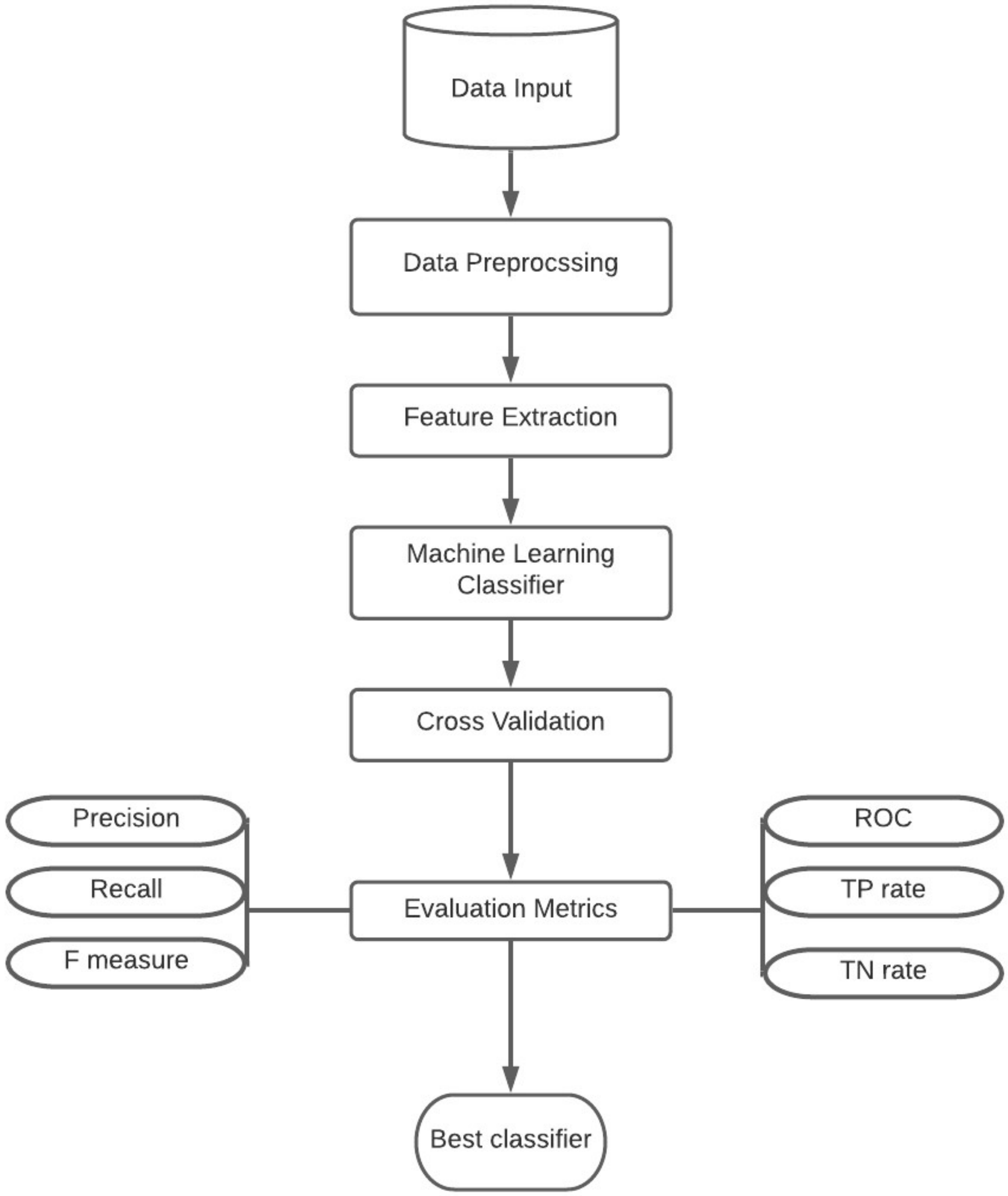

Figure 1. Representation of Procedure of Poultry Disease Detection

3.2 Description of Algorithms

3.2.1 Naive Bayes:

The Bayes consists machine learning approaches are a list of classification algorithms created on in Bayes rule. This isn't a simple singular model algorithm. The classifier has been a good example for prediction with provided datasets.

$$(|) = \frac{(|)()}{()}$$

where A and B , P(A) is the possibility of A and P(B) is the prospect of B. Now, for the dataset, applying Bayes theory here,

$$(|) = \frac{(|)()}{()}$$

where, y = class X = vector and n. Here,

$$= (_{1}, _{2}, _{3}, ... ,)$$

3.2.2 Logistic regression:

Regression of logistics used as a mathematical structure that can be use in original to the functions to describe a basically binary value and it is more complex, like as yes or no indicating Zero or One values. The basic formula equation of linear regression,

$$= _{0} + _{11} + _{22} + ... +$$

Here, y = variable and $_{1}, _{2}$, ... , = the predictor variables, $_{0}$ = Intercept,

$_{1}, _{2},$ .... , = constant.

with sigmoid function to the equation, here we got the logistic function,

$$()= \frac{1}{1+^{0+11+22+.....+}}$$

3.2.3 M L P Classifier:

A serval layer in this classifier is an artificial model for AI network feed that translates in the data for a couple of results.

The h output node error in the data point n can be observed, which is described by the following equation, where d and c indicate the real and predicted values, both.

$$() = () - ()$$

3.2.4 SGD Classifier:

A very efficient approach is Stochastic Gradient Descent (SGD) for fitting linear classifier and backwards convex loss functions.

Here is the knowledge rate, w is weight that lies in the x,y, is the i-th reflection.

$$\leftarrow \; - \Sigma_{=1} \; ()$$

3.2.5 AdaBoost Classifier:

Basically, AdaBoost was designed to enhance binary classification efficiencies as an ensemble learning process.

AdaBoost algorithm for classification.

$$() = (\Sigma_{=2} \; ())$$

Here, the h is a weak classifier which is represented by classifier.

3.2.6 Bagging Classifier:

The bagging classifier is a metaphor criteria that got into the random sub-components of the original data set of each base classifier and then aggressively combines its insightful projections.

Possibilities sample that x' can be got after training the detection on x' from the particular trees:

So, detecting function $\hat{} = {}^{1}\Sigma_{=1} \quad (')$

Where B is the number and it's a free constraint.

3.2.7 Decision Tree Classifier:

In Decision Classification of tree, structures are used. Root nodes mean the class label's words and kid nodes.

The Entropy E(S) described as follows,

$$() = \sum_{=1} \quad {}_{2}$$

Where the possibility of the jth class.

3.2.8 Random Forrest Classifier:

The data algorithm on a group tree is the same. The Random Forestry Classifier is a random selection of decision-making bodies subset. This classifier is possibly can generate the best accurate outcome for ant prediction model.
Using the mean squared error which is MSE while using the Random Forest Algorithm to fix regression problems.

$$M = {}^{1}\Sigma_{=1} \quad (-)$$

Here N = number of data points, fi = value that the model returns and yi = the actual value of the data.

For Gini index,

$$= 1 - \Sigma \quad ()^{2}$$

Here, pi means the relative frequency of the class

We can also use entropy to determine how nodes branch in a decision tree. Here E is entropy, is the class of ith.

$$() = \Sigma_{=1} \quad {}_{2}$$

3.2.9 K Nearest Neighbor (KNN):

The KNN technique represents a type of controlled machine learning approach to classification and regression predictions. KNN classifier is a very effective algorithm to evaluate any prediction. Here is the theorem,

$$P(B|A) = \frac{P(A|B) * P(B)}{P(A)}$$

$$P(A|B) = \frac{P(B|A) * P(A)}{P(B)}$$

3.2.10 XGB Classifier:

The XGBoost Classifier model is an excellent data set because all input variables are numeric and the task is a binary classification problem. It is practice implementation of Gradient Boosting.
The classifier has a connection with artificial neural network and decision tree-based algorithms while making prediction model.

3.2.11 Gradient Boosting Classifier: Gradient enhancement is a greedy technique that can swiftly override a training data. Gradient Boosting algorithm can be used as not only continuous prediction model but also used for a categorical prediction model. Here an example of chickens,

Eat	Egg	Sleep	Age (Days)
False	True	False	55
True	False	True	40
False	False	True	32
False	Ture	False	44

Gradient Boosting Classifier Table

3.3 Representation of Dataset

3.3.1. Import the Dataset

For the following study we have gathered 500 poultry datasets found at The UCI machine learning repository is used into the illness datasets. After taking the data we manipulated the data for our research purpose with preprocessing. There are 30 characteristics in this data collection, 29 are predictive dataset and that is as follows,

Age: It is presenting the age in years of a chicken.

Temperature: The temperature of a particular chicken in the shed, that has been collected from 500 chickens of a farm.

Humidity: The Humidity of a chicken's body has taken here.

Light Intercity: Random light gained in chicken of the shed.

Ammonia: It indicates count of Ammonia in a chicken's body.

Noise: How dB noise is getting from a single chicken.

Bp: It indicates blood speed rate of a chicken.

Sg: It indicates specific gravity of chicken.

Al: It indicates albumin.

Su: It indicates glucose level of chicken body.

Rbc: It indicates the RBC cell of chicken body.

Pc: It indicates pus cells of chicken body.

Pcc: It indicates pus cell clumps of chicken body.

Ba: It indicates bacteria of chicken body

Bgr: It indicates blood glucose of chicken body.

Bu: It indicates urea of chicken body.

Sc: It indicates serum of chicken body creatinine.

Sod: It indicates Na of chicken body.

Pot: It indicates K of chicken body

Hemo: It indicates hemoglobin of chicken body

Pcv: It indicates cell volume of chicken body

Wc: It indicates WBC count of chicken body.

Rc: It indicates RBC count of chicken body.

Htn: It indicates hyper tension of chicken body.

Dm: It indicates diabetes of chicken body.

Cad: It indicates artery functions of chicken body.

Appet: It indicates appitet of chicken body. its value is nominal.

Pe: It indicates edema of chicken body.

Ane: It indicates whole rate of anemia of chicken body.

Class: Having poultry disease as follows.

These are the dataset attributes that we have used in our train run in with the machine learning models. After the analysis with different machine learning approaches, we will able to find the best accurate algorithm.

3.3.2 Data Prepossessing

A Datasets of 30 characteristics, 29 detected and 1 is answer variable are utilized in this dataset. Some characteristics are nominal in predictive 29 attributes, some of them numbers. After taking the data we manipulated the data for our research purpose with preprocessing. The data manipulation has done here to provide the best performance with the algorithms. The Convert notional qualities to numerical attributes using a mapping capability. The nominal value in this dataset comprises all the body components of a chicken of poultry farm. We have a mapping function to transform this value to a numerical value. We now have a full set of numerical values. Furthermore,
Here in the research, we have,

- ✓ Train Dataset 80%
- ✓ Test Dataset 20%

3.3.3 Extraction of Function

The main component analysis was presented in this part as extraction of the feature from Figure 2. We color two types of red and green as a matter of principle. The red color is CPD and the green color is NOT CPD.

In figure 2, Here we have generated a principal component analysis for the dataset we have used in pf respective models.

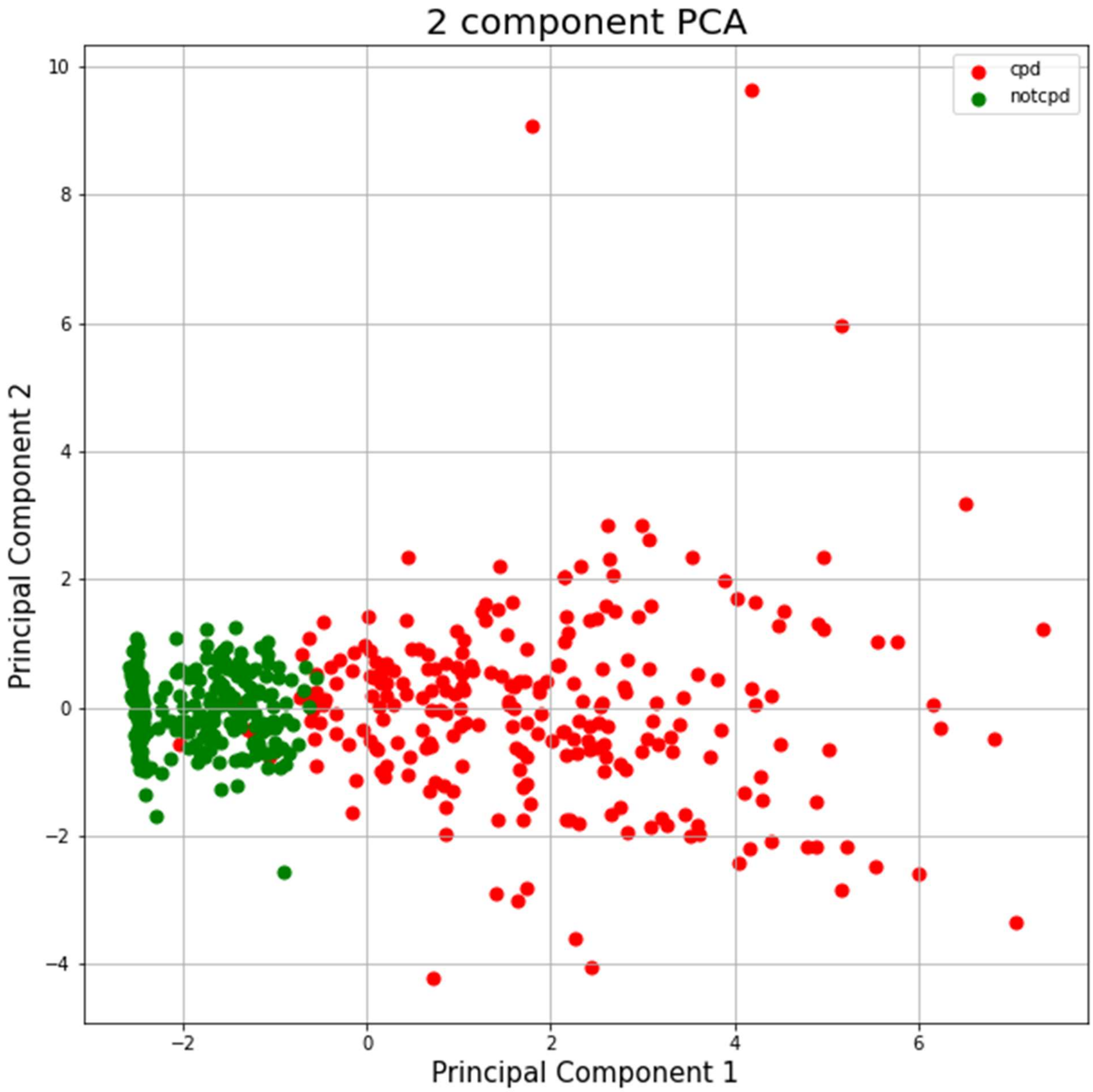

Figure 2: Principal Component Analysis

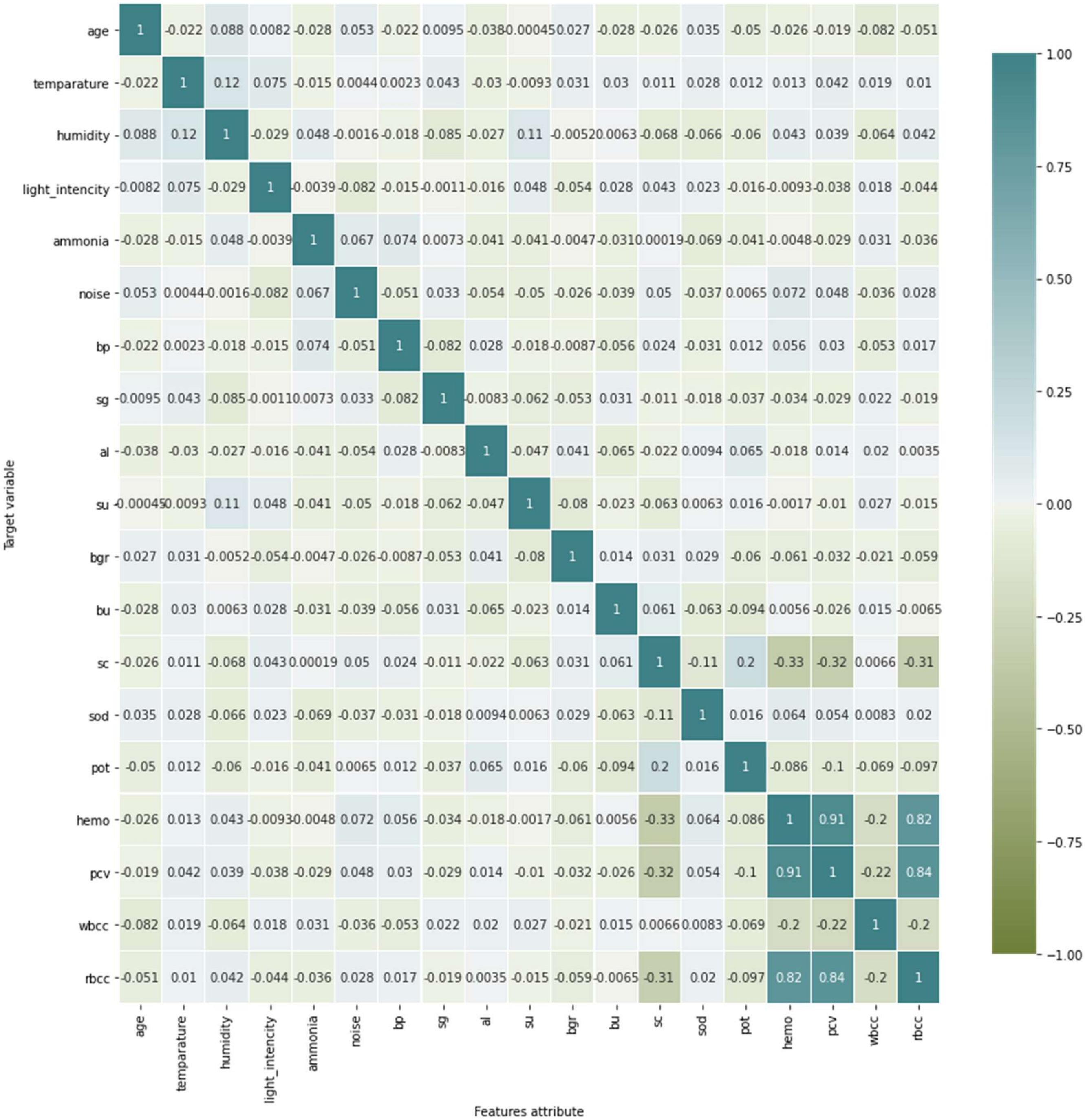

Figure 3: Correlation Metrics with the goal of the Feature Attribute

3.3.4 Classifier of ML

We create eleven algorithms in this prediction study to compute the result of the CPD or NOTCPDs. The following algorithm is applied here, Naive Bays, Random Forest Classifier Logical regression, the closest neighbor of Multilayer Perceptron, Decision tree Classifier Classification of XGB, Gradient Boosting Stochastic Gradient Descending, Adaptive Boosting (Adaboost), Classification Classifier & K Nearest Neighbor Classifier (KNN) as well.

3.3.5 Validation of Values

The values of validation are a method employed by the training and assessment of various techniques of machine learning in the data sub-sets. Additional data subset. Subset. The model has the best rate of its frequently compared and selected during applied machine training since it is easy to comprehend, simple to apply and results in forecasts of capabilities that generally have a smaller partiality than other techniques.

Machine learning model testing approach that involves training various machine learning algorithms on accessible input data subsets and assessing them on a complementary data subset. Use cross validation, such as filling to generalize a sequence, to detect overfitting. In applied machine learning, comparing and selecting a model or a given predictive modeling issue is widespread because it is simple to grasp, easy to apply, and produces ability estimates with fewer bias than other techniques. We utilize k-fold cross validation because our data set is tiny.

k fold cross authentication divides the information into k sub collections. The holdout solution is now repeated k times, with the test set validation serving as one of the k subsets each time, and the remaining k-1 subsets forming a training set. The error estimate is aggregated over all k experiments to determine our model's maximum effectiveness. Each data point is verified exactly once and trained in a k-1 times sequence, as indicated. Because we employ the majority of the fitting data in validation sets, we minimize bias and variance significantly. Another disadvantage of this method is the mixing of training and assessment sets. K is either 15 or 20. Here k = 20 can be our evaluation matrices

3.3.6 Evaluation Metrics of ML

In to calculate the results of the study we have to go for the results like precision where TP presents true positive, FP presents false positive, TN presents true negative and FN presents false negative.

Precision: Predictive Precision or

The positive of predictive values as follows,

TP / TP + FP,

Recall: The Recall values,

TP / TP + FN

F Measure: The F-1 score values as follows,

2 * TP / 2 * TP + FP + FN

Accuracy: The accuracy values as follows,

TP + TN / TP + TN + FP + FN

3.3.7 Confusion Matrices of ML

The Here regarding with the values,

A. TP indicates true positive Meaning we anticipated that the label is cpd and is precisely the same when a properly predicted label is.

B. FP means wrong thus we anticipated that when a label was wrong, it was cpd, but notcpd.

C. FN indicates false negatives thus If there is not a predicted label, it's not cpd but cpd, we predicted.

D. TN signifies true negative thus if another label predicts properly, we expected it to be notcpd and not cpd to be included in the data set.

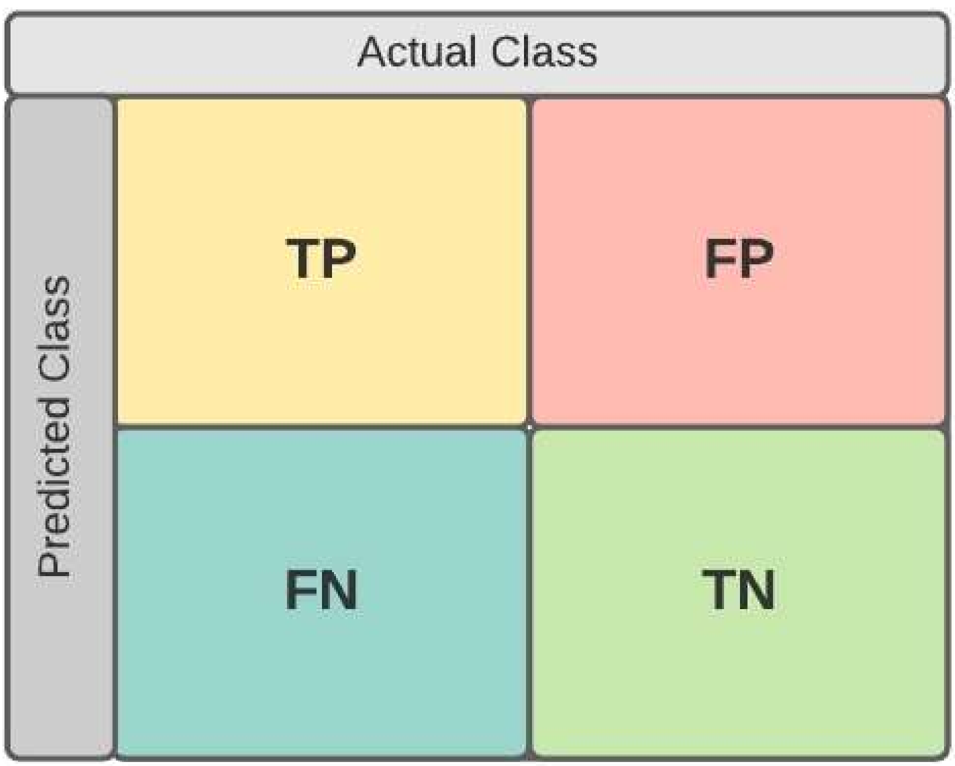

Figure 4: Expected Confusion Metrics for the following Structure

3.3.8 Most Accurate Model

Here after the result all the algorithm gives a positive result. But in these algorithm Random Forrest Classifier generates the best accurate result. Here we have used multiple machine learning algorithms to predict the poultry disease as early as possible. We have used eleven total machine learning approaches to reproduce the most accurate algorithm that has been used in a model to make the percussion of the poultry disease.

After the training of the particular models almost all the model performs quite good from all the aspects. such as Naive Bayes, Logistic Regressions, Multilayer Perceptron, Adaptive Boosting, Bagging, Decision Tree, Classification Random Forests, KNN Classifier, XGB classifier & Classification Gradient boost. The evaluation of the entire approach showed successful performance. Perhaps it is described by Random Forrest Classifier with the most accurate rate of 97% as follows.

But among them all of them Random Forrest Classifier did the best accurate performance through its respected model.

CHAPTER 4
RESULT ANALYSIS

4.1 Confusion Metrics for Respective Analysis

4.1.1 Confusion Metrices on the Predicted Classifier

Table I showed that the analysis performed calculates various machine-learning technique approaches to get the confusion matrices on predicted machine learning classifier.

The Table II shows the study of confusion metrics so that it is essential to analyze them. The negative is more necessary to achieve positive perfection. The negative is expected. This study presents the best findings from all other classification. Table I showed that the analysis performed calculates several machine learning techniques followed by Naive Bayes, Logistic Regressions, Multilayer Perceptron, Adaptive Boosting, Bagging, Decision Tree, Classification Random Forests, KNN Classifier, XGB classifier & Classification Gradient boost. The evaluation of the entire approach showed successful performance. Perhaps it is described by Random Forrest Classifier with the most accurate 97% respectfully.

The best possible machine learning approach among all the model for training is Random Forest Classifier with the most accuracy. The Precision Recall F1-score and ROC value as well.

Confusion Metrices on the Predicted Classifier

Models	Labels	Predictive Positive	Predictive Negative
Random Forest Classifier	CPD NOTCPD	82 4	1 63
Decision Tree Classifier	CPD NOTCPD	81 4	2 63
Bagging Classifier	CPD NOTCPD	83 6	0 61
AdaBoost Classifier	CPD NOTCPD	82 5	1 62
SDG Classifier	CPD NOTCPD	0 0	83 67
Logistic Regression	CPD NOTCPD	80 4	3 63
Naive Bayas	CPD NOTCPD	83 10	0 57
MLP Classifier	CPD NOTCPD	64 3	19 64
KNN Classifier	CPD NOTCPD	69 25	14 42
XGB Classifier	CPD NOTCPD	82 5	1 62
Gradient Boost Classifier	CPD NOTCPD	82 5	1 62

Table I

4.2 Evaluation Metrics Respective Analysis

4.2.1 Evaluation Metrics Analysis for Cross Validation

The perform analysis shown in table II using Evaluation matrices analysis with ML Classifiers from different machine learning classifiers and the analysis performed calculates many machine learning procedure such as Naive Bayes, Logistic Regressions, Multilayer Perceptron, Adaptive Boosting, Bagging, Decision Tree, Classification Random Forests, KNN Classifier, XGB classifier & Classification Gradient boost.

The best possible machine learning approach among all the model for training is Random Forest Classifiers with highest most accurate rate of 97%. The Precision with Recall through F1-score and ROC value as well.

Evaluation Matrices Analysis with ML Classifiers

Model	**Accuracy**	**Label**	**Precision**	**Recall**	**F1-score**	**ROC**
Random Forest Classifier	97%	CPD NOTCPD	0.95 0.98	0.99 0.94	0.97 0.96	0.99
Decision Tree Classifier	96%	CPD NOTCPD	0.95 0.97	0.98 0.94	0.96 0.95	0.95
Bagging Classifier	96%	CPD NOTCPD	0.93 1.00	1.00 0.91	0.97 0.95	0.98
AdaBoost Classifier	96%	CPD NOTCPD	0.94 0.98	0.99 0.93	0.96 0.95	0.99
SDG Classifier	45%	CPD NOTCPD	0.00 0.45	0.00 1.00	0.00 0.62	0.50
Logistic Regression	95%	CPD NOTCPD	0.95 0.95	0.96 0.94	0.96 0.95	0.97
Naive Bayas Classifier	93%	CPD NOTCPD	0.89 1.00	1.00 0.85	0.94 0.92	0.93
MLP Classifier	85%	CPD NOTCPD	0.96 0.77	0.77 0.96	0.85 0.85	0.96
KNN Classifier	74%	CPD NOTCPD	0.73 0.75	0.83 0.63	0.78 0.68	0.81
XGB Classifier	96%	CPD NOTCPD	0.94 0.98	0.99 0.93	0.96 0.95	0.99
Gradient Boosting Classifier	96%	CPD NOTCPD	0.94 0.98	0.99 0.93	0.96 0.95	0.99

Table II

4.2.2 Evaluation Metrics Analysis for Test data

The dataset has given for the most accurate machine learning techniques in our research work. We have found out the best one with most accurate performance.

It is used to compute the true positive rate True Positive Rate it also called as sensitivity. The True Positive Rate consists chance to a true positive would be a test positive. The True Negative Rate is also called Specificity. The true negative value it can be classified by the main reason that the main to being test negative.

- ✓ The theorem for testing True Positive Rate is TP/TP+FN.
- ✓ The theorem for testing True Negative Rate is TN/TN+FP.

Evaluation Matrices Analysis with ML Classifiers with TP & TN

Model	Accuracy	Label	Precision	Recall	F1-score	AUC	TP rate	FP rate
Random Forest Classifier	97%	CPD NOTCPD	0.95 0.98	0.99 0.94	0.97 0.96	0.99	0.95	0.98
Decision Tree Classifier	96%	CPD NOTCPD	0.95 0.97	0.98 0.94	0.96 0.95	0.95	0.95	0.96
Bagging Classifier	96%	CPD NOTCPD	0.93 1.00	1.00 0.91	0.97 0.95	0.98	0.93	0.96
AdaBoost Classifier	96%	CPD NOTCPD	0.94 0.98	0.99 0.93	0.96 0.95	0.99	0.94	0.98
SDG Classifier	45%	CPD NOTCPD	0.00 0.45	0.00 1.00	0.00 0.62	0.50	0.00	0.44
Logistic Regression	95%	CPD NOTCPD	0.95 0.95	0.96 0.94	0.96 0.95	0.97	0.95	0.95
Naive Bayas Classifier	93%	CPD NOTCPD	0.89 1.00	1.00 0.85	0.94 0.92	0.93	0.89	1.00
MLP Classifier	85%	CPD NOTCPD	0.96 0.77	0.77 0.96	0.85 0.85	0.96	0.95	0.77
KNN Classifier	74%	CPD NOTCPD	0.73 0.75	0.83 0.63	0.78 0.68	0.81	0.73	0.75
XGB Classifier	96%	CPD NOTCPD	0.94 0.98	0.99 0.93	0.96 0.95	0.99	0.94	0.98
Gradient Boosting Classifier	96%	CPD NOTCPD	0.94 0.98	0.99 0.93	0.96 0.95	0.99	0.94	0.98

Table II

4.3 Analysis of ROC Curve

A ROC can be said Receiver Operating Characteristic Curve also which classified as a graphical depiction which displays the diagnostic capabilities of a binary classifier device as the threshold of discrimination varies. ROC curvature compares the TPR or true positive rate from different threshold settings to the FPR or false positive rate.

The ROC curve of test data for Random Forest Classifier has given below as well as the ROC curve of test data with threshold.

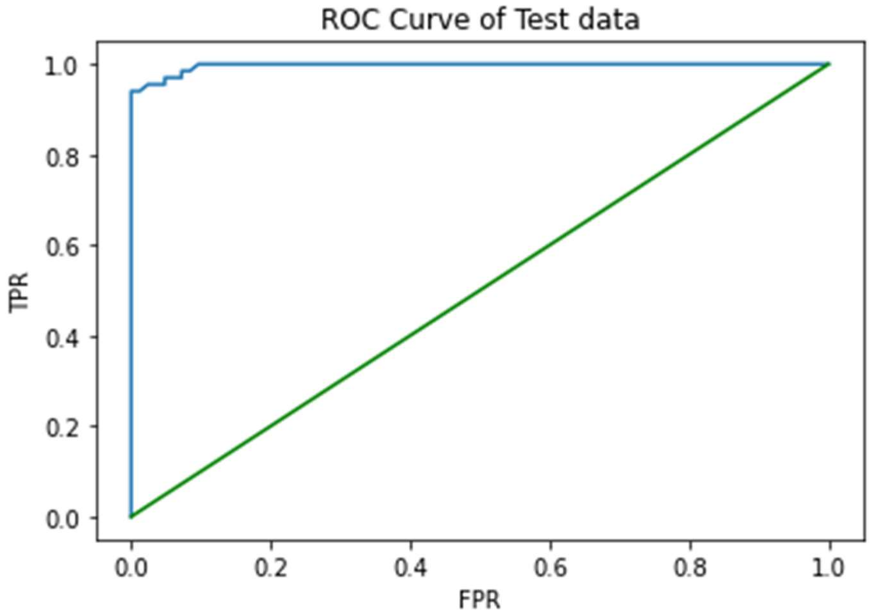

Figure 5: ROC curve for Random Forest Classifier

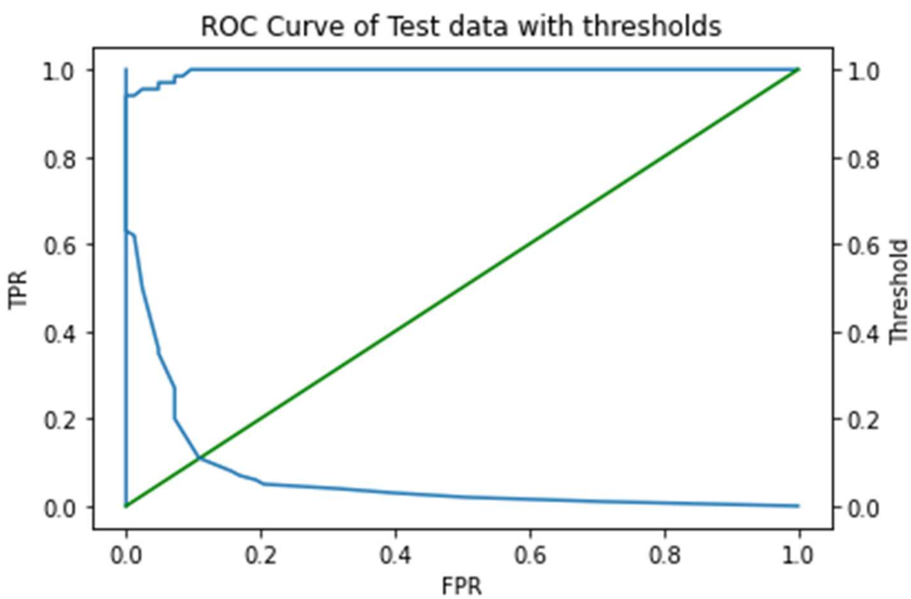

Figure 6: Thresholds for Random Forest Classifier

The ROC curve of test data for Decision Tree Classifier has given below as well as the ROC curve of test data with threshold.

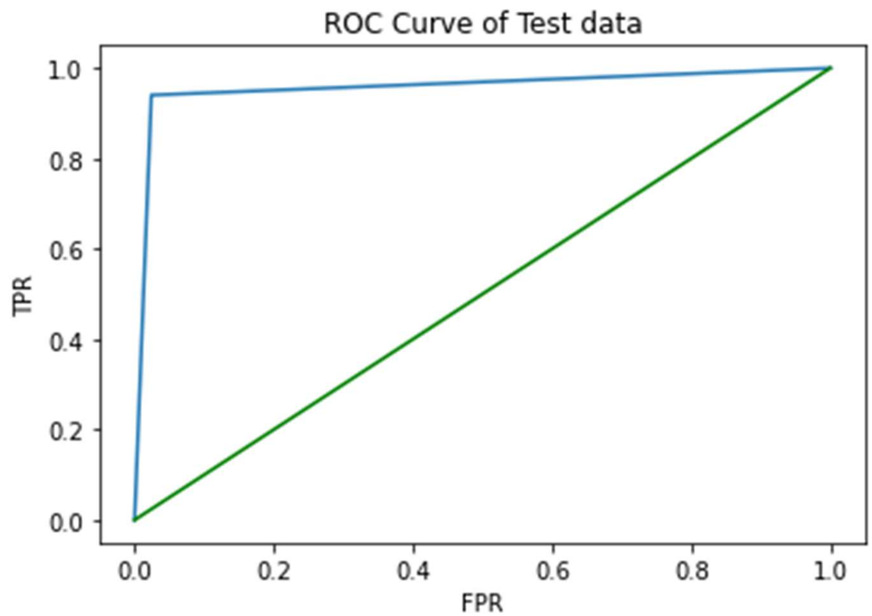

Figure 7: ROC curve for Decision Tree Classifier

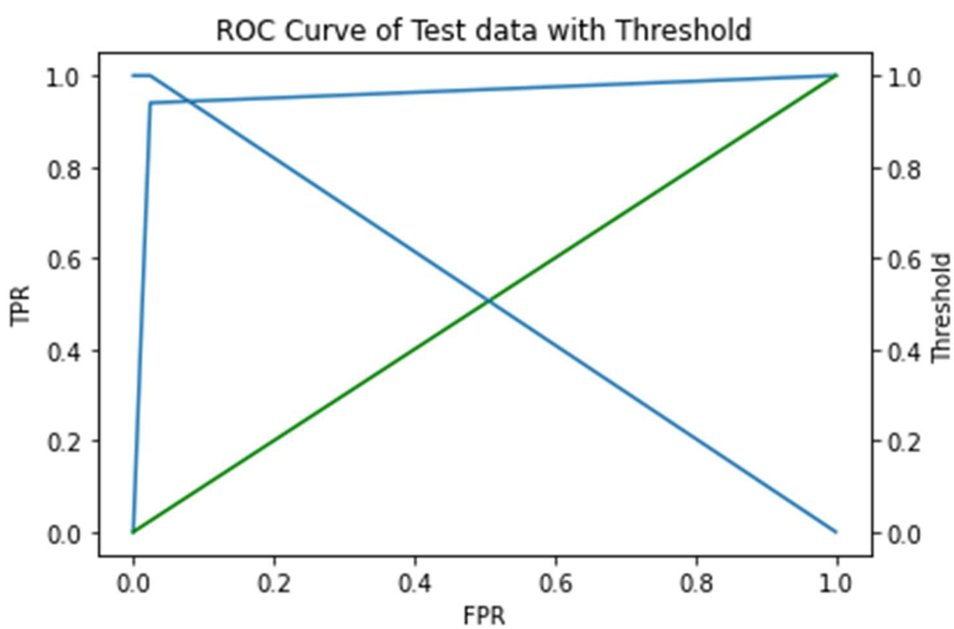

Figure 8: Threshold for Decision Tree Classifier

The ROC curve of test data for Bagging Classifier has given below as well as the ROC curve of test data with threshold.

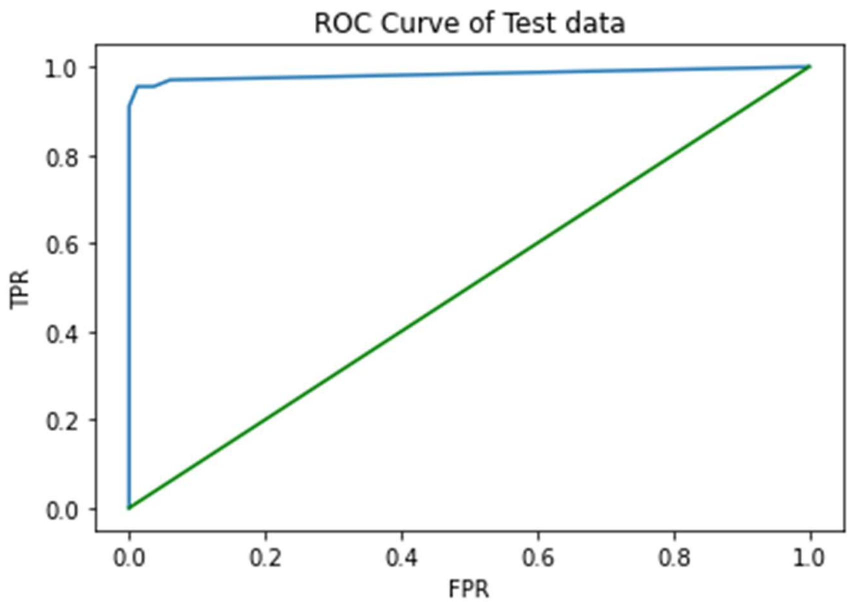

Figure 9: ROC curve for Bagging Classifier

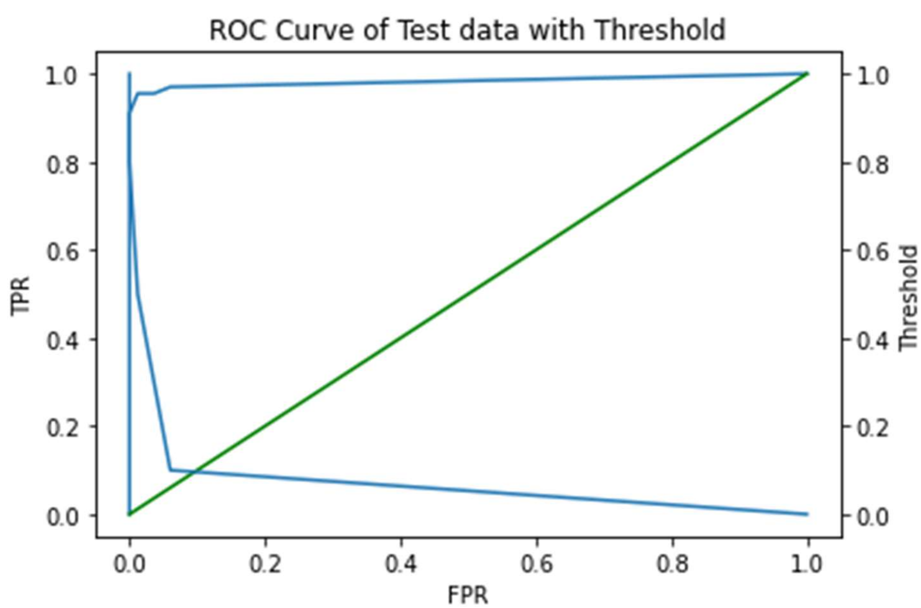

Figure 10: Thresholds for Bagging Classifier

The ROC curve of test data for AdaBoost Classifier has given below as well as the ROC curve of test data with threshold.

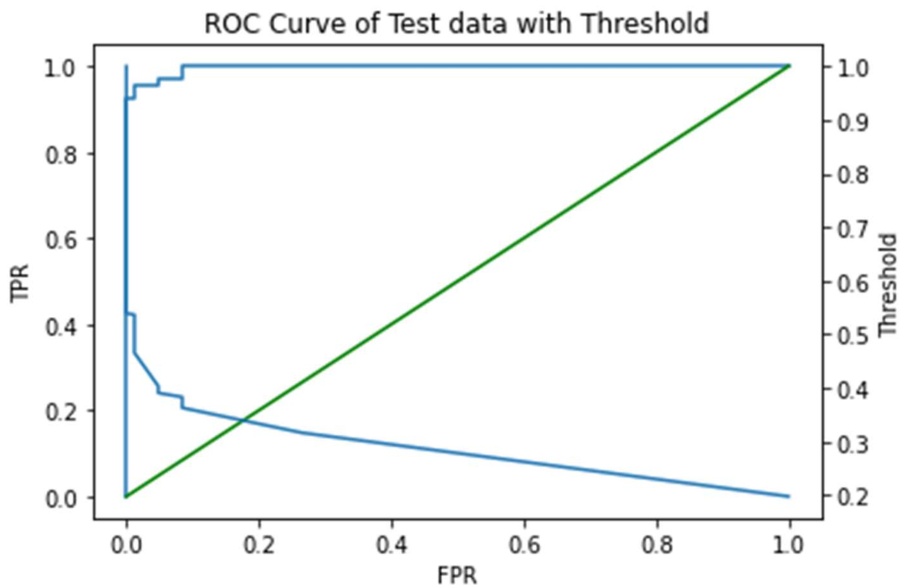

Figure 11: ROC curve for AdaBoost Classifier

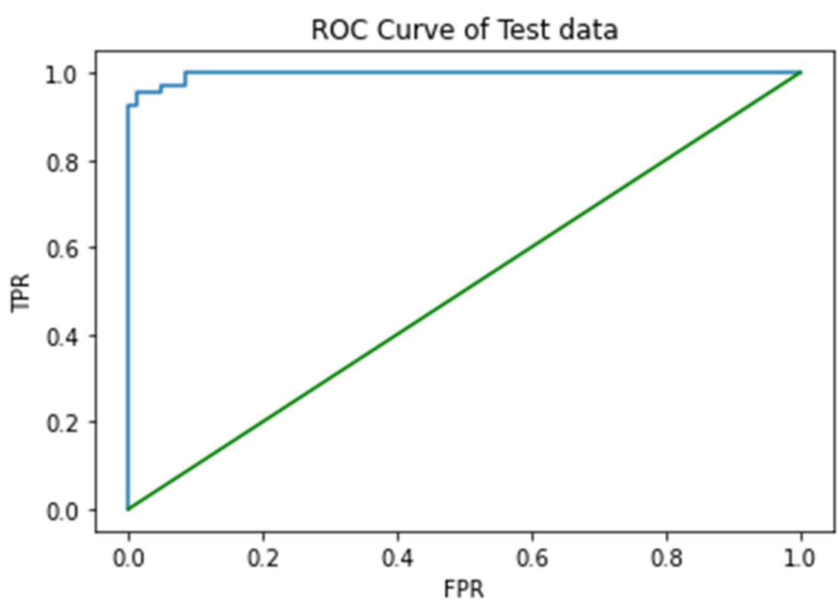

Figure 12: Thresholds for AdaBoost Classifier

The ROC curve of test data for SGD Classifier has given below as well as the ROC curve of test data with threshold.

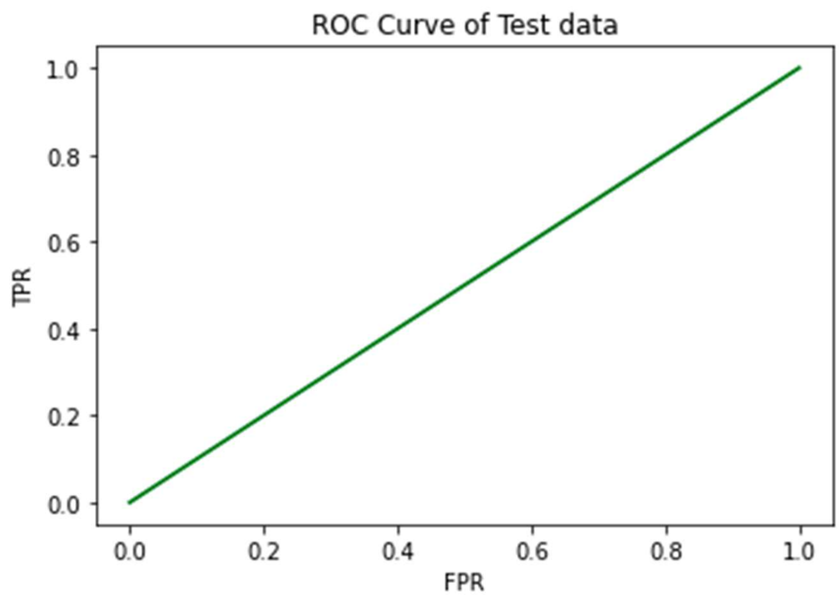

Figure 13: ROC curve for SGD Classifier

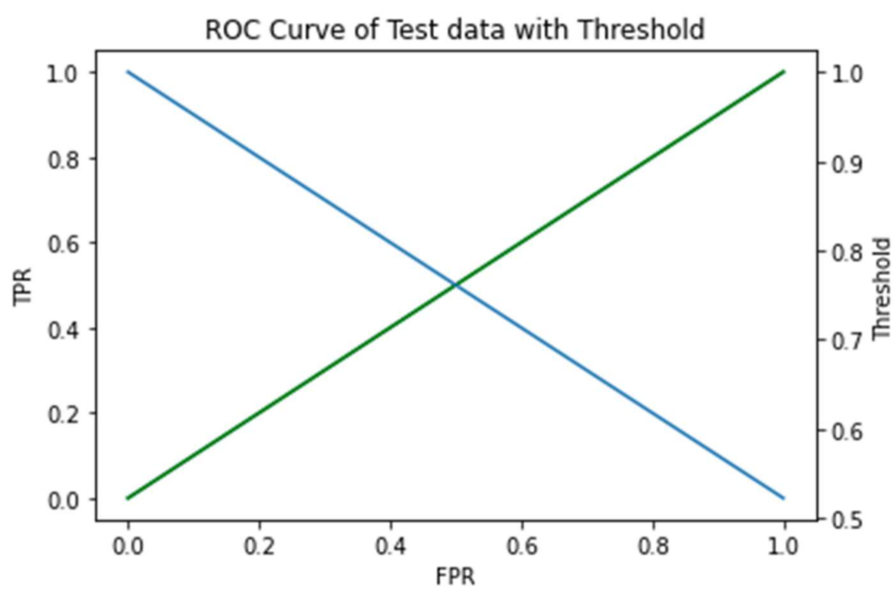

Figure 14: Thresholds for SGD Classifier

The ROC curve of test data for Logistic Regression Classifier has given below as well as the ROC curve of test data with threshold.

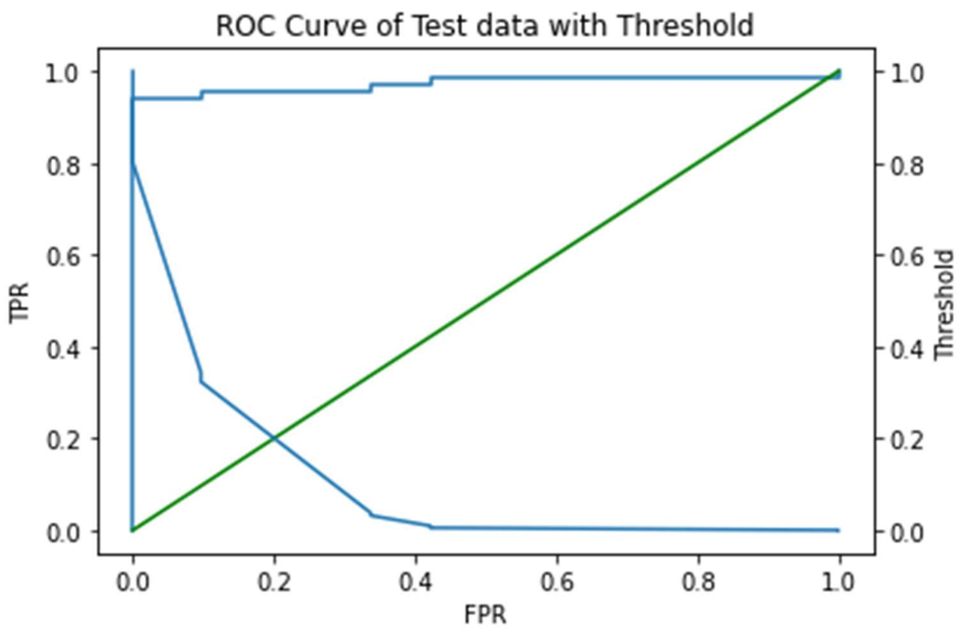

Figure 17: ROC curve for Logistic Regression Classifier

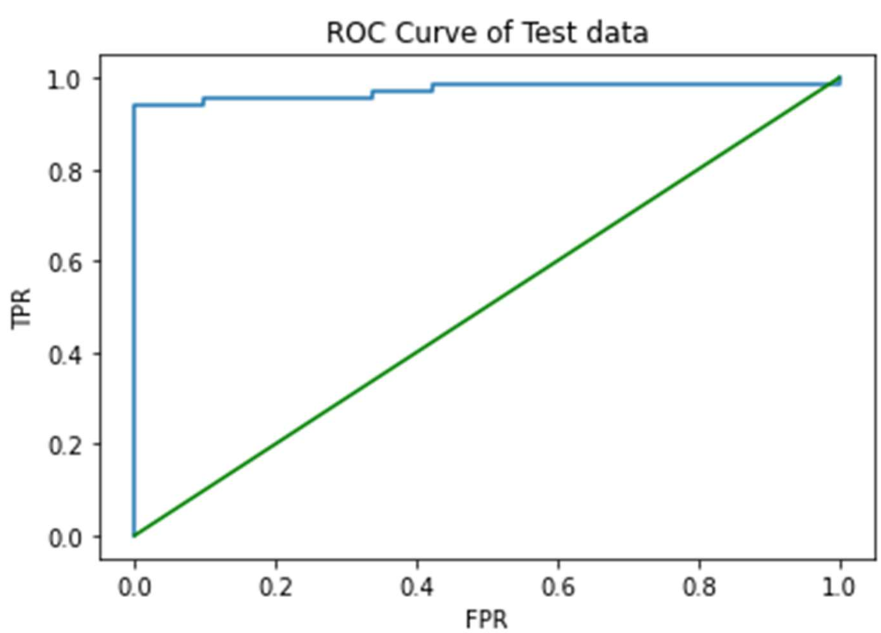

Figure 18: Threshold for Logistic Regression Classifier

The ROC curve of test data for Naive Bayes Classifier has given below as well as the ROC curve of test data with threshold.

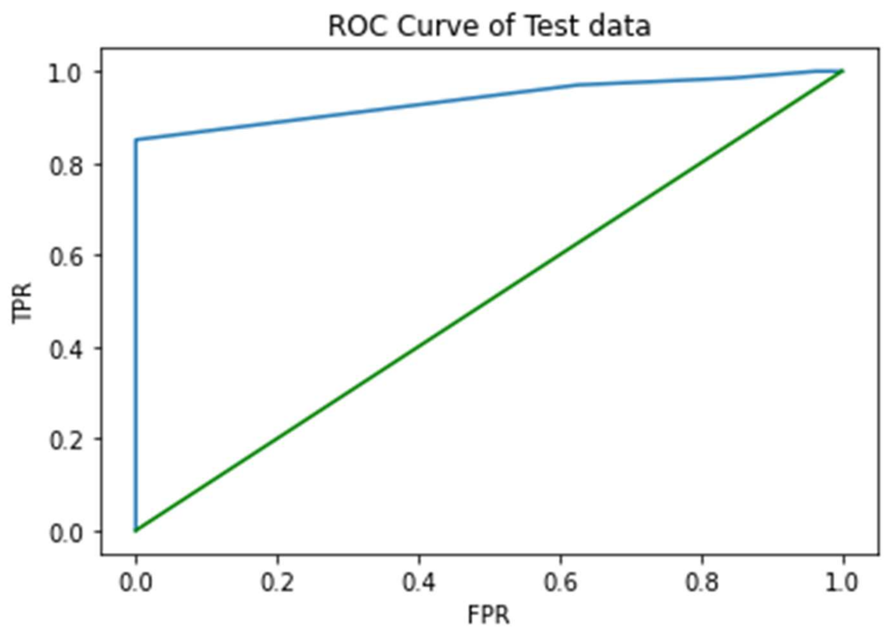

Figure 19: ROC curve for Naive Bayes Classifier

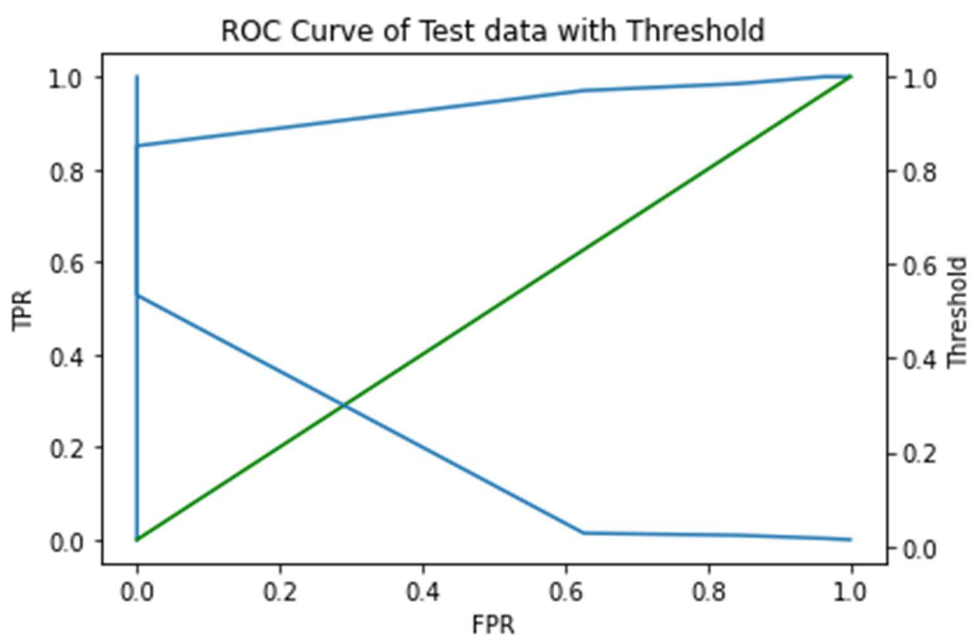

Figure 20: Thresholds for Naive Bayes Classifier

The ROC curve of test data for MLP Classifier has given below as well as the ROC curve of test data with threshold.

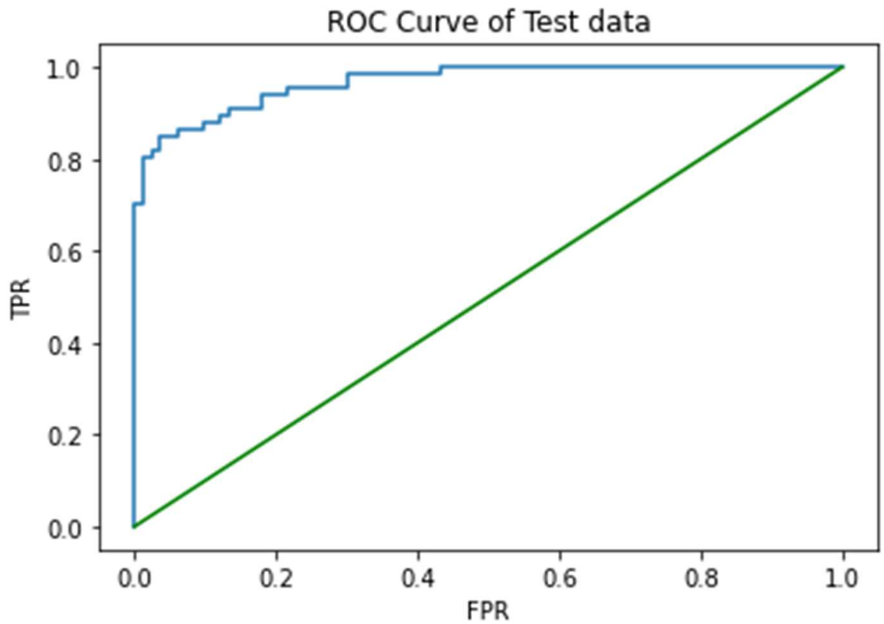

Figure 21: ROC curve for MLP Classifier

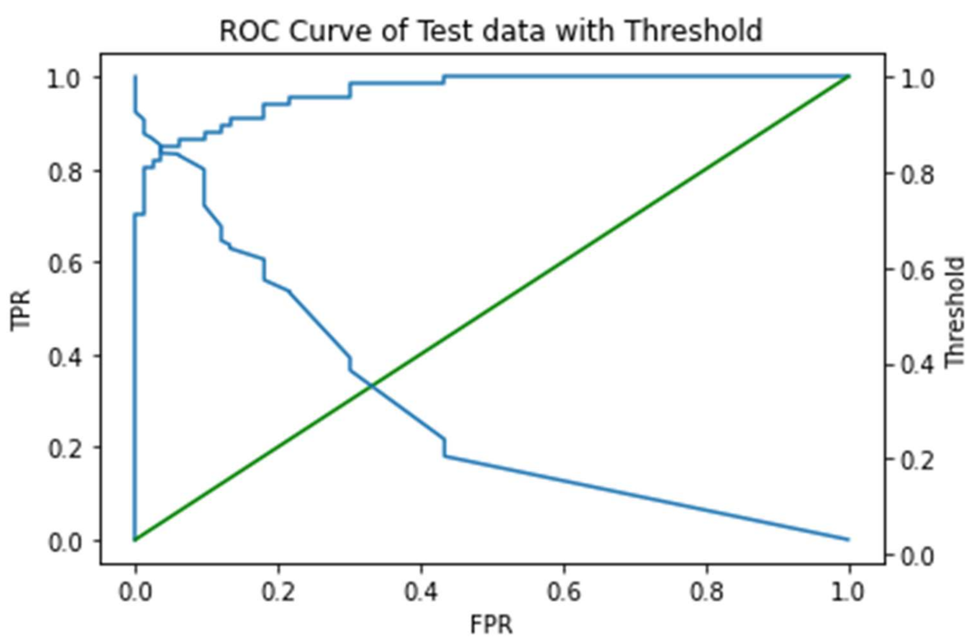

Figure 22: Thresholds for MLP Classifier

The ROC curve of test data for KNN Classifier has given below as well as the ROC curve of test data with threshold.

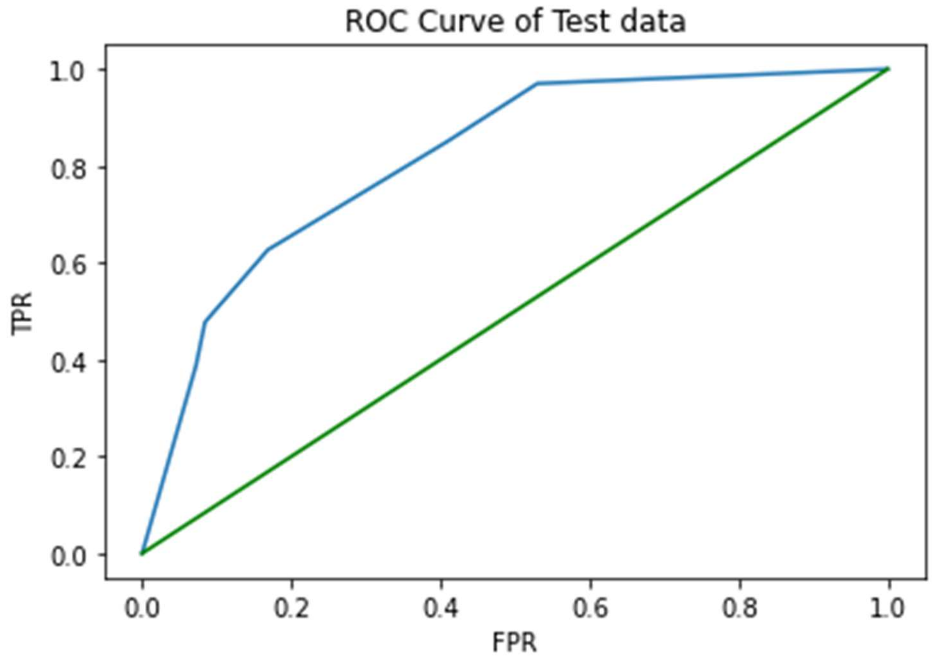

Figure 23: ROC curve for KNN Classifier

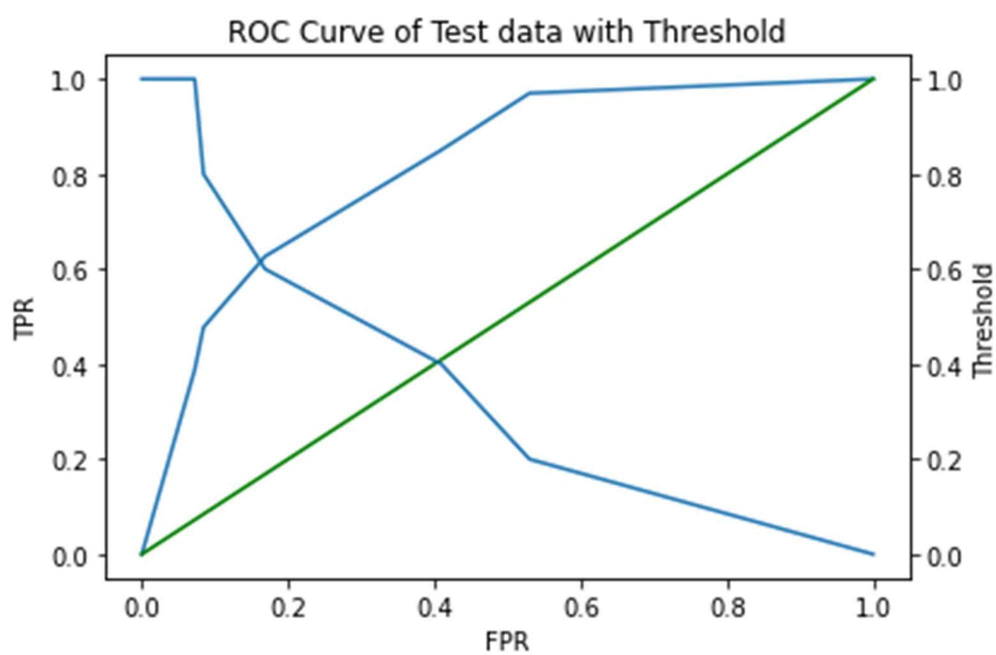

Figure 24: Threshold for KNN Classifier

The ROC curve of test data for XGB Classifier has given below as well as the ROC curve of test data with threshold.

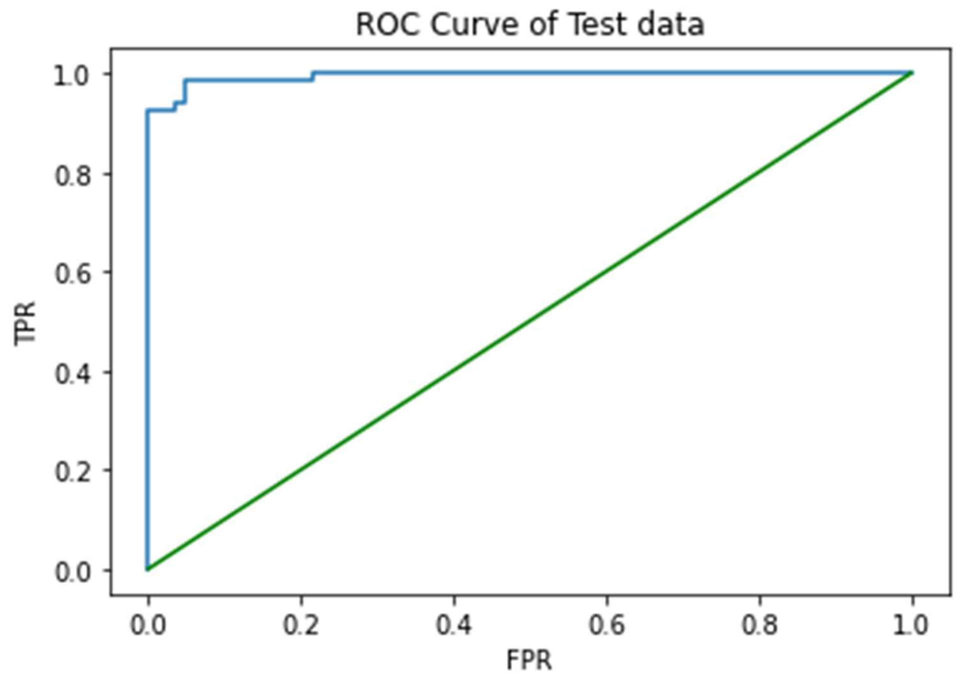

Figure 25: ROC curve for XGB Classifier

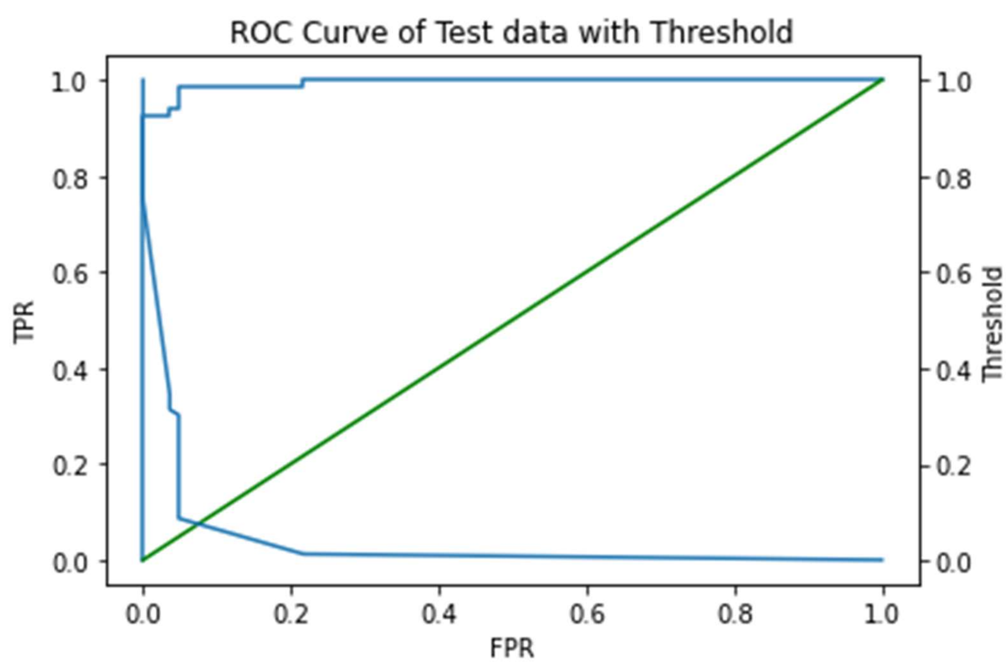

Figure 26: Thresholds for XGB Classifier

The ROC curve of test data for Gradient Boosting Classifier has given below as well as the ROC curve of test data with threshold.

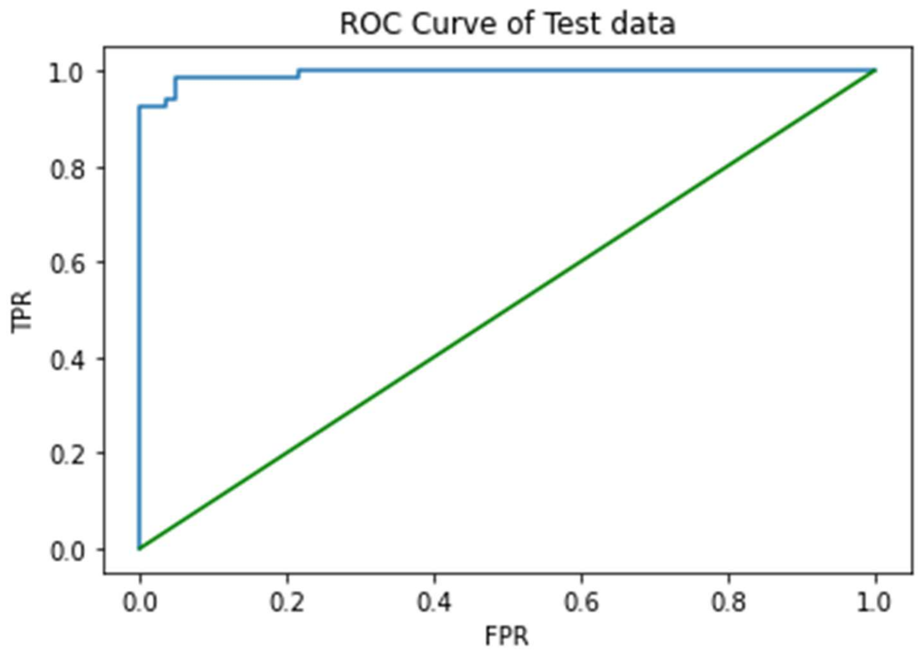

Figure 27: ROC curve for Gradient Boosting Classifier

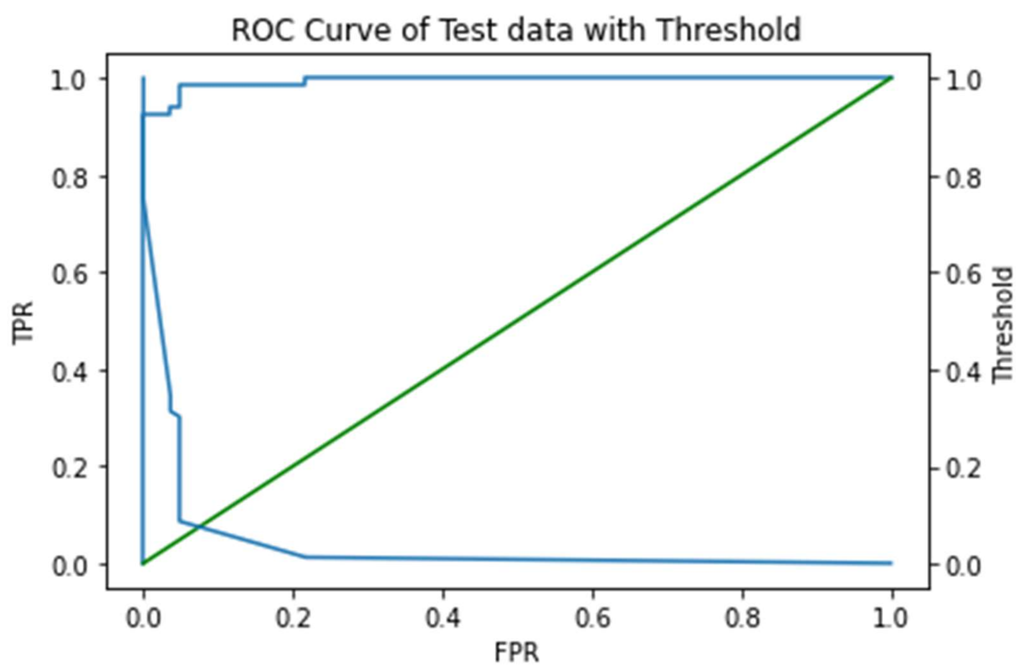

Figure 28: Threshold for Gradient Boosting Classifier

CHAPTER 5
CONCLUSION AND FUTURE WORK

5.1 Conclusion

Machine learning and data mining algorithm can be cast-off in this kind of research work to precaution the emerging disease in poultry industry. By this kind of work the poultry industry can be prepared from that kind of deadly disease like Avian Influenzas, Newcastle Disease and so on. Developing country like Bangladesh has huge investment in poultry industry. Moreover, poultry industry can ensure us animal protein and meat that is so good for human health. Poultry chicken of healthy breed can be a big part of our economics as well. The study we have done here that will be very much helpful for the farm owners as well the whole poultry industry. Every year over 40% of poultry chickens died due to some random diseases. Our research will make a huge impact on this big lose over the year. We have used eleven best machine learning algorithms in this work. All of them work perfectly. Provided acceptable accuracy but among all of them the Random Forest Classifier has generated the most accurate result for the study. The Random Forest Classifier's 97% accuracy result is the most accurate expected outcome for the study for us and its ROC values also the most 99% accurate for the study.

5.2 Future Work

The project is based on machine learning with data mining approaches ahead with it. Implementing more data could be a more efficient research work. There has been a 500 record in the following dataset that we have used in this research work. Which will be more realistic if we should have more dataset in the future. More dataset in the work will bring more significant diversity in the research. That will be a huge impact in our research. Usually, this kind of prediction research has an advancement in big data use. By the implementation of Deep Learning, Artificial Neural Network and Image Processing this work will be more advanced in future.

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APPENDICES

Abbreviation

CPD = Chronic Poultry Disease

NCPD = No Chronic Poultry Disease

ROC = Receiver Operating Characteristic

ML = Machine Learning

NB = Naive Bayes

MLP = Multilayer Perceptron

SGD = Stochastic Gradient Descent

AdaBoost = Adaptive Boosting

LG = Logistic Regression

DTC = Decision Tree Classifier

Appendix: Research Reflections

We had very limited expertise through the machine learnings approaches for recognition and prediction at the start of our research project. Our supervisor was quite pleasant and helpful to us. He provided us with good advice and was quite helpful. During this study period, we learnt a lot of new knowledge, approaches, and how to apply new algorithms, as well as how to deal with diverse methodologies. We encounter several challenges when we first begin working with this, but we progressively grow more acquainted with these methods.

At the end, through conducting the research, we acquired bravery and were encouraged to conduct other research in the future.

International Publication: Scopus Index

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