ANALYSIS THE DENGUE PATIENTS INCREASING RATE IN BANGLADESH BASED ON WEATHER BY USING MACHINE LEARNING MODELS

BY

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FINAL YEAR DESIGN PROJECT REPORT

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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DHAKA, BANGLADESH

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APPROVAL

This Project titled "**Analysis The Dengue Patients Increasing Rate In Bangladesh Based On Weather By Using Machine Iearning Models**", submitted by **Dipa Rani Saha** and to the Department of Computer Science and Engineering, Daffodil International University.It has been deemed satisfactory for partially fulfilling the requirements for the BSc degree in Computer Science and Engineering and has been approved regarding its style and content.The presentation was held on **13.07.24.**

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DECLARATION

I hereby confirm that this project has been completed by me under the supervision of **Ms. Sharmin Akter, Lecturer(senior scale), Department of Computer Science and Engineering, Daffodil International University**. Also stating that no part of this project has been submitted anywhere for degree or diploma.

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ABSTRACT

Dengue virus is created in the medium of Aedes mosquito. Because the virus is more prevalent in tropical areas and people are more affected, people in these areas should be aware of it as a health concern and have effective disease management measures in place. Reduction and prediction of dengue outbreaks is crucial for prevention and reduction of mortality. As the death rate has been decreasing in recent years, recently machine learning algorithm are all of them models have the potential to dengue prediction and reduce mortality as they analyze correlations between large datasets. All are algorithms are an too much basis for dengue risk prevention and control. Dengue is dangerous and sometimes fatal. This fever infection has become a major problem. So we need to predict the dengue outbreak and reduce mortality. Provides an overview of various ML methods used in dengue prediction including Logistic Regression models, DT, KNN. Examining the limitations of each, discussing features, selection, model interpretability and in addition, we discuss related data for dengue forecasting and mortality reduction, such as models for different geographic regions. My aim to decrease the accuracy of dengue forecasting models and provide directions for future research. Various ML algorithms are used to analyze dengue data sets of summer patient illness in Dhaka city to reduce dengue prevalence and mortality. Our results suggest that applying machine learning techniques is an accurate tool to predict dengue. which is used to reduce the effects of disease on humans, including incorporating real data. ML plays a role in dengue prediction.

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CHAPTER 1
Introduction

1.1 Overview

Currently, Dengue, primarily caused by the dengue mosquito and transmitted by the Aedes mosquito, is a growing public concern in the subtropical country Bangladesh has become. Global burden for dengue has increased due to urbanization, climate change factors. Early prediction of dengue outbreaks is crucial for effective disease management and prevention [1]. Dengue is taking a terrible form in Bangladesh. In addition, there are Procopius of dengue in other countries. Dengue prediction involves epidemiological data, environmental factors to estimate the probability of an outbreak. These predictive models aim to provide public health authorities with timely [2]. Machine learning algorithms can process large datasets and identify complex patterns that contribute to dengue outbreaks. These models can make accurate predictions. There is no specific medicine for dengue, that's why people go to death with a slight fever. The symptoms of this fever are fever with high temperature, Pain under the eyes, Nausea, joint pain [3]. But when it is so severe, it is called 'breakbone fever'. Also, when dengue becomes severe, the blood vessels are damaged and perforated and the platelet count drops rapidly [4]. This is the main problem in the summer area of dengue decrease is the nature and challenges it poses, which can vary in intensity, time and geography of heat[5]. Epidemiology has not been sufficient for accurate and prediction of dengue outbreaks, there is a need to improve early detection and response to the disease. The symptoms of dengue fever are similar to common fever, but that is why people do not easily understand whether it is actually dengue fever or common fever [6]. Most of the time people take medicine for common fever but when it is a long time than people realize that it is not common fever so we have to be careful first. Dengue is transmitted by the common female Aedes mosquito. Dengue is largely weather related [7]. Even a few years ago, there was not so much dengue in our country, there was no death, currently the rate of dengue and death is increasing day by day. The main reason for that is the weather. Sometimes too much rain, sometimes too much heat, the dengue mosquito rate has increased [8]. The symptom of dengue disease is fever. But the fever lasts for 1-4/6/8 days. Also, BP, Spo2 are checked at baseline. NS1 test is done to know if dengue has occurred in the first 4 days. Again test IgM on 5-6 days of fever. Dengue IgG is tested along with Dengue IgM to determine whether dengue has been previously diagnosed. If dengue is present then the patient is placed in special care, the patient is full of risk. Along with patient lunch, WBS, RBC, Hemoglobin and platelets are checked. The number of dengue cases in 2023 will break all previous records[report]. The death rate has

increased significantly with the incidence rate. In the past, the death rate was just a few, now it is in the thousands. Along with the rate of infection. Predicting with weather, the rate of dengue patient infection has reached the target of 1000 plus per year. Which is very high. Diagnosing and forecasting dengue by predicting weather data with dengue data from 2012 to 2023. So that the death rate does not increase. More recently, machine learning. Machine learning algorithms include decision trees, logistic regression, KNN models. These models can integrate different data sets and different variables to create predictive models for dengue outbreak risk, transmission. Recently, new approaches for dengue prediction using (ML) algorithms [9]. Application of ML algorithms in dengue 52forecasting. We discuss the evolution, limitations, and early warning of ML methods in dengue research. Then we can provide nation-wide dengue protection and predict people by reducing the mortality rate of dengue fever [10].

1.2 Background and present State

Dengue fever, a mosquito-borne illness. Dengue infections influenced by climatic factors make it difficult to predict and mitigate complications. The lack of predictive models hinders the ability to implement proactive public health measures, resulting in increased morbidity in the health care system .Relying on simple models for dengue forecasting. May not Dengue transmission is influenced by climate variability, human movement and population density. Models cannot account for complex interactions between these variables, resulting in sub-predictive performance. capture the complex relationships between different variables that influence disease prevalence. Addresses the growing need for more advanced and robust predictive tools by leveraging the power of machine and deep learning. This fever is to develop a comprehensive dengue forecasting model that not only considers meteorological variables but also integrates the power of sophisticated algorithms capable of understanding complex patterns and dependencies in the data. The dataset and spread of dengue demand timely intervention strategies. Current models may lack the required accuracy, hindering the implementation of health systems and resource allocation. The huge datasets required for accurate prediction create processing, feature selection and model challenges. Conventional methods can handle the high-dimensional nature of the data and cannot fully absorb the information. This research paper is to develop an improved dengue dead decrease find out model to address the challenge of increasing the accuracy of dengue outbreak forecasting, empowering public health authorities for proactive management of this infectious disease.

1.3 Problem statement

Dengue fever, a mosquito-borne illness. Dengue infections influenced by climatic factors make it difficult to predict and mitigate complications. The lack of predictive models hinders the ability to implement proactive public health measures, resulting in increased morbidity in the health care system. Relying on simple models for dengue forecasting. May not Dengue transmission is influenced by climate variability, human movement and population density. Models cannot account for complex interactions between these variables, resulting in sub-predictive performance. Capture the complex relationships between different variables that influence disease prevalence. Addresses the growing need for more advanced and robust predictive tools by leveraging the power of machine and deep learning. This fever is to develop a comprehensive dengue forecasting model that not only considers meteorological variables but also integrates the power of sophisticated algorithms capable of understanding complex patterns and dependencies in the data. The dataset and spread of dengue demand timely intervention strategies. Current models may lack the required accuracy, hindering the implementation of health systems and resource allocation. The huge datasets required for accurate prediction create processing, feature selection and model challenges. Conventional methods can handle the high-dimensional nature of the data and cannot fully absorb the information. This research paper is to develop an improved dengue dead decrease find out model to address the challenge of increasing the accuracy of dengue outbreak forecasting, empowering public health authorities for proactive management of this infectious disease.

1.4 Objectives

Dengue is the biggest cause of death in all counties, particularly in tropical regions. Implications of developing advanced prediction models for dengue outbreaks. Dengue fever affects humans Climate change contributes to the geographic spread of dengue, emphasizing the need for adaptive predictive models. Relying on epidemiological models for dengue forecasting. These approaches may not adequately capture dengue complications, leading to suboptimal prediction. Early detection of dengue outbreaks is important. Machine and deep learning models have the potential to provide timely predictions. Which is proactive like mosquito control, resource allocation to health care facilities. Modeling techniques are needed for evolving dengue transmission as affected by climate change and human dynamics. ML models provide complex relationships and patterns of change in data. Creating timely dengue forecasting models significantly affects public health. By predicting and managing outbreaks, these models can contribute to reducing dengue-related morbidity, mortality and healthcare burden. Compilation of a

comprehensive dataset covering dengue incidence rates, meteorological data, environmental variability and other relevant factors from dengue regions. Conduct feature engineering to enhance dataset information. Using feature selection techniques to identify influential variables for predicting dengue. Application of ML algorithms such as random forest, SVM, LR, DT to model dengue patterns and identify key predictors. Evaluate the algorithm performance of these dataset in terms of accuracy, and specificity. Evaluate the performance of deep learning models compared to machine learning methods. Optimize models to improve predictive accuracy and generalizability. Regularization mitigates problems such as overfitting and underfitting. Assess the robustness of models by validating them against datasets and time periods.

1.5 Scope and Limitation

Dengue will focus on regions, in tropical and subtropical climates, where Aedes contributes to mosquito transmission. Collect dengue temperature, humidity, rainfall and other environmental data. Ensure data quality for different urban and rural areas. Explore a set of dengue climate data, population density, land use pattern features. Experiment with different features to improve model accuracy. Considering a time period for data analysis, the dataset captures changes and long-term trends in dengue transmission. Evaluate the performance of models over multiple years to assess robustness. Apply machine learning algorithms such as SVM. DT, RF, LR for dengue forecasting analysis. Explore machine learning. Advanced models and warning systems adapted to different regions and different data sources. Consider the possibility of portability to new geographic areas with environmental conditions. Limitation means dataset, area, geographical limitation. As such the disease area will be different based on weather defended on it. The dataset I am collecting is just a specific area. This is Dhaka, that's why we can predict or give a preview of the weather data of Dhaka, how dengue will be next year. But other areas cannot be said depending on the results of this data. Again, it is not possible to say which geographical country. But one thing that can be done is that if we follow the SIM process, we can easily know about other areas.

1.6 Report Organization

Importance of dengue prognosis in public health. Dengue fever is a global problem . The purpose of the report is to focus on dengue prognosis. Provide background on dengue, its transmission cycle and the Aedes mosquito responsible for its spread. The need for improved prediction methods. Emphasize the complexity of dengue's impact on public health. Discuss the potential impact of accurate predictions on intervention strategies, & community engagement. Environmental, epidemiological, mosquito, climatic,

meteorological and sociodemographic factors are factors in predicting dengue.Describe methods used in dengue forecasting, including data collection, analysis, and modeling techniques.The role of machine learning in increasing prediction accuracy.Provide examples of successful prediction models and technologies currently in use.Current dengue forecasting models have been successfully implemented. Explore the latest technologies and innovations in dengue forecasting Such as satellite data, and the use of real-time systems.Advise public health authorities and researchers on how to enhance dengue prevention efforts.Do ways to improve existing public health predictive models.Sources and references used in the report, including additional data or detailed methods.The report is structured in this way, from understanding the background and significance of dengue to methods used for prediction and improving dengue forecasting efforts.

Introduction in Chapter 1, how dengue is said here. The death rate is also increasing. Along with the symptoms of the disease are mentioned. These are mainly due to weather instability.
Chapter 2 discusses the literature review. Dengue related papers mentioned here are reviewed. And what model is using whom and how much accuracy are they given? Then my work is compared with previous models.
Chapter 3 discusses the methodology. Here is the plan of how I will work. It means how to collect data, which model to apply. I will work with what will be used. How much money will be spent on them has been discussed.
Implementation is discussed in Chapter 4. Data collection, model implementation, results have been worked here.

Chapter 5 deals with result analysis. The results of each algorithm i.e. algorithm are discussed. Also discussed are linear and lasso flow charts.
In Chapter 6, the impact on society has been discussed. It means that there is no benefit in doing any work if it does not benefit the society. Benefits in public life will be really profitable then everyone will be with me.
Chapter 7 discusses future work. Means how much effect it will have on the future. How much will people benefit?

1.7 Summary

Currently, dengue has taken a terrible form in Bangladesh. In addition, there are procopies of dengue in other countries. If this continues, dengue will become an epidemic after a few years. Earlier the death rate was very limited but now its rate is increasing. Dengue is mainly caused by female Aedes mosquitoes. Applying algorithm on Medical Dengue Data

to Reduce Dengue Prevalence and Mortality. Dengue transmission is influenced by climate variability, human movement and population density. Models cannot account for complex interactions between these variables, resulting in sub-predictive performance. capture the complex relationships between different variables that influence disease prevalence. Addresses the growing need for more advanced and robust predictive tools by leveraging the power of both machine learning and deep learning. The dataset Current models may lack the required accuracy, hindering the implementation of health systems .The huge datasets required for accurate prediction create processing, feature selection and model challenges. The importance of predicting dengue outbreaks is significant in protecting public health and reducing the burden on healthcare systems. It can also help allocate resources, such as medicines and insecticides, better. Therefore, accurate and timely dengue prediction is crucial for disease control and prevention. comprehensive dataset covering dengue incidence rates, meteorological data. Using feature selection techniques to identify influential variables for predicting dengue. Evaluate the performance of these models accuracy, and specificity .Evaluate the performance from a dataset machine models. This process many times results may be wrong in the medical center, but the machine is trained more than once and then the algorithm shown with the highest accuracy is used. In this case, everyone can know long before dengue and become alert and most of the people do not die.

CHAPTER 2
LITERATURE REVIEW

2.1 Overview

We know that dengue is caused by dengue virus. This virus is provided by the aedes mosquito. Dengue has 3 steps when people face dengue fever 1 to 4 days test NS1 when result positive means dengue virus infection. Then 5-7 days face fever then test IgM and IgG. IgM means dengue positive. Another side IgG positive means Dengue positive few days or month ago.Some time affected patient lunges because of dengue when without proper treatment patient nearly dead. This causes an increased death rate of dengue. The paper uses techniques such as LR,DT,KNN,SVM classification analysis in ML algorithms . This work, the performance of the predictive method is analyzed by classification analysis. Dengue disease is predicted and mortality is reduced. For this work, various predictive performances are analyzed using accuracy and evaluation measures. The best algorithm for dengue prediction is chosen by applying multiple algorithms. Some papers have used seven machine learning algorithms such as, logistic regression (LR) , decision trees (DT) , Naive Bayes (NB) , artificial neural networks (ANN) , sequential minimization optimization, and k-nearest neighbor (K-NN) . The classification performance metrics used are true positive and, true negative, false positive, false negative For binary classification, the value of the matrix is measured. Some of the ML algorithms used in applications are Artificial Neural Networks (ANNs), Support Vector Machines (SVMs), and . (SOM), decision tree (DT), random forest, and genetic algorithm. We applied two linear models and four non-linear models to model time. Cross validation was used to reduce the dependence of assessment results. Specifically, ml algorithm validation is used to evaluate the model developed to learn dengue pre-models from temperature.

2.2 Related Works

Currently the data classification capabilities of ML have changed the concept of using ML in dengue detection and weather. Model building up for predicting dengue from recent dengue data and combined with weather. ML algorithms are much better in accuracy. Scored 90%+ in most of the papers.

Fathima (2012) proposed on dengue prediction using machine learning. They used raw data The Dengue Disease dataset is downloaded from the UCI (Unique Client Identifier) Machine Learning Repository website and saved as a text file. Such as uses some algorithm are Support Vector Machine, Sequential Mining Optimization, Linear Regression, K-

means Clustering. They found accuracy of 94% .Best model of SVM. weakness is people dying [11].

Iqbal (2019) proposed on Machine learning for dengue outbreak prediction. This paper raw data is used where data from 20 cities in China where 60% is highest is worked. Uses machine learning algorithms are Decision Tree, DNN, Logistic Regression. They found accuracy 72.0%. The best model of DNN. Too much low accuracy [12].

Yavari Nejad(2021) proposed on Identification of significant climatic risk factors and machine learning models in dengue outbreak prediction .This paper uses raw data .Uses ML algorithms are Naive Bayes (NB) , Bayes network (BN) , Support Vector machine (SVM) , RBF tree, Decision Tree .They found accuracy 92%. and the best model of RBF. when climate change then model does not show the same accuracy[13].

Saleh (2021) proposed on Dengue Prediction Using DL With Long Short-Term Memory (LSTM) . The paper uses raw data and automatically learns from them using general learning procedures. Uses algorithm decision tree , neural network models, regression .They found 80 % accuracy and best model of LSTM .people cannot follow rules and die[14].

Sanju Devi(2019) proposed on Dengue Prediction in Latin America Using ML and the One health perspective . This paper uses raw data. Uses machine learning algorithm CNN, RNA, ANN, k-Nearest Neighbor. Best accuracy of 95% and best model of KNN. Dengue outbreaks is not possible [15].

Zhao(2020) proposed ML algorithm based dengue prediction disease with performance and accuracy elevation patterns . This paper uses raw data. Uses machine learning algorithms are Random Forest, Decision Trees. Best accuracy of 82% .Best model of Random Fores t. Always does not work for every area[16].

Salami(2020) proposed on Predicting dengue importation into Europe, using machine learning. This paper uses raw data in this area. Used machine learning algorithms are Random Forest, Support Vector Machine, Logistic Regression. Best accuracy is 95%. Random forest is the best model in this paper. Limitation in this paper cannot decrease death of people[17].

Andersson (2018) proposed on Characterization of clinical patterns of dengue patients using an unsupervised machine learning approach. This paper data was obtained from each patient's medical records. Used machine learning algorithm are Random forest, Decision

Trees. Best accuracy is 92%.Random forest is the best model of this paper .Limitation of this paper cannot help dengue outbreaks[18].

Huang(2020) proposed on Prediction of dengue incidence using hospitalized patients, metrological and socio-economic data using machine learning approach. This paper used Directorate General of Health Services (DGHS) to conduct this research. Uses machine learning algorithm Linear Regression, Support Vector Regression. Best accuracy of 75% .Best model of SVR. This is not helpful cause accuracy too much less[19].

Ong(2023) proposed on assessing the risk of dengue severity using demographic and laboratory test results with ML .This paper used raw data .Uses machine learning algorithms are Linear Regression and Support Vector Regression .Best accuracy of 82.02%.Best model of this paper SVR. Many times people die from these diseases in this paper limitation [20].

Anno(2019) proposed on forecasting Dengue Fever Using Machine Learning Regression Techniques. In this paper, we analyze a weather-related dataset to predict the number of illness cases per week in the cities of San Juan and Iquitos. fever in two cities (Iquitos and San Juan) using available dataset. Uses model are Random Forest, Naive Bayes, Regression, Decision tree, Support Vector Machine, K-nearest neighbors ,Regression ,AdaBoost ,RNN, ANN .Best accuracy of this paper 94% and model RNN. Limitation is only focus on climate[21] .

Gambhir(2018) proposed on Dengue fever prediction Using machine learning tecnique. In this paper data set collected from dengue collected at the UCI Repository. Uses algorithm are SVM, Decision Tree. Best accuracy of 99 and model SVM. Limitation of this paper week data mining tools[22].

Edussuriya(2021) proposed on Dengue Outbreak Prediction: machine learning approach. In this paper the Study was done using a dataset of dengue cases and rainfall level for five districts in Selangor. The data were from 2004 to 2005. We used Neural Network, Decision Tree, Support Vector. Best accuracy of 89% .Best model of DT. Limitation of this paper temperature use can not show actual result[23].

Zhao(2023) proposed on Prediction of High Incidence of Dengue in the Philippines. In this paper used raw data. Uses machine learning algorithm NN , and Support Vector Machine . Best accuracy of this paper 92%..SVM is the best model of this paper .Limitation of this paper can not apply model properly[24].

Scavuzzo(2018) proposed on Mapping dengue risk in Singapore using Random Forest .In this paper. This paper used all data (Dengue, Population and Entomological) were arranged to the grids .Uses algorithms are Random forests ,SVM ,decision trees .Best accuracy of this paper 98.13%.Random forest is the best model of this paper[25].

2.3 Comparison between existing work

Machine learning algorithms are applied to dengue data along with weather data to predict dengue and reduce the rate of dengue disease. Several years of weather data have been taken for the test to be accurate. In the case of dengue detection, it is easy to wait a few days to get the result out of the contemporary detection and predict the weather in advance.

Table 2.3.1: Comparison between existing work

SL No	Author Name	Used Algorithm	Best Accuracy
1.	Jincheng Xu 1,2,3, Keqiang Xu 1,3, Zhichao Li 4,5, Fengxia Meng 6 Taotian Tu 7, Lei Xu 4,5,6, and Qiyong Liu 6,	ANNs, LSTM, TL	LSTM=95 %
2.	S. Kannimuthu1∗, K.S. Bhuvaneshwari1, D. Bhanu2, A. Vaishnavi1, and S. Ahalya1	SVM, NN, K-NN, C4,5	C4.5=89.33%
3.	Naiyar Iqbal, Mohammad Islam	Logistic Regression (LR), Decision Tree(DT),Naive Bayes(NB), Artificial Neural Network (ANN) & K-nearest neighbor (KNN), Logit boost	Logit boost =94%
4.	Juan M. Scavuzzo Francisco Trucco Manuel Espinosa Carolina Marcelo Abrilc Carlos M.	Artificial Neural Network, Support Vector	linear regression= 95%

	Scavuzzob, Alejandro C. Freryd	Machine, Linear Regression	
5.	Instituto de Ci^encias Matem´aticas e de Computa¸c˜ao, Universidade de S˜ao Paulo,S˜ao Carlos, SP,	Neural Network, RNN, CNN	CNN=92%
6	ANNALISA APPICE 1,2, YULIA R. GEL 3, ILIYAN ILIEV 4 VYACHESLAV LYUBICH 5 AND DONATO MALERBA 1,2,	SVR, KNN, M5	SVR=95%
7	T.Sajana 1, M.Navya2 , CVSSV2,Gayathri2, N.Reshma2	Naive Bayes, Artificial Neural Network, ANN, CART, Regression tree	CART =100%
8	Pi Guo1, Tao Liu2, Qin Zhang3 Li Wang1,Jianpeng Xiao2, Qingying Zhang1,Ganfeng Luo, Zhihao Li2,Jianfeng He4,Yonghui Zhang4 Wenjun Ma2	Support Vector Regression, Linear Regression, Gradient Boosted Regression, Decision Tree	SVR=95%
9	Shireesha, O., Sri, P. H., Prem Jacob, T., Nagarajan, G., & Pravin, A. (2021). Dengue Prediction Using Machine Learning Techniques. In *Advances in Smart Grid and Renewable Energy: Select Proceedings of ETAEERE 2020*.	K-means Clustering, Support Vector Machine	K-means clustering= 86%.
10	Gaurav Gupta 1,Shakir Khan 2,3,* , Vandana Guleria 4, Abrar Almjally 2 Bayan Ibrahim Alabduallah 5,*, Tamanna Siddiqui 6,Bader M.	Support Vector Machine, Decision Tree, Random Forest, ANN,GNB.	ANN=89.5 %

	Albahlal 2, Saad Abdullah Alajlan 2 and Mashael AL-subaie		
11	Fathima Maadhurya, D. Pavithra and S. Ramya Sree	support vector machine, sequential mining optimization, Linear Regression, K-means clustering	SVM=94%
12	Iqbal-Shiann HoID1,2, Ting-Chia WengID3,4, Jung-Der WangID3,5,6, Hsieh-Cheng Han7Hao-Chien ChengID8, Chun-Chieh Yang8,, Chih-Hen Yu5 Yen-Jung Liu8,Chien Hsiang Hu9,Chun-Yu Huang8 Ming-Hong Chen9,Chwan-Chuen King10*, Yen-Jen	Decision Tree, DNN, Logistic Regression	DNN=72.0 %
13	Yavari Nejad, F., & Varathan, K. D. (2021). Identification of significant climatic	Naive Bayes, Bayes network, Support Vector machine, RBF tree, Decision Tree	TRF=92.3 5%
14	Saleh Abdulrazak Yahya Saleh,Lim Baiwei	decision tree , neural network models, regression	LSTM=80 %
15	Sanju Maritza Cabrera 1, 2 , Jason Leak3 José Naranjo Torres 4,	CNN,RNA, ANN, k-Nearest Neighbor,	k-Nearest Neighbor= 95%
16	Zhao Rekha Gangula a,Lingala Thirupathi b,Rajashekar Parupati c, K. Sree Veda , Saritha	Random Forest,Decision Trees	Random Forest=82 %

17	Salami Donald Salami 1 ,Carla Alexandra Sousa1 , Maria do Rosário Oliveira Martins1 & César Capinha 2	Random Forest, Support Vector Machine, Logistic Regression	Random Forest=95 %
18	Andersson Gleicy Macedo Hair 1 , Flávio Fonseca Nobre 1 and Patrícia Brasil2	Random forest, Decision Trees. ,Binary	Random Forest=92%
19	Huang Samrat Kumar DeyID1, Md. Mahbubur Rahman2, Arpita Howlader3 , Umme Raihan Siddiqi4, Khandaker Mohammad Mohi Uddin5, Rownak Borhan5, Elias,Ur RahmanID5	Linear Regression ,Support Vector Regression	SVR = 75%
20.	Sheng-WenHuangID1, Huey-Pin Tsai2,3, Su-Jhen Wen-Chien KoID4, JenRen Wang2,3,5	Linear Regression (MLR) and Support Vector Regression (SVR).	SVR=82.6 %
21.	Anno Qanita Bani Baker, Dalya Faraj,Alanoud Alguzo	Random Forest ,Naive Bayes, Regression, Decision tree, Support Vector Machine, K-nearest neighbors, Regression , AdaBoost, RNN, ANN .	RNN=94%
22.	Gambhir R. Sanjudevi1, D. Savitha2	SVM, Decision Tree	SVM=99%
23.	Edudduriya Emmanuelle Sylvester ID1,2*,Clarisse Joachim 3,4, Elsa Cécilia-JosephID2 ,Guillaume Bouzille	Neural Network ,Decision Tree, Support Vector	Decision Tree=89%

	Campillo-Gimenez ID1,5,Marc Cuggia Andre´ Cabbie´ ID6,7,8		
24.	Zhao Duc Nghia Pham1,, Tarique Aziz1,, Ali Kohan1, Syahrul Juraina binti Abd. Jamil2Jing Jing Khoo2,, Dickson Lukose1, Sazaly bin Abu Bakar2,and Abdul Sattar3	Neural Network , and Support Vector Machine	SVM=92%
25	Scavuzzo Siddharth Srivastava, Sumit Soman, Astha Rai	Random forests SVM or decision trees	random forest=98.13 %
26	Yuhanis Yusof,Zuriani Mustaffa	support Vector Machines, Artificial Neural Network models.	LS-SVM = 90%
27	Anna L. Buczak, Benjamin Baugher1 Steven M. Babin1 Liane Ramac-Thomas1 Erhan Guven1Yevgeniy Elbert1 Phillip T. Koshute1	Fuzzification ,Identification	Fuzzification=80%
28	Janet Ong1,, Xu Liu1,, Jayanthi Rajarethinam1, Suet Yeng Kok1,, Shaohong Liang1, Choon,,Siang Tang2,, Alex R. Cook3	Random forests or decision trees	Random forest=83 %
30	Yuan Shi,1 Xu Liu,1 Suet-Theng Kok,1 Jayanthi Rajarethinam,1 Shaohong Liang,1 Grace Yap Luxemburger2 & N. M. Ferguson 1	linear regression	linear regression =95%

There are some limitations in each paper. The limitations are dataset issue, area based issue, weather issue, death related issue. These gaps remain. I am working with dengue data and weather data of 2014-2023. Here dengue rate is decreasing more by defending on weather data. Because of the data of many years, we can easily warn people by analyzing it with the weather and if people are careful, the death rate will decrease.

2.4 Open Issues

Open issue" means the open or open status of an issue, which has not yet been resolved. It is commonly used in software development or project management, where bugs, errors, or functions are waiting to be resolved. To say that the problem has not been solved, dengue cases here have been tried to reduce but could not. Previous work has shown attempts to reduce mortality but have not been able to. If the death rate is not reduced, if it continues like this, the death rate will eventually increase and become an epidemic. For this reason it is necessary to provide advance accommodation so that everyone is aware and can take appropriate measures. That's why we want to solve the problem by predicting dengue data by predicting dengue data on weather data.

2.5 Summary

Dengue fever and its significance as a global public health issue. Most of the paper uses primary data because without primary data we cannot take actual accuracy . some of countries use temperature data and some of countries use dengue patient data but they do not control people's death cause they always focus on disease prognosis. most of the time use machine learning algorithm and deep learning algorithm . when only use machine learning algorithm then accuracy most of the time do work .Machine learning algorithm are used like Naive Bayse, Logistic Regression, K-means ,K-nearest, Decision tree etc and most of the paper logistic Regression show the best accuracy . They input to the current phase .Some papers use techniques like ANNs ,LSTM,TL algorithm. Some Papers use techniques like the C4.5 algorithm . Machine learning uses analytics and predictive methods to predict the future. Predictive method analysis using classification analysis is used to predict a dengue disease. The performance of various predictive methods is evaluated in this work using evaluation measures such as precision, recall, and others.The prediction algorithm is selected (ML) to identify those areas of dengue prognosis Identify gaps Studies focus on specific types of data (e.g., climate data, dengue cases) without adequately incorporating population dynamics.

CHAPTER 3
METHODOLOGY

3.1 Overview

Identify and collect relevant data sources.Climate data (temperature, humidity, rainfall).Socio-economic indicators,Historical Dengue incidence,Human mobility patterns.Data Preprocessing data quality issues, missing values, outliers, and ensure data consistency.Normalize or scale numerical features,Encode categorical variables.Analyze feature importance for model input.Analysis and domain expertise in selecting relevant features.I will use machine learning based methods like regression,linear,naive bayes a show more accuracy so I will compare them with the model.Methods for enabling predictions .Since I am working on dengue prediction here first I have to collect data. Then you have to plan how to do it means how to work on the data to get the right result. Now you have to take the data set. The data should be cleaned and then the data should be preprocessed for good results and then the model should be applied for the results through which we will get good results and through that we will try to reduce the dengue rate by predicting it.It is not necessary to do this and also have an idea about the cost. If the cost is high and the profit is low, then common people will not be helpful. If good results are obtained at less cost, then people will be very helpful. Because if it is expensive people will not test and run on the data nor will the help of common people they will endure day after day.

3.2 Proposed Methodology

First collect the data dengue present related data as well as collect the weather data. This time there is no dengue data weekly and no weather data yearly in the data. Now let's train the data. Besides, we apply some machine learning models on the data. Compare the performance of the models. Which would be good as it helps predict dengue.Here the data is taken from 2014-2023 but we will find the accuracy from 2014-2018 if we see the result is close to 23 then it will be understood that the result of 23 or whatever will come will match the next year and we can easily predict.data and then put it in the data drive. I will do two options for it. One will store year data and the other will store weekly data. Then there are many null values and counter values which will be cleaned through preprocessing and here I will use leveling smoothing because the data will not be taken to a level if I apply the algorithms here, you will not get the correct result. After smoothing, I will take 80% of the 100% data and keep 20% for testing. Here I will use LR, DT, K-NN. Compared to Machine Learning, I will specify which one has better accuracy and use it for prediction.

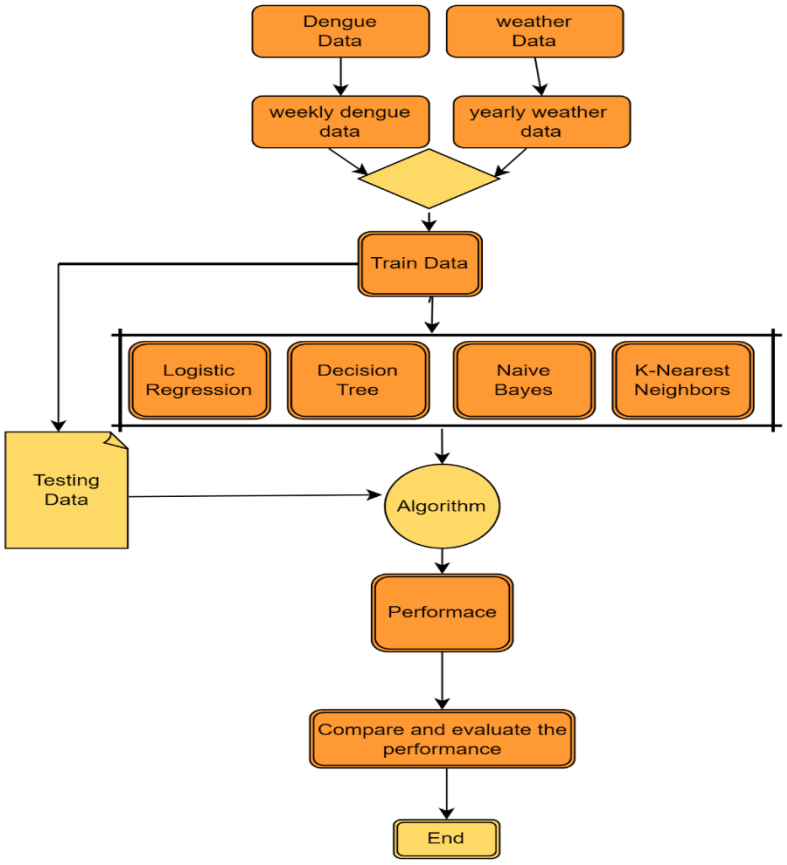
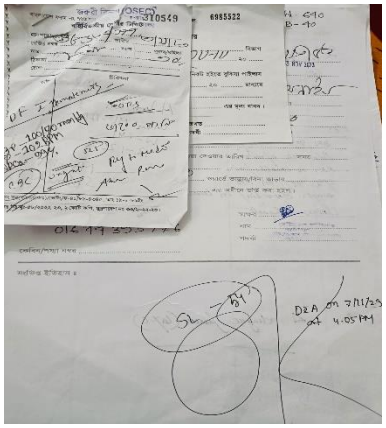


Figure 3.2.1: Proposed methodology of diagram

Data Collection Procedure

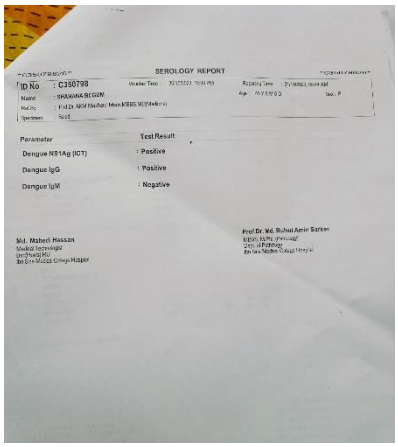
Since I am working with raw data, I first went to Sahwardi Hospital to collect data. While I was doing the application, I took the supervisor's signature on the application and then submitted it to them with the seal of the university. I applied to the director of the hospital.Sign is coming from the application director then went to the statistics office where there is data they gave me a copy of the original copy they kept for their security then giving me data 2012-2023 weekly dengue data. Now it will not be done only with dengue data because I want to reduce the death rate by predicting and for that I am collecting the weekly weather data of Bangladesh from Kagel. Then I created two datasets. From this data I am creating a train, test, validation data folder.Dengue data provided 674.To create the dataset, discard Train, Test, and Validation folders. Each raw data. The four attributes that I have collected from the hospital are year, week, dengue type, number. There are two types of dengue type, one is dengue IgM. Another dengue IgG is dengue positive if found in the body through its antibody test. Dengue has occurred before when it is

positive.Another is weather data. Here there are 4 attributes which are year, week, daily rainfall and average temperature

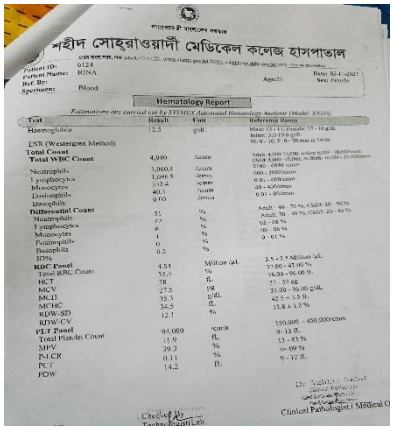


(a)

(b)



(c)



(d)

Figure 3.2.2: (a),(b),(c),(d) raw data of file

Process of Experiments

First, the dengue data should be collected from the hospital and made into a folder, and the weather data should be collected and made into a folder from the Kagel. The two data should be loaded separately in the lab, and then the data should be merged together. Weather data was from 1901 as my dengue data is from 2014 so I took weather data equal to dengue data from 2014-2023. Now applying preprocessing to apply the model to the data.

Data isnull(): First I will check the dataset whether there is any missing value, if there is any missing value then I will convert it to 0.Because then no data attribute will be omitted.

Feature removal:When we check the data set and the redundant columns known in the data set are not needed then they are removed with the help of feature removal. In the data set I don't want the name of Jigopp road because it is dengue before it is considered for the result so it is removed with the help of features.Again, the necessary column 2014-2023 has been taken from the weather data set by removing it from 1901.

Data merging:A dengue data and another weather data are combined through a data joining process and a new data set is created.

new dataset

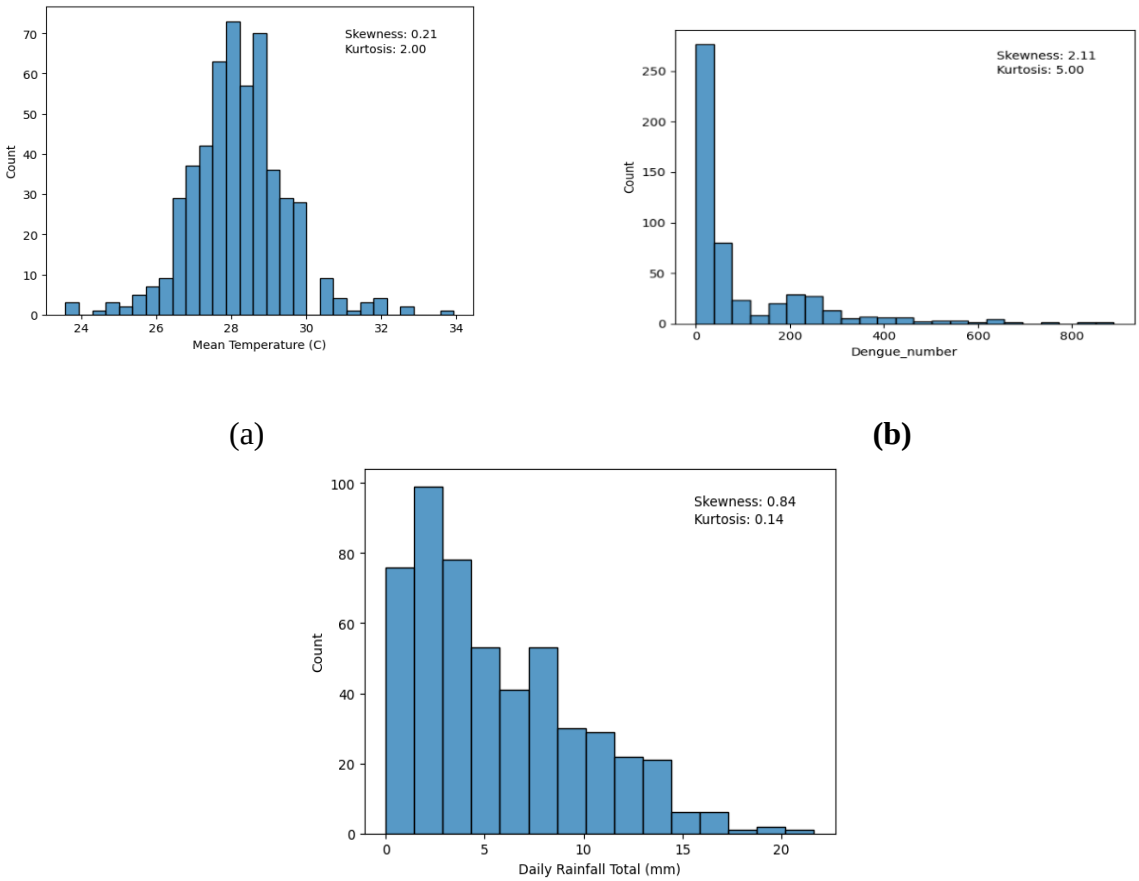
Table 3.2.3: new dataset

year	week no	Daily rainfall	Mean tem.	Dengu number
2014	1	3.456	26.59	436.0
2014	2	8.061	26.56	479.0
2014	3	0.0617	26.28	401.0
…….	……	…..	……	…..
2023	48	2.8309	28.56	113
2023	49	5.8056	27.67	107

Statistical Analysis:This section will be focused on identifying key series of the dataset and provide statistical summary of the data. The central tendency of the data can be used to describe the data by identifying summary statistics such as mean,median and mode.

Firstly finding avg rainfall, avg temperature.avg dengue mean in the dataset year wise.Secondly finding avg rainfall, avg temperature.avg dengue median in the dataset year wise.Thirdly finding avg rainfall, avg temperature.avg dengue mode in the dataset year wise.

Type of Distribution:



(a) **(b)**

(c)

Figure 3.2.4: (a),(b),(c),Skewness vs Kurtosis

flowchart

Skewness: A metric method of data distribution that measures the unevenness of data. Means where the data is, its value can be both positive and negative.

Kurtosis :is a statistical metric that measures the tailedness of data. Also helps to understand the heaviness or thinness of data analysis. which shows the data in different formats. Through this we can easily visualize complex data through graphs or charts and also identify patterns easily.Here the data for each year is visualized as a year.Select the columns to plot Use the pairplot function to plot the columns.

Data Visualization:

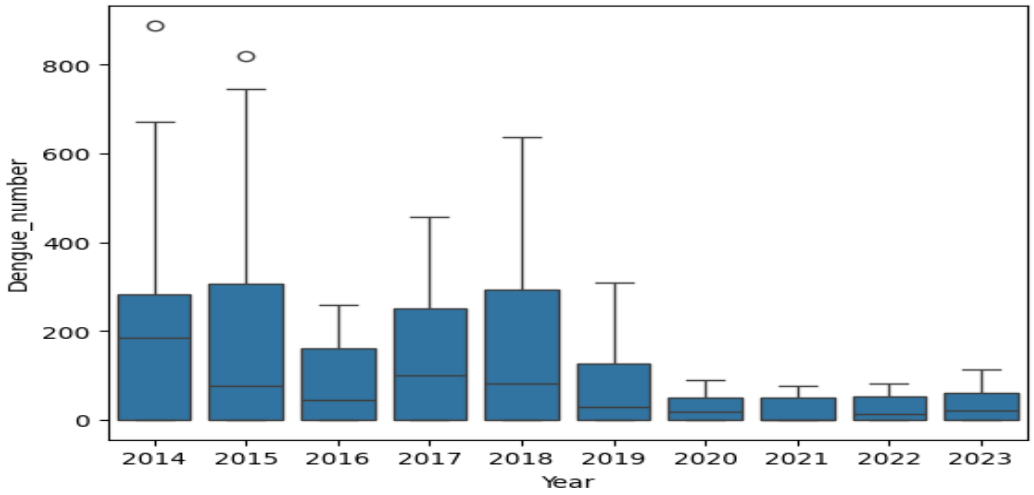


Figure 3.2.5:Data visualization of Daily Rainfall Total (mm)', 'Mean Temperature (C)', 'Dengue_number

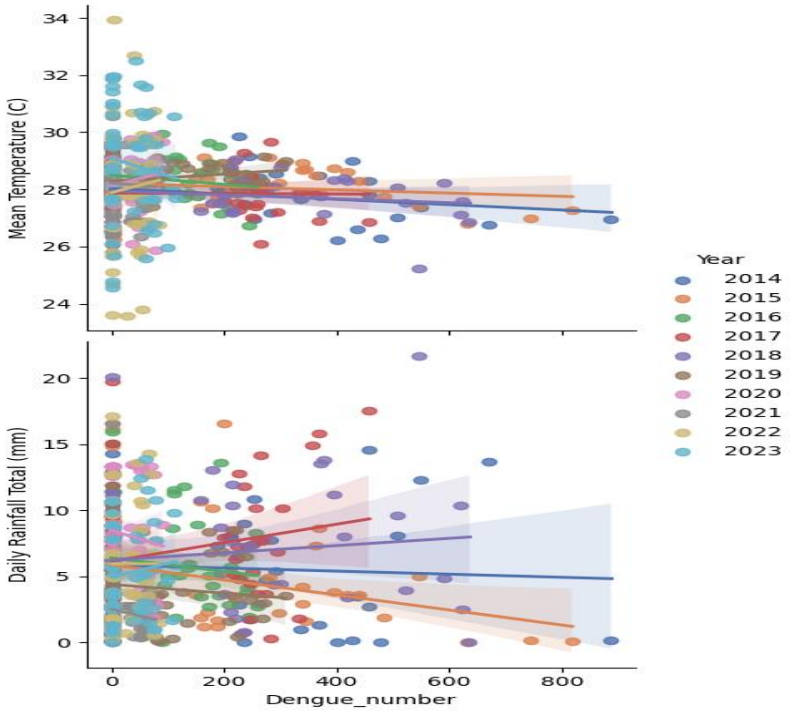


Figure 3.2.6: dengue cases in 2014 and 2023

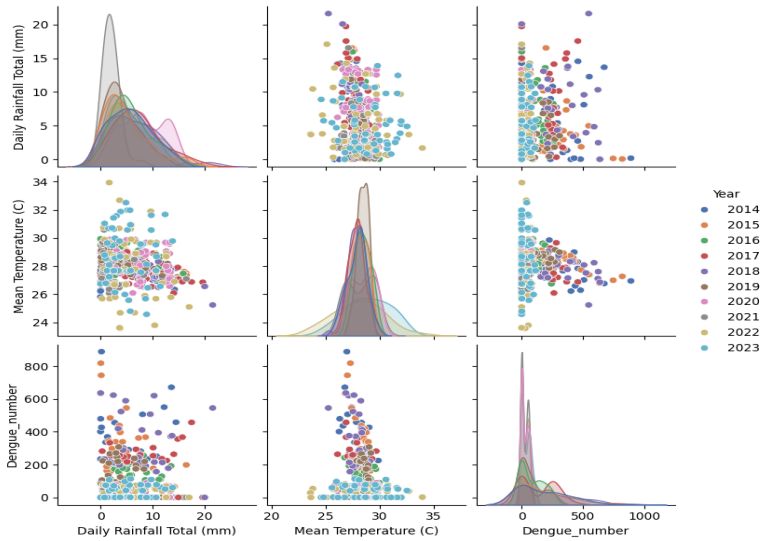


Figure 3.2.7: Dengue_number,Mean Temperature (C)", "Daily Rainfall Total (mm)"

Data visualization is an important tool for data analysis. which shows the data in different formats. Through this we can easily visualize complex data through graphs or charts and also identify patterns easily.

Linear Regression

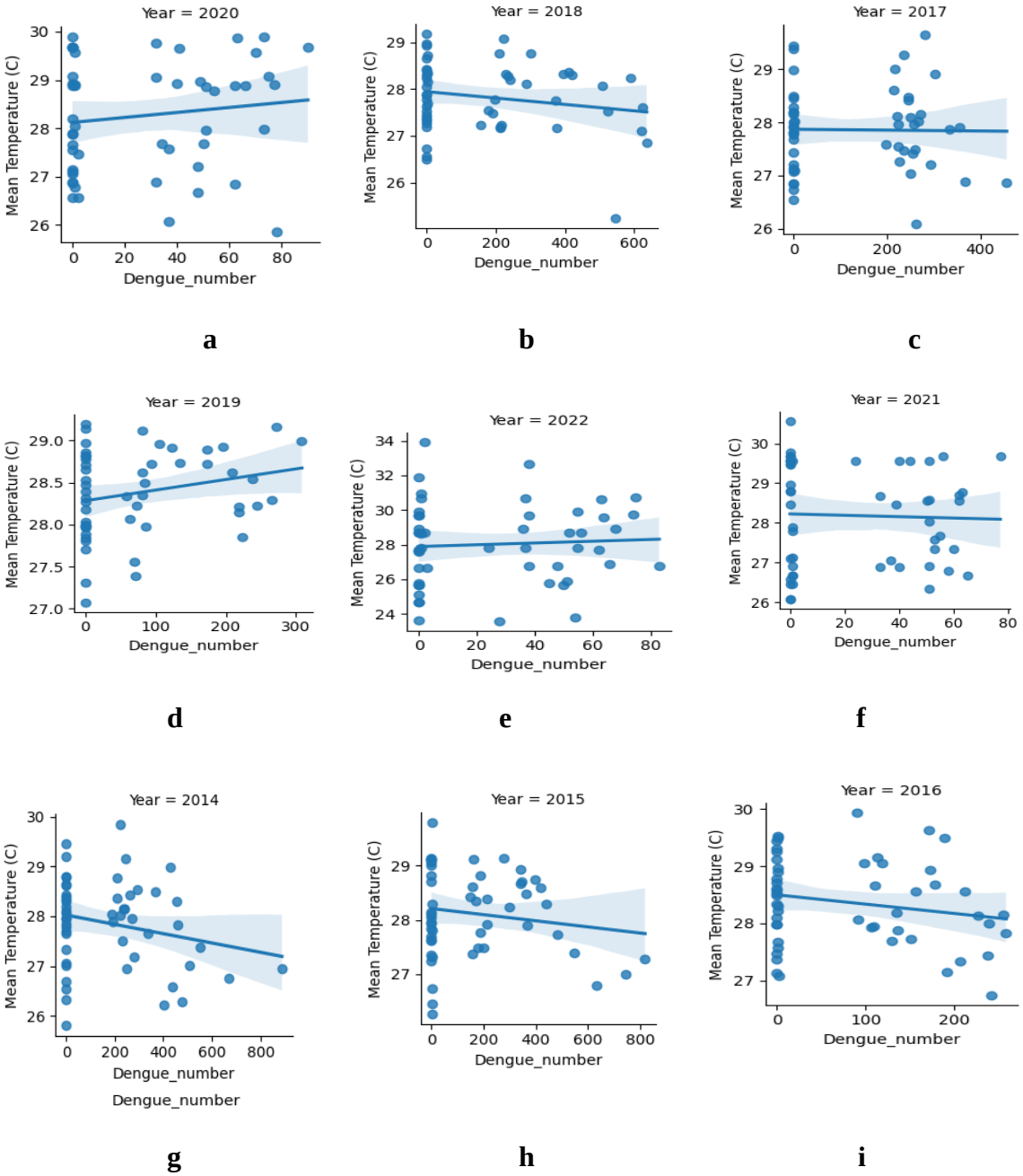


Figure 3.2.8: (a),(b),(c),(d),(e),(f),(g),(h) Simple Linear Regression

Exclude data that consist of no correlation, such as daily rainfall due to the graph not showing any upward trends. As the scatter plot is a horizontal line of regression at that time period. This is likely due to the low number of rainfall recorded at that time period, it causes the reading to be concentrated in a vertical line with no expansion to the y-axis.

3.3 Hardware/Software Requirements

Machine learning algorithms should be applied on dengue data and weather data for dengue detection as dengue prediction is the main goal. Dengue has now become a serious disease as it infects the lungs leading to death. Here the respiratory tract infection of dengue lungs acts as the focal point. Here the challenges that dengue faces with traditional detection methods are discussed and how these limitations can be overcome.Machine learning models work by extracting uncorrelated data from data and applying it to dengue detection. Machine learning algorithms are known for their work. Extracting specific features from medical data and weather data and providing independent results.Analyze, identify, explore synergies in the research. Describe the climate and characteristics of dengue affected areas. This approaches limitations of the study and to address these limitations to guide more accurate and robust strategies.The research topic is centered on ml medical data and Lungs with a specific focus on progress in dengue detection.Through the innovative application of Ml.Dengue is not only for this year, so every time we research dengue data with weather data, we will get an idea about the amount of dengue next year. With the change in climate, the rate of dengue and rain is increasing, so people are more affected, but it is not possible to eradicate this mosquito. We need to be vigilant.With the help of Machine Learning Algorithm, we can easily find out the results and easily give everyone a preview so that every year, everyone will not have to face so much day after day or suddenly the number of dengue patients will not get rain.The main goal in dengue detection is to reduce prognosis and mortality.

Finally, research focused on applying machine learning algorithms to predict dengue by considering medical data as the focal point of lung breathing. Here not only the academic side but also contributing to the health sector as well as reducing the rate of disease. To maintain the health of the people of the country.

3.4 Project Management and Financial Analysis

Manage the project and divide tasks.Skills required for the project Evaluate the technology required for data collection, model training, and system deployment.Identify potential risks related to data quality, model performance, and develop strategies to mitigate them.Explore potential grants and funding opportunities for research and disease prediction projects. Conduct cost-benefit analysis to assess the economic viability of the project.Plan for financial contingencies in case of unexpected expenses or delays. Regularly re-evaluate and update inputs to increase the efficiency, effectiveness and sustainability of your dengue prediction project using ML and DL.

Table 3.4.1: Financial Analysis

SN	Components	Cost (BDT)
03	Software and Tools	500
04	Data Collection and Processing	2000
05	Documentation and Report Writing	1000
		3500

3.5 Summary

Identify and collect relevant data sources.Climate data (temperature, humidity, rainfall).Socio-economic indicators,Historical Dengue incidence,Human mobility patterns.Data Preprocessing data quality issues, missing values, outliers, and ensure data consistency. I will collect the data and then store it in the data drive. I will do two options for it. One will store 1/2 year data and the other will store monthly data. Then there are many null values and counter values which will be cleaned through preprocessing and here I will use leveling smoothing because the data will not be taken to a level if I apply the algorithms here, you will not get the correct result. After smoothing, I will take 80% of the 100% data and keep 20% for testing. Here I will use LR, SVM, DT, K-NN. Machine learning. I will specify which one has better accuracy and use it for prediction.Normalize or scale numerical features,Encode categorical variables.Methods to increase the robustness and generalizability of dengue prediction models.Real-time prediction Challenge Explore gaps in forecasting capabilities. Many models may be retrospective or rely on historical data, creating challenges for timely and effective predictions. Consider ways to improve conversions from real-time forecasts.I will use machine learning based methods like regression,linear,naive bayes .Temperature, humidity, rainfall and other relevant weather conditions, population density, along with the number of dengue cases, location-specific data. Organize data flow for dengue prediction system using ML data through system for prediction.Manage the project and divide tasks.Skills required for the project Evaluate the technology required for data collection, model training, and system deployment.Identify potential risks related to data quality, model performance, and develop strategies to mitigate them.Explore potential grants and funding opportunities for research and disease prediction projects. Conduct cost-benefit analysis to assess the economic viability of the project.

CHAPTER 4
IMPLEMENTATION

4.1 Overview

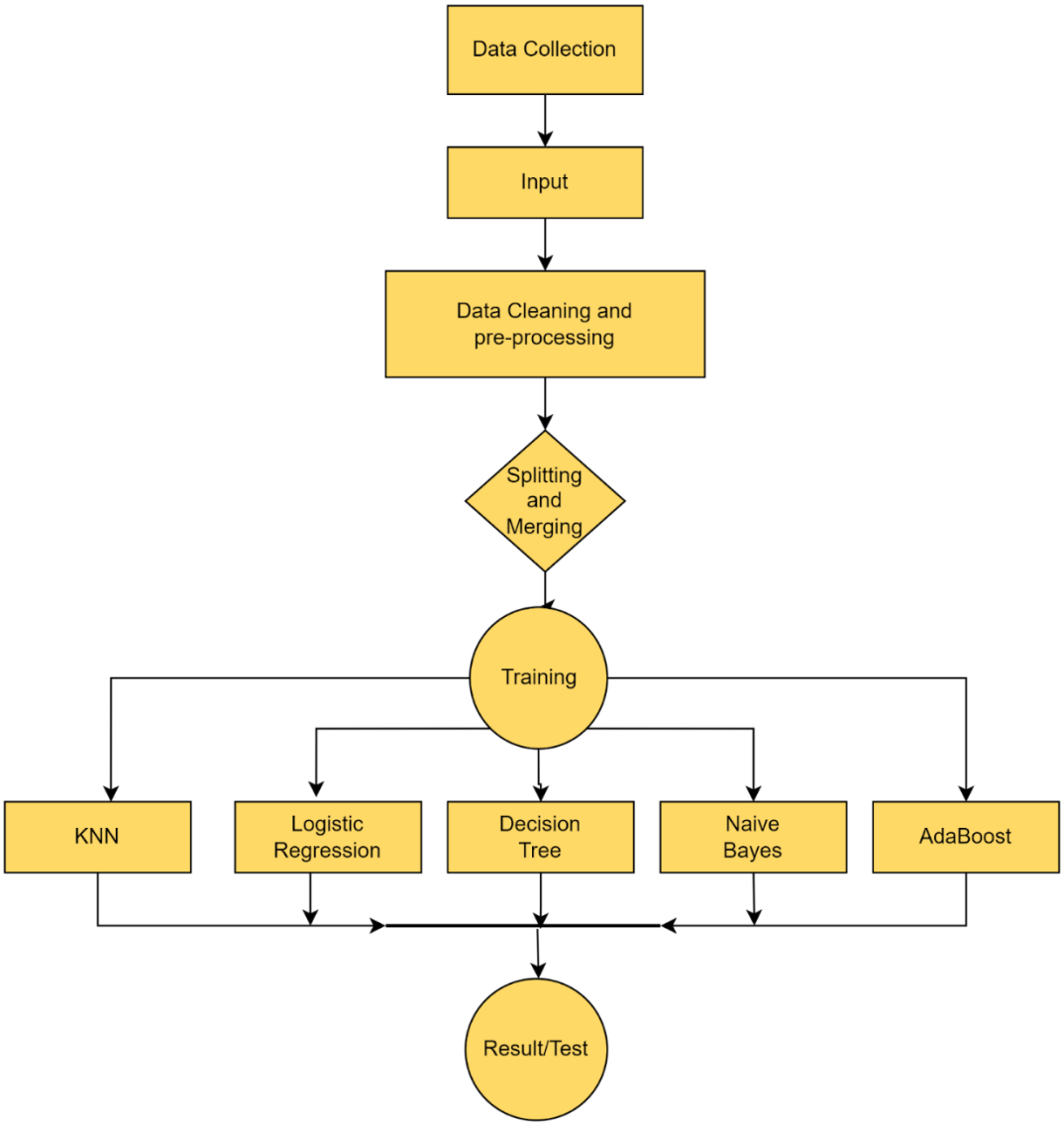


Figure 4.1.1: workflow diagram

Data must be collected first. Data must be imported as input. Then the data needs to be cleaned and preprocessed to apply the model. Since there are two datasets, the datasets have to be marched. Then the dataset should be trained. Now apply three machine learning

models. The models are KNN, Logistic Regression, Decision Tree. Now from the three models, the accuracy will be good, it will be the result.

4.2 Train Model

This step acts as a model learner. Dataset cleaning and preprocessing is done to train the dataset with three models used here: data analysis, feature removal, dataset merging, statistical analysis, distribution, data visualization, linear regression.These are used to check the accuracy by using. The dataset always has large imbalances but good results or accurate results are our goal so delete redundant data from the dataset and apply the model.

k nearest neighbor

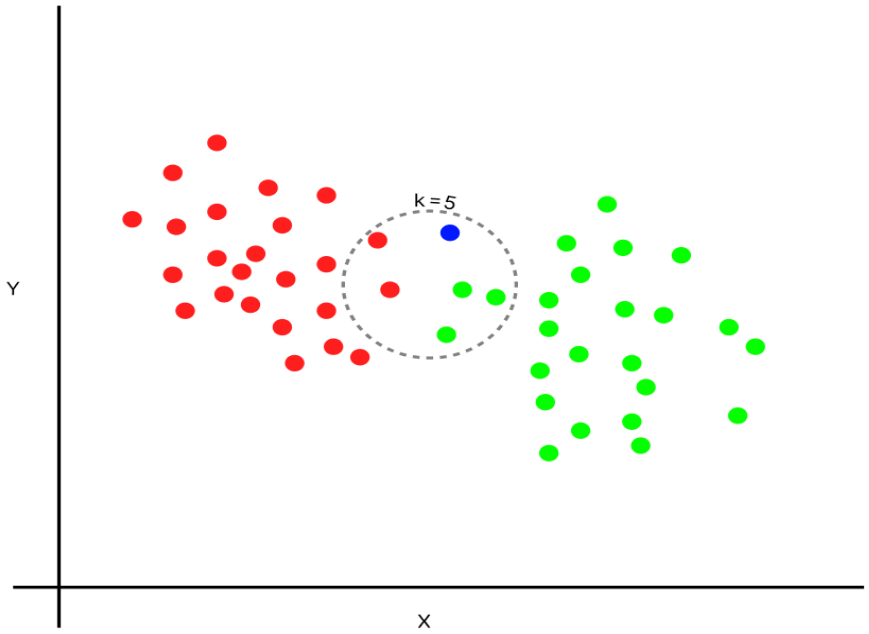
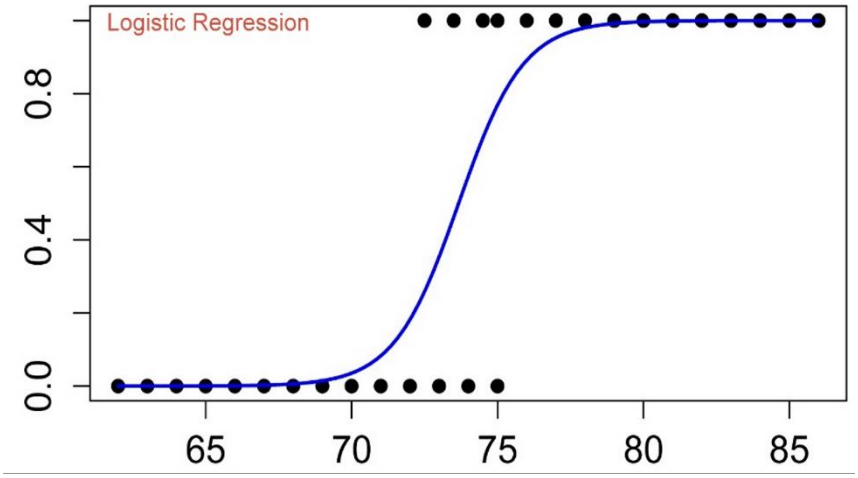


Figure 4.2.1:Diagram of k nearest neighbor

kNN algorithm is a machine learning algorithm. Through which we can solve data regression problems. Parton is also recognized as well as the domain involved in the implementation of this algorithm. Also in real life and settlement reasons. Because it makes no assumptions about the distribution of the data. This method classifies the coordinates in the dataset. Their two features complete two states of an object.A Manhattan when we travel by objects instead of space and calculate speed. Another is the Euclidean formula through which we can determine the velocity.They always operate on data of the same type

and predict the level of a new data point by considering the level or value of the nearest neighbor of the data set.

Logistic Regression:



4.2.2:Diagram of Logistic Regression

0.5 then it is taken as 1 and when the value is less than 0.5 then it is taken as 1. is. Usually used for classification in terms of linearity. Logistic predicts the dependent variable output. But time can be true or false from 0,1. Logistic regression predicts the maximum value.In this case no inputs are dependent and all are independent. There is no relationship between the variables. It can take only two values because binary is a two-way variable. In this case, there should be no outliers in the dataset. Here 1, 0 independent variables map to any real valued set of inputs.

Decision Tree:

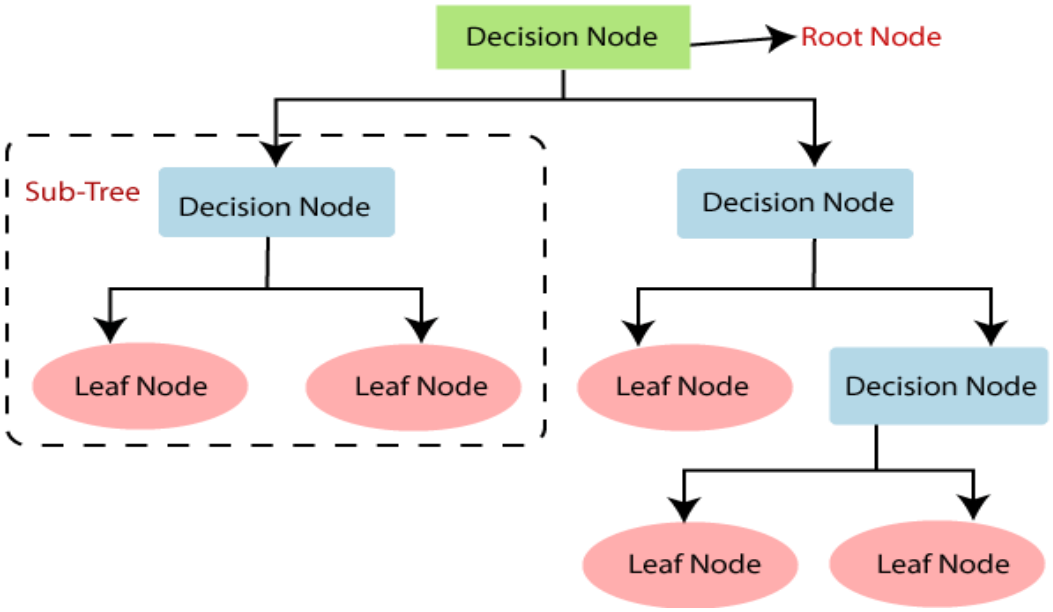


Figure 4.2.3:Diagram of Decision Tree

A decision tree works like a flow chart. They help in general decision making or forecasting. Here the nodes are the branches representing the results. Each node corresponds to an experiment. Each leaf node corresponds to a class. The root node acts as a representative in the decision-making dataset. The inner node represents the experiment. The leaf node always gives the final decision meaning the future.Decision tree works for decision making. Feature selection, entropy, feature selection for data partitioning, partitioning into subsets based on features. Iterating for subsets. All instances of a node belong to the same class which does not go to depth health.

Naive Bayes:

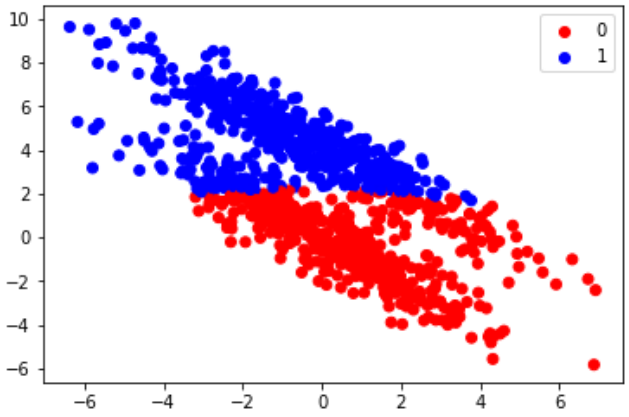


Figure 4.2.4: Diagram of Naive Bayes

Naive Bayes classifiers are a collection of classification algorithms . It is not a single algorithm but a family of algorithms where all of them share a common principle, i.e. every pair of features being classified is independent of each other.This model predicts the probability of an instance belonging to a class with a given set of feature values. It is a probabilistic classifier. It is because it assumes that one feature in the model is independent of the existence of another feature. In other words, each feature contributes to the predictions with no relation between each other. In the real world, this condition is rare. It uses Bayes theorem in the algorithm for training and prediction.

AdaBoost:

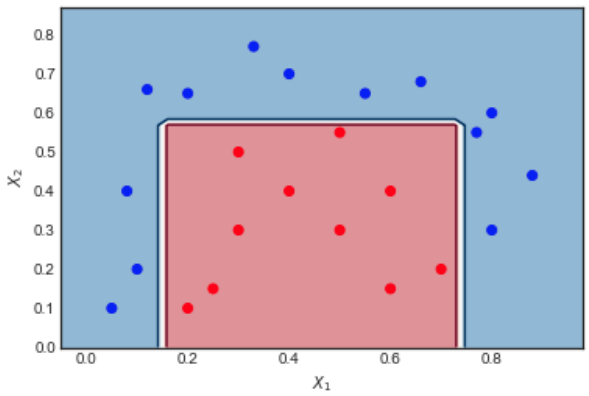


Figure 4.2.5: Diagram of Adaboost

AdaBoost in machine learning is one of these predictive modeling techniques. AdaBoost, also known as Adaptive Boosting, is a Machine Learning approach that is utilized as an Ensemble Method. AdaBoost is the most commonly used estimator of decision trees with one level, which is decision trees with just one split. These trees are often referred to as

Decision Stumps.This approach constructs a model and assigns equal weights to all data points. It then applies larger weights to incorrectly categorized points. In the following model, all points with greater weights are given more weight. It will continue to train models until a smaller error is returned.

4.3 System Testing

After applying the model logistic regression gave the best results followed by KNN. The decision tree gave the worst results. But to test whether KNN is a good forecasting model, we need to use the Resume value to average the predicted value by the actual value of the model. By resuming, we can see how inconsistent the values are. It shows how far the actual values are from the data. The lower the value, the better the model. Here the value is 0.38. Since the value is low we can say that KNN is a relatively good fit for predicting.

4.4 Summary

This step acts as a model learner. Dataset cleaning and preprocessing is done to train the dataset with three models used here: data analysis, feature removal, dataset merging, statistical analysis, distribution, data visualization, linear regression.I applied to the director of the hospital.Sign is coming from the application director then went to the statistics office where there is data they gave me a copy of the original copy they kept for their security then giving me data 2012-2023 weekly dengue data.The two data should be loaded separately in the lab, and then the data should be merged together. Weather data was from 1901 as my dengue data is from 2014 so I took weather data equal to dengue data from 2014-2023. Before data preprocessing use data cleaning and merge two dataset. Uses data preprocessing Data isnull(),Feature removal,Statistical Analysis,Data Visualization.After data preprocessing use ml model logistic regression,decision tree,k-nearest-neighbor. Best result shows Logistic regression and helps predict dengue and reduce people death

CHAPTER 5
RESULT AND ANALYSIS

5.1 Overview

Among the three models that I get from a dengue data set by predicting on weather dataset, LR works best for dengue prediction along with KNN and gives good results but the decision tree gives very bad results. Here LR works as the best model. Which helps in pre-housing and will reduce mortality. Two of the three models will work well but since we want to be more sure, the LR is best for that.Also in the prediction graph we will see that earlier the infected rate was low but now it is increasing day by day. Also, if you make a prediction from the previous sexual data, it can be seen that the rate of dengue will increase in the future

5.2 Experimental Result

This section compares the three K nearest neighbors,Decision Tree,Logistic Regression,Naive Bayes,AdaBoost.First comes the performance of the algorithms. Then comes the training performance of the models and finally comes the accuracy area of the models worked on.

Table 5.2.1:Accuracy for Classification of Individual

Architecture	Training Accuracy	Model Accuracy
K Nearest Neighbors	92.06%	92%
Logistic Regression	85.38%	85%
Decision Tree	56.90%	56%
Naive Bayes	78.20%	78%
AdaBoost	75.50%	75%

Linear Regression

The main purpose of the regression model is to determine the effect of independent variables on the dependent variable and to establish the relationship between them. In linear regression, the error is determined by fitting the model in such a way that the error is minimized. Only then will the forecast be minimal.

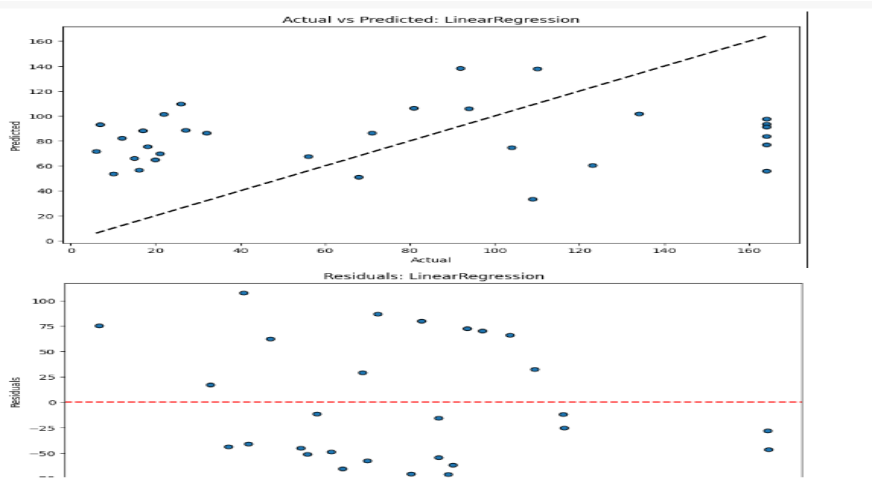


Figure 5.2.1:Flowchart of Linear Regression

Lasso

The main purpose of the Lasso model is to perform regularization with variable selection in regression models. Here the coefficients are reduced. Some are set to 0 which are excluded from the model. This is why fitting is done to provide correct results from the model.

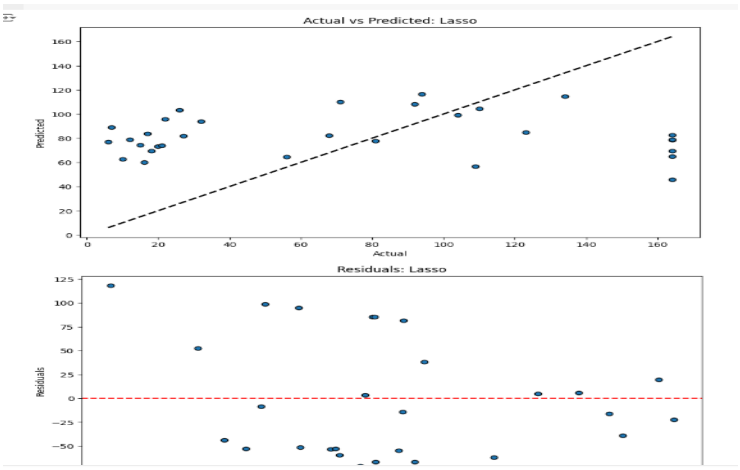


Figure 5.2.2:Flowchart of Lasso

Regression on coefficients uses the coefficients of all variables, whereas the Lasso model sets some coefficients to 0 and selects variables. Lasso models do not have regressions that shrink the coefficients. Model Simplification: Lasso model simplifies the model by omitting some variables, but ordinary regression uses all variables.

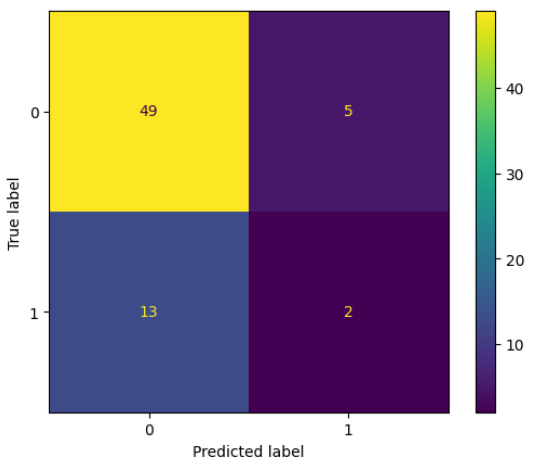
5.3 Comparative Analysis

The comparative analysis of several pre-trained Machine learning architectures, namely Logistic Studies have been done to predict dengue. The main point here is to reduce mortality by predicting and providing more avenues for research. This requires good results from a good dataset. If the results are not good then the dataset is not good either. For this, the data needs to be well cleaned and pre-processed to get good results. KNN gave the best results in the dataset because its accuracy is the highest. The results are model integration and features.Dengue forecasting is not only based on one study because if we can collect the data of dengue patients in other areas, we can predict what the situation will be with the weather of that area. Besides, there is no correct or specific medicine for dengue. If we have fever, we take normal medicine, same as if we have dengue

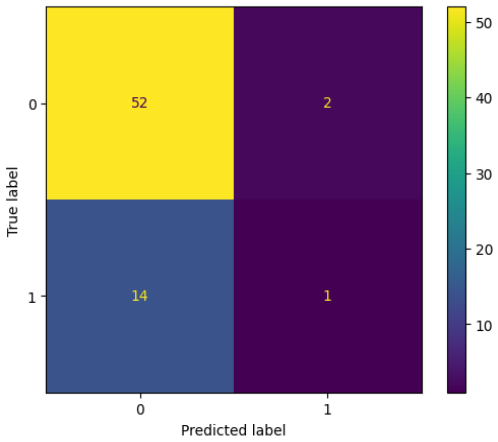
Table 5.3.1: Model,Accuracy,precision Score,Recall Score

Model	Accuracy Score	Precision Score	Recall Score
K Nearest Neighbors	0.9230434782608695	0.4772727272727273	0.4772727272727273
Logistic Regression	0.855072463768116	0.4758064516129032	0.44696969696969696
Decision Tree	0.5652173913043478	0.4642857142857143	0.29545454545454547
Naive Bayes	0.782608695652174	0.391304347826087	0.5
AdaBoost	0.75	0.5111111111111111	0.5054503729202524

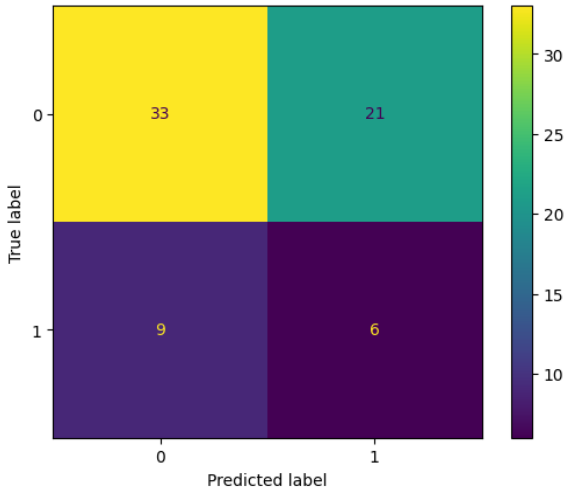
Table 5.3.1 compares the accuracy of the models. Here is an overview of the three models. Three models LR,DT,KNN,NB,AD. Here the accuracy, score, support value of each model is given. Also the architectures have given performance with outstanding results. Especially when applied to the test dataset the values are clear. In particular, these two models consistently exhibit higher accuracy scores in different classes.Confirming their effectiveness in accurate dengue detection. LR,KNN models show appreciable performance in forecast classification, DT model, in comparison, gives relatively low detection rate. Provides information to understand the model's strengths and limitations in the dengue forecast context.


49
5
13
2
True label
Predicted label
0
1
40
30
20
10

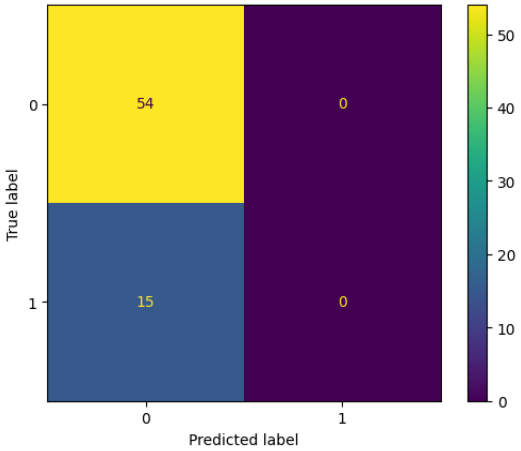
(a)


52
2
14
1
True label
Predicted label
0
1
50
40
30
20
10

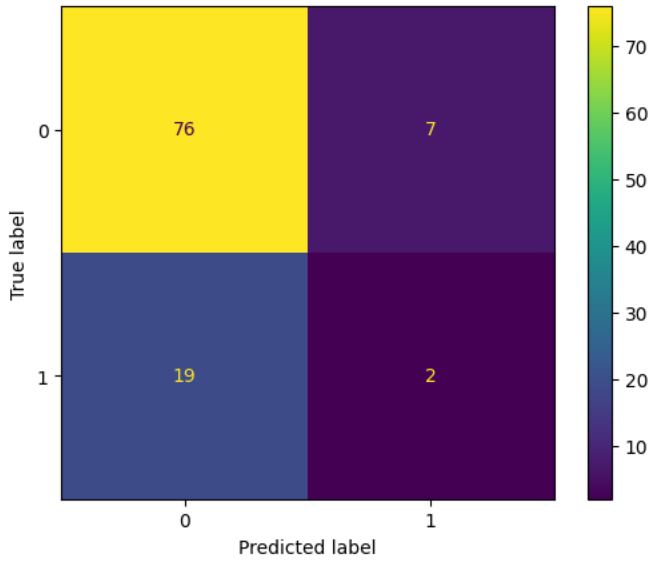
(b)


33
21
9
6
True label
Predicted label
0
1
30
25
20
15
10

(c)


54
0
15
0
True label
Predicted label
0
1
50
40
30
20
10
0

(d)



(e)

Figure 5.3.2:(a),(b),(c) ,(d),(e) Diagram of Logistic Regression,KNN,DT,NB,Adaboost

5.4 Summary

Among the three models that I get from a dengue data set by predicting on weather dataset, LR works best for dengue prediction along with KNN and gives good results but the decision tree gives very bad results. K nearest neighbors,Decision Tree,Logistic Regression,Naive Bayes,Adaboost.First comes the performance of the algorithms accuracy are 92%,56%,85%,78,75.Comparative analysis of several pre-trained Machine learning architectures, namely Logistic Studies have been done to predict dengue. A regression model is to determine the effect of independent variables on the dependent variable and to establish the relationship between them. In linear regression, the error is determined by fitting the model in such a way that the error is minimized.Main purpose of the Lasso model is to perform regularization with variable selection in regression models.Lasso models do not have regressions that shrink the coefficients.The main point here is to reduce mortality by predicting and providing more avenues for research. This requires good results from a good dataset.Especially when applied to the test dataset the values are clear. In particular, this 2two model consistently exhibits higher accuracy scores in different classes.Confirming their effectiveness in accurate dengue detection. LR,KNN models show appreciable performance in forecast classification, DT model, in comparison, gives relatively low detection rate.

CHAPTER 6
IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

6.1 Impact on Life

Dengue forecasting by machine learning and comparison between models. These not only help in academic studies but also have significant impact on health care. Timely predictions for machine learning algorithms have the potential to revolutionize disease that will reduce mortality and morbidity, leading to improved patient outcomes and societal benefits. Using machine learning algorithms to drive better patient outcomes and the biggest societal improvements. Efforts to increase accuracy and efficiency in dengue forecasting will enable better decision making. This research is influenced in several ways. Public health, social. Dengue affects millions of people leading to illness. Health care can be a problem when many people need to be treated together but hospitals struggle because they can't do it properly and patients die due to lack of treatment. Again, there is no medicine for this disease, Napa, Fexo, Monas, normal fever, whatever it is, but if they work, if it is more serious, then the lunge is affected and the patient suffering from long-term health problems has to spend extra money on medicine and tests. Sometimes the test is so late that the treatment is too late and the patient goes to the serious stage. For example, if Dhaka is identified as a high dengue affected area, then there will be a lag in terms of business and tourists will decrease. Because no one will come to be affected by dengue. Again, boys and girls will not be able to go to school due to illness. If they drop out of their studies or perform poorly then the pass rate or pass rate will decrease. But public health will be most affected. Dengue infections are often fatal and cause dengue infections, burdening health care systems worldwide. Patient self-care is also important for more accurate prognosis and disease reduction. It also contributes to reducing the cost of hospitalization of dengue patients. If emphasis is placed on comprehensive research, people will not face complications. This will help everyone in the real world. To diagnose advanced dengue, if we collect the weather of the region and apply the model on it, we will easily know what is the rate of dengue infection next year. In this way, we will know in advance how much dengue can be in any area in any year. Doing so is consistent with global health initiatives that transcend geographic boundaries. No more dependence on medication by reducing disparities. Knowing this in advance contributes to public health outcomes and overall well-being.

6.2 Impact on Society and Environment

Although the main focus of research is on predicting dengue using machine learning, the implications for healthcare and technical environments are modest yet significant. Machine learning algorithms are involved in medical advancements as well as structurally. These processes are trained, optimized, and depend on the computing power of the hardware. In addition to improving the environment, reducing costs. Especially large data sets, complex models increase energy consumption and costs. Advancing technology in healthcare has implications as well as implications. However, environmental concerns are becoming more aware with machine learning. Which leads to algorithm and hardware optimization. Technology is also linked to the advancement of the environment. Actual consideration of impact on the environment. Balances progress and dictates awareness. Also depends on temperature and rain. Because forecasting is not possible without weather. To maintain the immediate balance for vector control with long-term environmental sustainability. Rainfall patterns are not always the same, so data must be collected and checked every year without thinking about it. Also, without planning houses, the environment is polluted.

6.3 Ethical Aspects

Research on dengue prediction using machine lancing. The data used here by the hospital has a lot of patient information and can be done as needed, but using the medical data to keep the patient information confidential shows ethical responsibility and loyalty. More vetted information with patient privacy. Social welfare is an integral part here as well. Besides, it is the responsibility to protect the amount of data collected with security. If the disease can be predicted by keeping the patient's information confidential, then the relationship with the hospital and common people, students will be better. Also, they will help in any work without any hesitation. Ethics is the main factor in any job, no matter what the job is. If you don't work with ethics, chances of success are very low. Besides, from where did I get the data, how did I work with them and ethics, because if anyone can lie, it will prove that there is no ethics. Ethics should also be kept in mind while choosing a model. Applying any model is not enough. All work requires ethics but in research there is a great need to work with ethics

6.4 Sustainability Plan

Not only should research be done but sustainability should also be considered. As I researched today, it will be over tomorrow, and I have to keep an eye on how it is affecting

them. For example, Dengue is not only for academic help but also to ensure how to reduce the impact from the environment. Training and applying the model to think about how much computer damage is caused by it. Think about how much computer damage is caused by training and applying the model. Because applying any model will not work because if it damages the computer, there will be a big problem and the project will be locked. Because of so much damage, no one will work on it for a second time, which is very expensive. Besides, we are collecting data in this case, we have to think about how environmentally friendly it is. If we don't think so, then we have to change the plan. Because sustainability will increase only by solving problems and working in an environmentally friendly way. Because there are so many problems now, policies will be prioritized first. Among so many problems, if we focus on responsible, environmentally friendly scientific innovation, sustainability will increase to a large extent.

6.5 Summary

Dengue forecasting by machine learning and comparison between models. These not only help in academic studies but also have significant impact on health care. Health care can be a problem when many people need to be treated together but hospitals struggle because they can't do it properly and patients die due to lack of treatment. Again, there is no medicine for this disease, Napa, Fexo, Monas, normal fever, whatever it is, but if they work, if it is more serious, then the lunge is affected and the patient suffering from long-term health problems has to spend extra money on medicine and tests. Sometimes the test is so late that the treatment is too late and the patient goes to the serious stage. For example, if Dhaka is identified as a high dengue affected area, then there will be a lag in terms of business and tourists will decrease. In addition to improving the environment, reducing costs. Especially large data sets, complex models increase energy consumption and costs. Advancing technology in healthcare has implications as well as implications. The data used here by the hospital has a lot of patient information and can be done as needed, but using the medical data to keep the patient information confidential shows ethical responsibility and loyalty. More vetted information with patient privacy. Social welfare is an integral part here as well. Besides, it is the responsibility to protect the amount of data collected with security. Because of so much damage, no one will work on it for a second time, which is very expensive. Besides, we are collecting data in this case, we have to think about how environmentally friendly it is. If we don't think so, then we have to change the plan. All work requires ethics but in research there is a great need to work with ethics.

CHAPTER 7
CONCLUSION AND FUTURE WORK

7.1 Conclusions

Early detection of dengue has become a prerequisite. It is the main focal point for evaluating the performance of machine learning using dengue data based on meteorological data. Emphasis on Machine Learning Algorithms and Dataset Performance Using Machine Learning Algorithms on datasets. Deficits for dengue forecasting are clearly highlighted. There are 3 different models developed to predict the dengue occurrences and each with varying degrees of accuracy. Dengue should not only be found out accurately but should also be tried so that early detection is done. Because people are not careful, they need to understand as much as possible about them. This research is not about dengue data, only here weather data is used to predict dengue using machine learning algorithms. But the smaller the data set, the fewer problems to face. The data set is big because of the two data sets, so we have to face the problem to bring accuracy. And if it is big, there is no deficiency in accuracy because if it is small, a lot of data is left out, but here there is no such possibility at all. Three models are applied and each model gives accurate results. The goal is to reduce the death rate associated with dengue. Besides trying to cooperate with health authorities, they are not able to work on how to reduce the transmission of the disease. Because they cannot identify the disease in its early stage. That's why they can't reduce it even if they want to. My work is academic as well as helpful in reducing dengue for a specific area. I am saying specific areas because the result is different from area to area.

7.2 Further Suggested Works

Studies have been done to predict dengue. The main point here is to reduce the mortality rate by prediction and also to provide more avenues for research. This requires good results from a good dataset. If the results are not good then the dataset is not good either. For this, the data needs to be well cleaned and pre-processed to get good results. Logistic regression gave the best results in the dataset because its accuracy is the highest. The results are model integration and features. Dengue forecasting is not only based on one study because if we can collect the data of dengue patients in other areas, we can predict what the situation will be with the weather of that area. Besides, there is no correct or specific medicine for dengue. In case of fever, we take the same medicine as the normal medicine, but in case of dengue, we take the same medicine, which does not have any effect. There is no substitute

for predicting dengue and reducing the dengue rate because people slowly progress to the serious stage.

7.3 Limitations

Limitations" means limitations or limits on the ability of an act or thing. It is something that prevents or limits an action or activity. For example, the limitation of dengue prediction is that the data of the area to be worked with will give an idea about the area. Can't find out about other areas. Limitation means dataset, area, geographical limitation. As such the disease area will be different based on weather defended on it. The dataset I am collecting is just a specific area. This is Dhaka, that's why we can predict or predict on the weather data of Dhaka how dengue will be next year. But other areas cannot be said depending on the results of this data. Again, it is not possible to say which geographical country. But one thing that can be done is that if we follow the SIM process, we can easily know about other areas.

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Appendix A

Course Outcomes, Complex Engineering Problems (EP) and Complex Engineering Activities (EA) Addressing

Title: ANALYSIS THE DENGUE PATIENTS INCREASING RATE IN BANGLADESH BASED ON WEATHER BY USING MACHINE LEARNING MODELS

Student ID: 202-15-14385

CO Description for FYDP

CO	CO Descriptions	PO
	Phase -I	
CO1	Integrate recently gained and previously acquired knowledge to identify a **dengue Prediction problem** for the Final Year Design Project (FYDP)	**PO1**
CO2	Analyze different aspects of the goals in designing a solution for this FYDP	**PO2**
CO3	Explore diverse problem domains through a literature review , delineate the issues, and establish this goals for the FYDP	**PO4**
CO4	Perform economic evaluation and cost estimation and employ suitable project management procedures throughout the development life cycle of the FYDP	**PO11**
	Phase -II	
CO5	Design and develop technical solutions and system components or processes that meet specified requirements, ensuring compliance with public health and safety standards, as well as considering cultural, socioeconomic, and environmental factors in this FYDP	**PO3**
CO6	Choose and apply appropriate methodologies, resources, and contemporary engineering and IT technologies to address complex engineering processes, encompassing prediction and modeling, while adhering to relevant constraints in this FYDP	**PO5**
CO7	Analyze societal, health, safety, legal, and cultural considerations, along with associated responsibilities, in the context of professional engineering practice and the resolution of this problem, employing logical reasoning guided by contextual understanding.	**PO6**

CO8	Comprehend and evaluate the enduring sustainability and impact of professional engineering endeavors in addressing intricate engineering challenges within social and environmental frameworks.	**PO7**
CO9	Implement ethical principles and adhere to professional standards and norms in this FYDP	**PO8**
CO10	Capable of operating proficiently both individually and as a team member or leader across diverse teams and interdisciplinary settings in this FYDP.	**PO9**
CO11	Proficiently communicate with the engineering community and broader society regarding complex engineering endeavors, including the ability to comprehend and generate comprehensive reports and design documentation, as well as provide and receive clear instructions throughout this FYDP.	**PO10**
CO12	Acknowledge the importance of self-directed and life-long learning within the evolving landscape of technology, and possess the readiness and capability to engage in lifelong learning endeavors.	**PO12**

Addressing CO (1 to 8), Knowledge Profile (K), Attainment of Complex Engineering Problems (EP), and Attainment of Complex Engineering Activities (EA)

Addressing CO (1 to 8), Knowledge Profile (K), Attainment of Complex Engineering Problems (EP):

SN	EP Definition	Attainment	CO	Justification (with Knowledge Profile)	References
1.	**EP1: Depth of Knowledge required**	Yes	CO1, CO2, CO3, CO5, CO6, CO7 and CO8	This project **fundamental engineering (K3)** principles along with data cleaning preprocessing, machine learning algorithm logistic regression, decision tree KNN architecture. **specialist knowledge (K4)** Algorithms compare among themselves to predict dengue mortality and reduce infection rates	**Page no: 18-26 Section: 4.2 Page no: 28-30 Section: 4.3**
				The project applies **engineering practice & design (K5)** by the experiments of figure. The project addresses **engineering practice & technology (K6)** by utilizing the Machine Learning model.	**Page no: 16 Section: 4.1 Page no: 25-30 Section: 4.2**

				This project ensures **K8** (Research Literature) Synthesizing from research, dengue detection using machine learning, demonstrates the current comprehensive understanding.	**Page no: 12-15 Section: 2.2**
2.	**EP2: Range of Conflicting Requirements**	Yes	CO2, and CO7	This project addresses **EP-2** by recognizing the constraints of dengue forecasting, including method limitations and the complexity of integrating machine learning. The analysis tackles the challenge of understanding spatial distribution, providing insights to refine dengue.	**Page no: 38 Section: 7.3**
3.	**EP3: Depth of analysis required**	Yes	CO2, and CO6	This project addresses **EP-3**, highlighting the machine learning algorithm of logistic regression as a solution to enhance dengue prediction among multiple approaches, by finely comparing the results.	**Page no: 30-38 Section: 4.4**
4.	**EP4: Familiarity of Issues**	Yes	CO8	This project extends beyond computer science and engineering, influencing medicine in dengue respiratory diseases, and contributing to the advancement of public health practice that **EP-4** directs.	**Page no: 36-37 Section: 6.1,6.2**

5.	**EP5: Extends of application codes**	Yes	CO5	Determining whether or not the current user load scenario is effective before treating it dynamically. We specifically need to figure out how to measure the load time for this purpose.	**Page no: 25 Section: 3.1**
6.	**EP6: Extends of stakeholder involved & conflicting requirements**	No	CO8	N/A	N/A
7.	**EP7: Interdependence**	Yes	CO5	By integrating the various components of this project's data collection, analysis, and proposed high-level problem solving, **EP-7** ensures solutions to complex challenges in medical dengue data.	**Page no: 23-27 Section: 4.2**

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24-04-2024

To
Dr. Md.Shafiur Rahman
Director,Shaheed Suhrawardy Hospital
Sher-E-Bangla Nagar,Dhaka-1207
Dhaka, Bangladesh

Subject: Request for Access to Medical Records for Academic Research on Dengue Prediction.

Dear sir

I am writing to formally request access to medical records that are crucial for my academic research. My name is Dipa Rani Saha, and I am currently a final year student in the Department of Computer Science and Engineering at Daffodil International University. I am working on my thesis titled "Dengue Prediction Using Machine Learning & Deep Learning," under the supervision of Ms. Sharmin Akter, Lecturer (Senior scale), sharminakter.cse@diu.edu.bd, 01798625502, Department Of Computer Science and Engineering.

My research aims to create a predictive model that will aid in the early identification and containment of dengue fever outbreaks. Precise and thorough medical data are vital to my research. For this reason, I am asking to view the medical records for Dengue patients who were treated at Suhrawardy Hospital for the previous. I am especially interested in the following data: patient age, gender, diagnosis date, symptoms, test results, and treatment outcomes, among other things. Please be aware that patient confidentiality will be strictly respected and that all data will only be utilized for academic reasons.

I understand the sensitivity and privacy concerns related to patient medical records, and I am willing to comply with all protocols and procedures that your institution deems necessary for data sharing. I am also ready to discuss a data usage agreement and sign any confidentiality agreements you require.

I would be grateful if you could inform me about the process and any specific requirements or forms that I need to fulfill to access the data. I am keen to arrange a meeting to discuss this further and can be reached by email at dipa15-14385@diu.edu.bd or phone at 01608556629. Thank you very much for considering my request. I look forward to your positive response.

Yours sincerely,
Dipa Rani Saha
ID: 202-15-14385
Daffodil International University

Recommended
Please help her
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