CRIME PREDICTION USING LINEAR REGRESSION MODEL

A PROJECT REPORT

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BONAFIDE CERTIFICATE

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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ABSTRACT

Crime is one of the biggest and dominating problem in our society and its prevention is an Important Task. Daily there are huge numbers of crimes committed frequently. This requires keeping track of all the crimes and maintaining a database for same which may be used for future reference. We demonstrate the utility of the platform by visualizing spatial and temporal relationships in a set of real-world crime datasets. Predictive capabilities of the platform are demonstrated by predicting crime categories, for which a machine learning approach is used. To construct a model by using a algorithms as Random Forest Classifier, Logistic Regression, Support Vector Machine, Linear Regression. The current problems faced are maintaining of proper dataset of crime and analyzing this data to help in predicting and solving crimes. We propose a system which can analysis, detect, and predict various crime probability in given region. This project highlights the potential benefits of crime prediction for law enforcement agencies and policy makers, and discusses the challenges and limitations of this approach. Overall, this project emphasizes the importance of developing effective crime prediction models to improve public safety and reduce crime rates.

KEYWORDS: crime prediction, linear regression, public safety, future prediction, crime, Machine learning.

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LIST OF ABBREVIATION

WORD	ABBREVIATION
KNN	K Nearest Neighbor
SVM	Support Vector Machine
RFR	Random Forest Regression

CHAPTER 1

INTRODUCTION

Outline of the project:

Crimes are the significant threat to the human kind. There are many crimes that happen at regular interval of time. Perhaps it is increasing and spreading at a fast and vast rate. Crimes happen from small village, town to big cities. Crimes are of different type – robbery, murder, rape, assault, battery, false imprisonment, kidnapping, homicide. Since crimes are increasing there is a need to solve the cases in a much faster way. The crime activities have been increased at a faster rate and it is the responsibility of police department to control and reduce the crime activities. Crime prediction and criminal identification are the major problems to the police department as there are tremendous amount of crime data that exist. There is a need of technology through which the case solving could be faster. The aim of this project is to make crime prediction using the features present in the dataset.

The dataset is extracted from the official sites. With the help of machine learning algorithm, using python as core we can predict the type of crime which will occur in a particular area. Through many documentation and cases, it came out that machine learning and data science can make the work easier and faster. The inputs to our algorithms are year, state, district and class of crime:

• Act 379 - Robbery

• Act 13 - Gambling

• Act 279 - Accident

• Act 323 - Violence

• Act 302 - Murder

• Act 363 – Kidnapping

The output is the class of crime that is likely to have occurred. We try out multiple classification algorithms, such as Linear regression, Support Vector Machine (SVM), Logistic Regression and Random Forests.

Crime rate forecast is a scheme that uses different algorithms to determine the crime rate based on prior information. For our daily purposes we must go many places every day and many times in our daily we face numerous security issues such as hijacking, kidnapping, harassment, etc. In general, we see that we are searching for Google Maps when we need to go anywhere at first, Google Maps show that one, two or more ways to get to the destination, but we always choose the shortcut route, but we do not comprehend the path condition properly. Is it safe or not that's why we are faced with many unpleasant circumstances; this research introduces the design and execution of a strategy based on past crime data and analyzes the crime rate in past areas at distinct moments; for this work, we use primary data those are collected from the people based on their previous crime problem.

In our train information collection, we used different algorithms to figure out the highest precision between the Linear Regression algorithms that provides the greatest precision. In this paper, we use different models and table to show the different types of crime rate, mostly working data from last 7 years of crime and showing the level of crime prediction in different issues described in Sect.

Dataset platforms:

- Kaggle
- Open.gov.in
- India crime record bureau

Objective:

The prediction using machine learning techniques that is prediction rules. Frequent patterns are extracted based on the criteria's like crime type. Prediction is done based on the previous year datasets. The prediction report consists of all the datasets from the year 2015-2022.the year wise comparison is shown based on the state wise datasets. The clustering algorithm can be perform based on every datasets based on each year comparison is made.

CHAPTER 2

LITERATURE SURVEY

2.1 Project Title: Crime Analysis and Prediction Using Machine Learning
Authors: Roopa, Prof. Thouseef Ulla Khan
Year: 09 sep 2022 International Research Journal of Engineering and Technology (IJREAT).

Description:

This paper uses data mining approach known as "Prediction Rules" for crime pattern detection as well as automation for early crime prediction. Predicts crime trends based on past crime information, date and location

Advantage:

- Conducting criminal analysis and identifying trends in crime.
- Disseminate knowledge to help with the creation of crime reduction and preventive measures.

Limitations:

- The accuracy and reliability of machine learning models heavily depend on the quality and representativeness of the input data.

2.2 Title : Crime Analysis Using K-Means Clustering

Authors: Khushabu A. Bokde, Tiksha P. Kakade, Dnyaneshwari S. Tumsare, Chetan G. Wadhai

Published On : International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 vol.7 Issue 04, April-2018

Description :

In this paper crime analysis is done by performing k-means clustering on crime dataset using rapid miner tool and deploy on the web server.

Advantages:

- Visual and intuitive criminal and intelligence investigation techniques can be developed for crime pattern.
- It can process the data with large number of variables or dimensions making it suitable for analyzing.

Limitations:

- Crime data may have different types of features, such as time series or spatial data, which may require different distance metric

2.3 Title : Crime Data Analysis Using Machine Learning

Authors : P. Bhanumathi, S. Greeshma

Published On: International Journal of Research in Engineering, Volume 12 Issue 07, July 2022

Description:

This paper uses the data of past 18 years that is collected from various trusted sources. Data pre-processing is as important as final prediction, this paper used feature selection, removing null values and label encoding to clean and nourish the data. This research gives an efficient machine leaning model for predicting the next criminal case

Advantage:

- high accuracy in this model prediction methodology.

Limitations:

- Over fitting occurs when a model becomes too specialized in the training data and fails to generalize well unseen data.
- The accuracy and reliability of machine learning models heavily depend on the quality and representativeness of the input data.

2.4 Title: Empirical Analysis for Crime Prediction and Forecasting Using Machine Learning and Dee Learning Techniques

Authors : Wajiha Safat, Sohail Asghar and Saira Andleeb Gillani

Published On : May 6, 2021 IEEE Conference

Description:

In this paper crime forecasting results were further identified in the main regions for both cities, overall these results provide early identification of crime, hot-spots with higher crime rate and future trends with improved predictive accuracy than with other methods and are useful for directing police practice and strategies.

Advantage:

- It can handle large data sets with high number of variables efficiently.
- Facilitating scalability and faster computation.

Limitations:

- Typically requires a large amount of labeled data for training.

2.5 Title: Crime Data Analysis Using Machine Learning

Authors : P.Kiran, B.Mounika, P.Naveen, N.Tejashwini and B.Karthik

Published On : Dec 2022, South Asian Journal of Engineering and Technology (SAJET).

Description:

In this project, Machine Learning and data science Techniques are used for crime prediction of Chicago crime data set. For this supervised classification Random Forest method used.

Advantage:

- The model predicts the type of crime with accuracy of 0.789.
- This can lead to more accurate crime predictions compared to traditional methods.

Limitations:

While Random Forest provides accurate predictions, it can be challenging to interpret the underlying decision making process.

2.6 Title: Crime Prediction and Analysis Using Machine Learning

Authors : S.K. Senthil KUmar, Gampa Adarsh, Jessu Shashank and MD. Abdul Smaeer.

Published On : June 2021, International Journal of Techo Engineering (IJTE).

Description:

In this project, using the techniques of Machine Learning and data science for crime prediction of Chicago crime data set. The K-Nearest Neighbour and various Algorithms are tested for crime prediction.

Advantage:

- This allows it to adapt quickly to new data without requiring retaining the model.

Limitations:

- If the majority class dominates the neighbourhood, it may result in misclassification of the minority class.
- It can be slow and memory intensive for large datasets.

CHAPTER 3

METHODOLOGY

3.1 Existing system:

In the existing system of crime prediction using the K-nearest neighbors (KNN) algorithm is the "Chicago Crime Prediction" system developed by researchers at the University of Chicago This system uses historical crime data from the Chicago Police Department to predict the type of crime that is likely to occur in a particular location and time period.

In crime prediction, there can be a large number of features to consider, such as location, time, type of crime, weather, and demographics. The KNN algorithm may struggle to make accurate predictions with a high-dimensional dataset.

Limitation:

- By this methodology they had less accuracy in prediction.
- The prediction results are not perfect.
- This algorithm can be sensitive to noisy data, which can lead to poor performance or incorrect predictions.

3.2 Proposed system:

The proposed system is made on the basis of the research work that is done by going through various such documentations. Nearly all of the crimes are predicting based on the location and the types of crimes that are occurring in those areas. The crime data is extracted from the official portal of police. It consists of crime information like location description, type of crime, year,

month, state district. Before training of the model data preprocessing will be done following this feature selection and scaling will be done so that accuracy obtain will be high. The Linear Regression classification and various other algorithms (Logistic Regression, Support Vector Machine and Random Forest) will be tested for crime prediction and one with better accuracy will be used for training. Visualization of dataset will be done in terms of graphical representation of many cases for example at which time the criminal rates are high or at which state of the criminal activities are high. The whole purpose of this project is to give a just idea of how machine learning can be used by the law enforcement agencies to detect, predict and solve crimes at a much faster rate and thus reduces the crime rate. This can be used in other states or countries depending upon the availability of the dataset.

The data set contains different types of crimes that being committed in India according to the state and year respectively .This paper takes types of crimes as input and gives the area in which crimes are committed as output. The data pre-processing involves data cleaning, feature selection, dropping null values, data scaling by normalizing and standardizing.

Advantages:

- Helps to prevent crime in society
- System will keep historical record of crime.
- System is user friendly
- Saves time
- Gives high accuracy
- Reduce crime rates

Machine Learning Algorithms:

In our project we used Supervised Learning of Algorithms to analyze and predict the crime.

Supervised Learning:

Supervised learning is a type of machine learning algorithm where the model is trained using a labeled dataset. In other words, the data used for training the model includes both input features and their corresponding output labels. The goal of supervised learning is to create a function that can accurately predict output labels for new input data based on patterns learned from the training data.

Types of Supervised Learning:

There are two main types of supervised learning algorithms.

- Regression
- Classification

Regression:

Regression is used when the output variable is a continuous value. The goal is to create a function that can predict a numerical value for a given set of input features. Regression includes some type of algorithms are,

- Linear Regression
- Regression Trees
- Non-Linear Regression
- Bayesian Linear Regression
- Polynomial Regression

Classification:

Classification algorithms are used when the output variable is categorical, which

means there are two classes such as Yes-No, Male-Female, True-false, etc.

Spam Filtering, It includes,

- Random Forest
- Logistic Regression
- Support vector Machines

3.3 Proposed Algorithms:

3.3.1 Linear Regression Algorithm:

Is a relationship between a dependent variable and one or more independent variables. In other words, linear regression is used to predict a continuous output variable based on one or more input features that have a linear relationship with the output variable.

The linear regression model assumes that there is a linear relationship between the independent variables (also known as features or predictors) and the dependent variable (also known as the response variable or target). This linear relationship is represented by a straight line equation of the form y = mx + b, where y is the dependent variable, x is the independent variable, m is the slope of the line, and b is the y-intercept.

Multi-linear regression is a sort of mathematical approach to finding a relation between the dependent variables (Type of crime) and a set of

independent variables those input values gathered from the crime spot. This methodology predicts the Era of the victims district values based on the input characteristics indicate in the metadata column. The multi-linear regression is:

$Y = \beta 0 + \beta 1x1 + \beta 2x2 + \cdots + \beta p \text{ x } p$ (1)

Here,

Y performs as the reliant variable

X performs the independent variable

β represent the coefficient formula function of regression.

3.3.2 Random Forest Algorithm:

It is very popular ensemble learning method which builds a number of classifiers on the training data and combines all their outputs to make the best predictions on the test data. Thus, the Random Forests algorithm is a variance minimizing algorithm that uses randomness when making split decisions to help avoid over fitting on the training data. A random forests(Fig 4.5) classifier is an ensemble classifier, which aggregates a family of classifiers h(x|θ1),h(x|θ2),..h(x|θk). Each member of the family, h(x|θ), is a classification tree and k is the number of trees chosen from a model random vector. Also, each θk is a randomly chosen parameter vector. If D(x,y) denotes the training dataset, each classification tree in the ensemble is built using a different subset Dθk(x,y) ⊂ D(x,y) of the training dataset.

$$y = \text{argmax}_{p \in \{h(x_1)..h(x_k)\}} \{ \sum_{j=1}^{\kappa} (I(h(x|\theta_j) = p)) \}$$

Thus, h(x|θk) is the kth classification tree which uses a subset of features xθk ⊂ x to build a classification model. Each tree then works like regular decision trees: it partitions the data based on the value of a particular feature (which is selected randomly from the subset), until the data is fully partitioned, or the maximum allowed depth is reached. The final output y is obtained by aggregating the results thus: where I denote the indicator function.

3.3.3 Support Vector Machine Algorithm (SVM):

It works by finding the best possible decision boundary (or hyperplane) that separates the different classes in the data. In the context of classification, SVM seeks to find the hyperplane that maximizes the margin between the different classes, which is the distance between the hyperplane and the closest data points from each class. These closest points are called support vectors, and they play a crucial role in defining the decision boundary.

The basic idea behind SVM is to transform the input data into a higher dimensional space, where a linear decision boundary can be found to separate the classes. This transformation is performed by a function called the kernel function, which calculates the similarity between each pair of data points in the input space.

There are several types of kernel functions that can be used with SVM, such as linear, polynomial, radial basis function (RBF), and sigmoid. The choice of kernel function depends on the nature of the data and the problem at hand.

3.3.4 Logistic Regression Algorithm:

Logistic regression is one of the most popular Machine Learning algorithms, which comes under the Supervised Learning technique. It is used for predicting the categorical dependent variable using a given set of independent variables.

Logistic regression predicts the output of a categorical dependent variable. Therefore the outcome must be a categorical or discrete value. It can be either Yes or No, 0 or 1, true or False, etc. but instead of giving the exact value as 0 and 1, it gives the probabilistic values which lie between 0 and 1.

Logistic Regression is much similar to the Linear Regression except that how they are used. Linear Regression is used for solving Regression problems, whereas Logistic regression is used for solving the classification problems. In Logistic regression, instead of fitting a regression line, we fit an "S" shaped logistic function, which predicts two maximum values (0 or 1).

CHAPTER 4

DIAGRAM REPRESENTATION

4.1 Data Flow Diagram

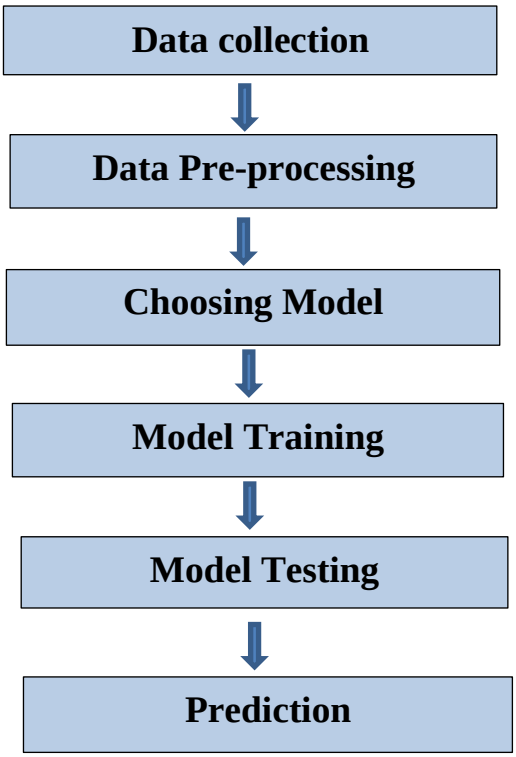

Fig 4.1. Data flow diagram

4.2 Simple Architecture Diagram

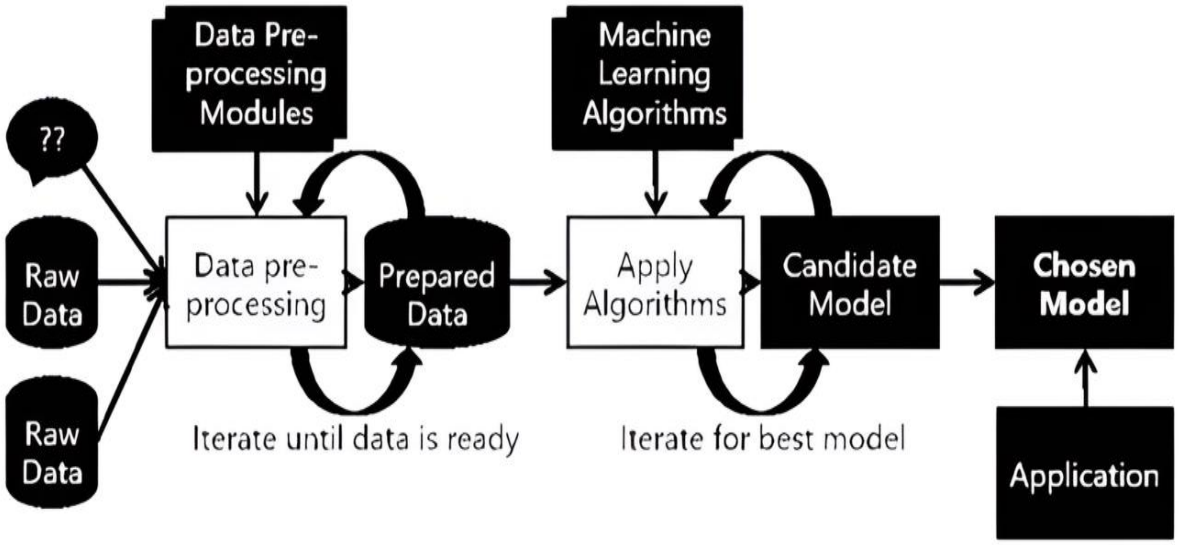

Fig 4.2. Simple Architecture Diagram

4.3 Detailed Architecture Diagram

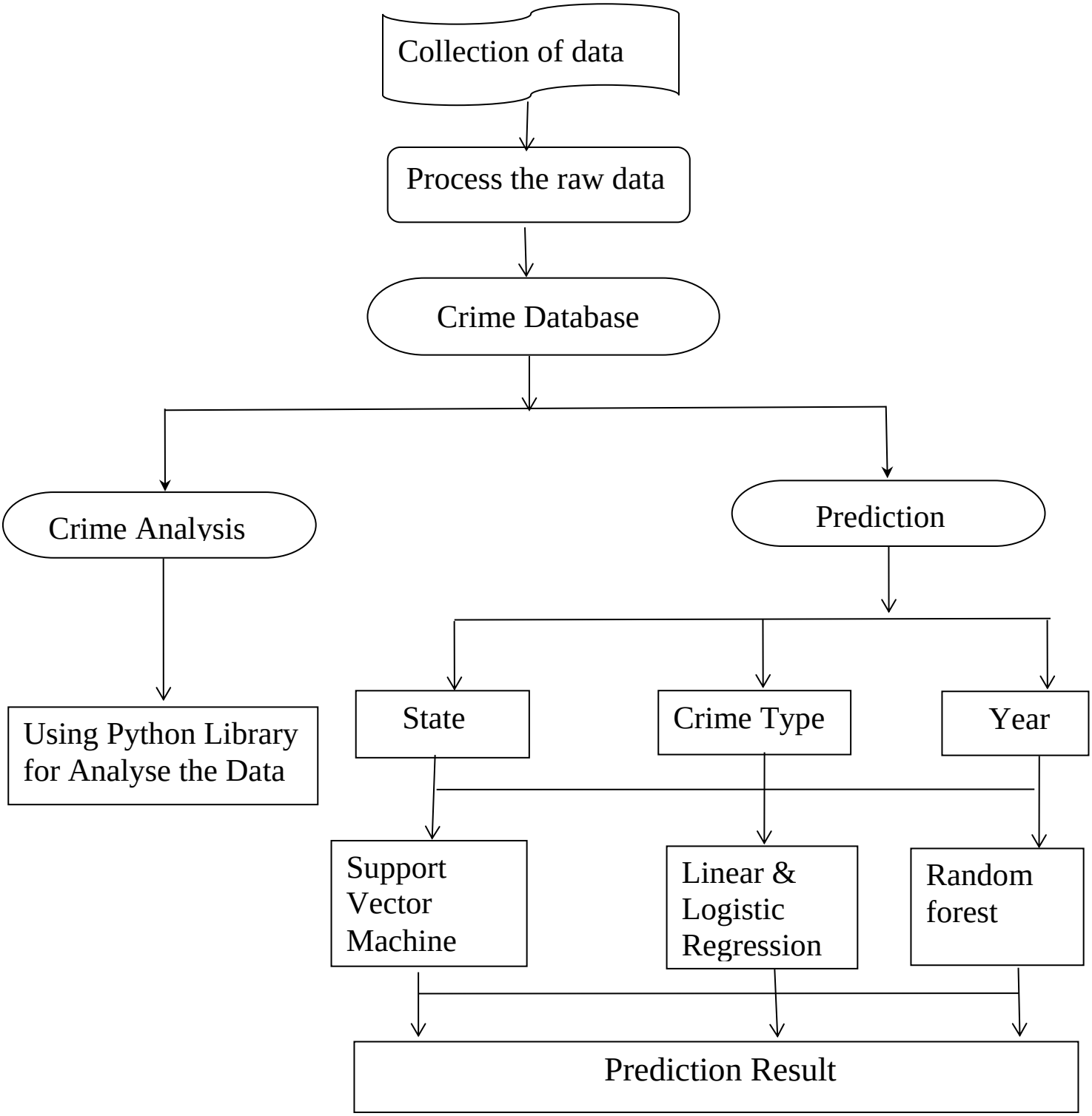

Fig 4.3. Detailed Architecture Diagram

CHAPTER 5

SYSTEM SPECIFICATION

5.1 Hardware Requirements:

• Operating system : windows, linux
• Ram : minimum 4 gb
• Hard disk : minimum 250gb

5.2 Software Requirements:

• Python idel 3.7 version (or)
• Jupiter (or)
• Google colab (or)
• Visual studio

Visual studio:

Visual Studio is a powerful developer tool that you can use to complete the entire development cycle in one place. It is a comprehensive integrated development environment (IDE) that you can use to write, edit, debug, and build code, and then deploy your app. Beyond code editing and debugging, Visual Studio includes compilers, code completion tools, source control, extensions, and many more features to enhance every stage of the software development process.

Python:

Here we use Python programming Language for a back-end process.Python is an interpreted high-level general-purpose programming language. Its design philosophy emphasizes code readability with its use of significant indentation. Its language constructs as well as its object-oriented approach aim to help programmers write clear, logical code for small and large-scale projects. Python is dynamically-typed and garbage-collected. It supports multiple programming paradigms, including structured (particularly, procedural), object-oriented and functional programming.

Creating Environment in VS:

A conda environment is a Python environment that's managed using the conda package manager (see Getting started with conda). Whether to use a conda environment or a virtual one will depend on your packaging needs, what your team has standardized on, etc.

From within VS Code, you can create local environments, using virtual environments or Anaconda, by opening the Command Palette (Ctrl+Shift+P), start typing the Python: Create Environment command to search, and then select the command. The command presents a list of environment types: Venv or Conda.

A virtual environment is a built-in way to create an environment to isolate the packages you install per workspace. A virtual environment creates a folder that contains a copy (or symlink) to a specific interpreter. When you install packages into a virtual environment it will end up in this new folder so that they are not interspersed with other packages used or needed by other workspaces.

The Python extension automatically detects existing conda environments. We recommend you install a Python interpreter into your conda environment, otherwise one will be installed for you after you select the environment. For example, the following command creates a conda environment named env-01 with a Python 3.9 interpreter and several libraries.

conda create -n env-01 python=3.9 scipy=0.15.0 num.

Data Manipulation Packages:

Pandas:

Pandas is a Python package providing fast, flexible, and expressive data structures designed to make working with structured (tabular, multidimensional, potentially heterogeneous) and time series data both easy and intuitive. It aims to be the fundamental high-level building block for doing practical, real world data analysis in Python. Additionally, it has the broader goal of becoming the most powerful and flexible open-source data analysis / manipulation tool available in any language. It is already well on its way toward this goal.

NumPy:

NumPy is a library for Python, adding support for large, multidimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays. NumPy is an open-source software and has many contributors. In comparison, MATLAB boasts a large number of additional toolboxes, notably Simulink, whereas NumPy is intrinsically integrated with Python, a more modern and complete programming language. Moreover, complementary Python packages are available;SciPy is a library that adds more MATLAB-like functionality and Matplotlib is a plotting package that provides MATLAB-like plotting functionality.

Model Building Package:

Scikit-plot:

Scikit-plot is the result of an unartistic data scientist‘s dreadful realization that visualization is one of the most crucial components in the data science process, not just a mere afterthought. Gaining insights is simply a lot easier when you‘re looking at a colored heatmap of a confusion matrix complete with class labels rather than a single-line dump of numbers enclosed in brackets. Besides, if you ever need to present your results to someone 15 (virtually any time anybody hires you to do data science), you show them visualizations, not a bunch of numbers in Excel.All in all, it is an intuitive library used to add plotting functionality to a scikit-learn object

Scikit-learn:

Scikit-learn (formerly scikits. learn) is a free software machine learning library for the Python programming language. It features various classification, regression and clustering algorithms including support vector machines(svm), random forest, gradient boosting, k means and DBSCAN, and is designed to interoperate with the Python numerical and scientific libraries NumPy and SciPy. It has been built on top of NumPy, SciPy and matplotlib.

Matplotlib’s pyplot:

Matplotlib is a Python 2D plotting library which produces publication quality figures in a variety of hardcopy formats and interactive environments across platforms. Matplotlib can be used in Python scripts, the Python and IPython shells, the Jupyter notebook, web application servers, and four graphical user interface toolkits.

It provides an object-oriented API for embedding plots into applications using general-purpose GUI toolkits like Tkinter, wxPython, Qt or GTK.matplotlib. Pyplot provides a MATLAB-like plotting framework pylab combines pyplot with NumPy into a single namespace. This is convenient for interactive work, but for programming it is recommended that the namespaces be kept separate.

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CHAPTER 6

SOFTWARE TESTING

The test scenario is a detailed document of test cases that cover end to end functionality of a software application in liner statements. The liner statement is considered as a scenario. The test scenario is a high-level classification of testable requirements. These requirements are grouped on the basis of the functionality of a module and obtained from the use cases. In the test scenario, there is a detailed testing process due to many associated test cases. Before performing the test scenario, the tester has to consider the test cases for each scenario. Documentation testing can start at the very beginning of the software process and hence save large amounts of money, since the earlier a defect is found the less it will cost to be fixed. The most popular testing documentation files are test reports, plans, and checklists. These documents are used to outline the team's workload and keep track of the process. Let's take a look at the key requirements for these files and see how they contribute to the process. Test strategy. An outline of the full approach to product testing. As the project moves along, developers, designers, product owners can come back to the document and see if the actual performance corresponds to the planned activities. Test data. The data that testers enter into the software to verify certain features and their outputs. Examples of such data can be fake user profiles, statistics, media content, similar to files that would be uploaded by an end-user in a ready solution.Test plans. A file that describes the strategy, resources, environment, limitations, and schedule of the testing process. It's the fullest testing document, essential for informed planning. Such a document is distributed between team members and shared with all stakeholders.

Test scenarios. In scenarios, testers break down the product's functionality andinterface by modules and provide real-time status updates at all testing stages. A module can be described by a single statement, or require hundreds of statuses, depending on its size and scope.

Test Driven Development:

Test Driven Development, or TDD, is a code design technique where theprogrammer writes a test before any production code, and then writes the code that willmake that test pass. The idea is that with a tiny bit of assurance from that initial test, the programmer can feel free to refactor and refactor some more to get the cleanest code they know how to write. The idea is simple, but like most simple things, the execution is hard. TDD requires a completely different mind set from what most people are used to and the tenacity to deal with a learning curve that may slow you down at first.

Unit Testing:

Unit testing focuses on verifying the effort on the smallest unit of software-module. The local data structure is examined to ensure that the date stored temporarily maintains its integrity during all steps in the algorithm's execution. Boundary conditions are tested to ensure that the module operates properly at boundaries established to limit or restrict processing.

Integration Testing:

Data can be tested across an interface. One module can have an inadvertent, adverse effect on the other. Integration testing is a systematic technique for constructing a program structure while conducting tests to uncover errors associated with interring.

Validation Testing:

It begins after the integration testing is successfully assembled. Validation succeeds when
the software functions in a manner that can be reasonably accepted by the client. In this the majority of the validation is done during the data entry operation where there is a maximum possibility of entering wrong data. Other validation will be performed in all process where correct details and data should be entered to get the required results.

Recovery Testing:

Recovery Testing is a system that forces the software to fail in variety of ways and verifies that the recovery is properly performed. If recovery is automatic, re-initialization, and data recovery are each evaluated for correctness.

Security Testing:

Security testing attempts to verify that protection mechanism built into system will in fact
protect it from improper penetration. The tester may attempt to acquire password through external clerical means, may attack the system with custom software design to break down any defenses to others, and may purposely cause errors.

Performance Testing:

Performance Testing is used to test runtime performance of software within the context of an integrated system. Performance test are often coupled with stress testing and require both software instrumentation.

Specification Testing:

We can set with, what program should do and how it should perform under various condition. This testing is a comparative study of evolution of system performance and system requirements.

Module Level Testing:

In this the error will be found at each individual module, it encourages the programmer to
find and rectify the errors without affecting the other modules

Blackbox Testing:

Black- box testing focuses on functional requirement of software. It enables to derive ets
of input conditions that will fully exercise all functional requirements for a program

Output Testing:

After performing the validation testing, the next step is output testing of the proposed system since no system would be termed as useful until it does produce the required output in the specified format. Output format is considered in two ways, the screen format and the printer format.

User Acceptance Testing:

User Acceptance Testing is the key factor for the success of any system. The system under consideration is tested for user acceptance by constantly keeping in touch with prospective system users at the time of developing and making changes whenever required.

CHAPTER 7

MODULES

List of Modules:

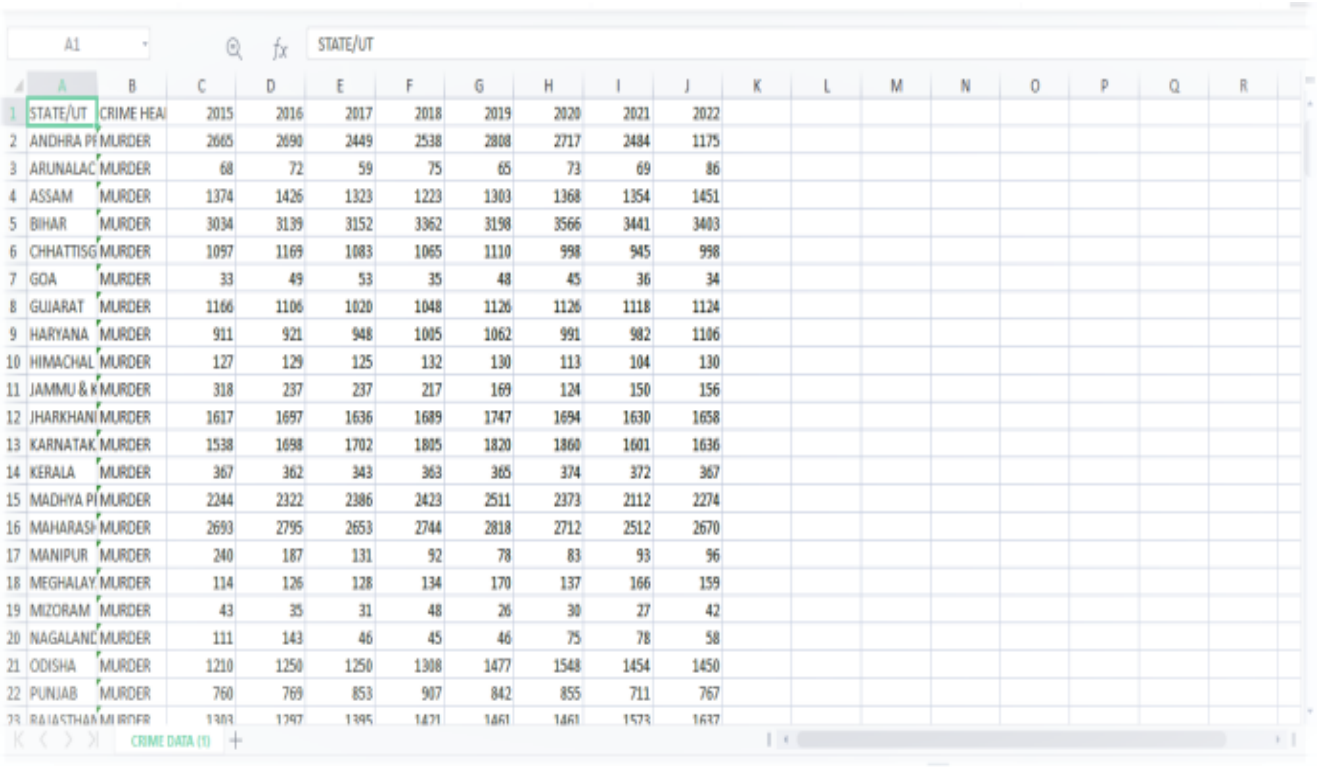
- Data collection Module
- Data Preprocessing Module
- Feature selection Module
- Building and Training Model
- Prediction Module
- Visualization Module

Data collection Module:

Collection of Crime dataset from kaggle, open gov.in and India crime record bureau is used in CSV format.The crime dataset is extracted from primary data collection based on field work.This dataset consists of about 433 in 10 rows details. The key features such as State, Years, Crime Type, and it contains 2015 to 2022 years are selected from the dataset as the system input features.

Data Preprocessing Module:

There are 5000 entries are present in the dataset. The null values are removed using df = df.dropna() where df is the data frame. The categorical attributes (Location, Block, Crime Type, Community Area) are converted into numeric using Label Encoder. The date attribute is splitted into new attributes like month and hour which can be used as features for the model.



STATE/UT	CRIME HEAD	2015	2016	2017	2018	2019	2020	2021	2022
ANDHRA PR	MURDER	2665	2690	2449	2538	2808	2717	2484	1175
ARUNALAC	MURDER	68	72	59	75	65	73	69	86
ASSAM	MURDER	1374	1426	1323	1223	1303	1368	1354	1451
BIHAR	MURDER	3034	3139	3152	3362	3198	3566	3441	3403
CHHATTISG	MURDER	1097	1169	1083	1065	1110	998	945	998
GOA	MURDER	33	49	53	35	48	45	36	34
GUJARAT	MURDER	1166	1106	1020	1048	1126	1126	1118	1124
HARYANA	MURDER	911	921	948	1005	1062	991	982	1106
HIMACHAL	MURDER	127	129	125	132	130	113	104	130
JAMMU & K	MURDER	318	237	237	217	169	124	150	156
JHARKHAN	MURDER	1617	1697	1636	1689	1747	1694	1630	1658
KARNATAK	MURDER	1538	1698	1702	1805	1820	1860	1601	1636
KERALA	MURDER	367	362	343	363	365	374	372	367
MADHYA PI	MURDER	2244	2322	2386	2423	2511	2373	2112	2274
MAHARASH	MURDER	2693	2795	2653	2744	2818	2712	2512	2670
MANIPUR	MURDER	240	187	131	92	78	83	93	96
MEGHALAY	MURDER	114	126	128	134	170	137	166	159
MIZORAM	MURDER	43	35	31	48	26	30	27	42
NAGALAND	MURDER	111	143	46	45	46	75	78	58
ODISHA	MURDER	1210	1250	1250	1308	1477	1548	1454	1450
PUNJAB	MURDER	760	769	853	907	842	855	711	767
RAJASTHAN	MURDER	1383	1297	1395	1471	1461	1461	1573	1637

Feature selection Module:

Features selection is done which can be used to build the model. The attributes used for feature selection are Block, Location, State, Year, Crine Type, X coordinate , Y coordinate, Latitude , Longitude, Hour and month.

Building and Training Model:

After feature selection Crime Type and year attribute are used for training. The dataset is divided into pairs of xtrain ,train and xtest, y test. The algorithm model is imported from sklearn. Building models is done using models. Fit (xtrain, ytrain).

Prediction Module:

After the model is built using the above process, prediction is done using model.predict(xtest). The accuracy is calculated using accuracy_score imported from metrics - metrics.accuracy_score (ytest, predicted).

Visualization Module:

Using matplotlib library from sklearn. Analysis of the crime dataset is done by plotting various graphs

CHAPTER 8

FLASK FRAMEWORK

Flask is a web application framework written in Python. Armin Ronacher, who leads an international group of Python enthusiasts named Pocco, develops it. Flask is based on the Werkzeug WSGI toolkit and Jinja2 template engine. Both are Pocco project Http protocol is the foundation of data communication on the world wide web. Different methods of data retrieval from specified URLs are defined in this protocol.

Save the following script as login.html

navi.html

```
<!DOCTYPE html>
<html lang="en" dir="ltr">
  <head>
    <meta charset="utf-8">
    <title>Responsive Navbar</title>
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <link rel="stylesheet" href="C:\Users\Rex\Desktop\crime prediction website\navi.css">
    <script src="https://kit.fontawesome.com/a076d05399.js"></script>
  </head>
  <body>
    <nav>
      <input type="checkbox" id="check">
      <label for="check" class="checkbtn">
        <i class="fas fa-bars"></i>
      </label>
      <label class="logo">CRIME PREDICTION & ANALYSIS</label>
      <ul>
        <li><a class="active" href="C:\Users\Rex\Desktop\crime prediction website\login.html">Home</a></li>
        <li><a href="C:\Users\Rex\Desktop\crime prediction
```

```
website\about.html">About</a></li>
            <li><a            href="C:\Users\Rex\Desktop\crime            prediction
website\crime.html">Services</a></li>
            <li><a            href="C:\Users\Rex\Desktop\crime            prediction
website\contact.html">Contact</a></li>
          </ul>
        </nav>
        <section>

            <img src="crime.jpg" alt="image description">
            <p>Crime is a term used to describe an unlawful or illegal act that
violates a set of established laws or regulations.
            It is an action that goes against the moral or ethical standards of a
society or community.
            Crimes can range from minor offenses,such as traffic violations or
petty theft, to more serious offenses, such as murder, robbery, and assault.
            To combat crime, law enforcement agencies and justice systems are
in place in most countries. These systems work to prevent and investigate
crimes,
            arrest and prosecute offenders, and ensure that justice is served. The
aim is to provide a safe and secure environment for individuals and
communities to live and work in.
            However, crime continues to be a significant challenge, and
understanding the root causes, such as poverty and social inequality, is
essential in developing effective strategies to prevent it. </p>
        </section>


    </body>
</html>
```

login.html

```
<!DOCTYPE html>
    <html lang="en">
    <head>
        <meta charset="UTF-8">
        <meta http-equiv="X-UA-Compatible" content="IE=edge">
```

```
        <meta name="viewport" content="width=device-width, initial-scale=1.0">
        <title> Home Login and Signup Form </title>

        <!-- CSS -->
        <link rel="stylesheet" href="C:\Users\Rex\Desktop\crime prediction website\login.css">

        <!-- Boxicons CSS -->
        <link href='https://unpkg.com/boxicons@2.1.2/css/boxicons.min.css' rel='stylesheet'>

    </head>
    <body>
        <section class="container forms">
            <div class="form login">
                <div class="form-content">
                    <header>Login</header>
                    <form action="#">
                        <div class="field input-field">
                            <input type="email" placeholder="Email" class="input">
                        </div>

                        <div class="field input-field">
                            <input type="password" placeholder="Password" class="password">
                            <i class='bx bx-hide eye-icon'></i>
                        </div>

                        <div class="form-link">
                            <a href="#" class="forgot-pass">Forgot password?</a>
                        </div>

                        <div class="field button-field">
                            <button>Login</button>
                        </div>
                    </form>
```

```
                    <div class="form-link">
                        <span>Don't have an account? <a href="#" class="link signup-link">Signup</a></span>
                    </div>
                </div>

                <div class="line"></div>

                <div class="media-options">
                    <a href="#" class="field facebook">
                        <i class='bx bxl-facebook facebook-icon'></i>
                        <span>Login with Facebook</span>
                    </a>
                </div>

                <div class="media-options">
                    <a href="#" class="field google">
                        <img src="C:\Users\Rex\Desktop\crime prediction website\google.png" alt="" class="google-img">
                        <span>Login with Google</span>
                    </a>
                </div>

            </div>

            <!-- Signup Form -->

            <div class="form signup">
                <div class="form-content">
                    <header>Signup</header>
                    <form action="#">
                        <div class="field input-field">
                            <input type="email" placeholder="Email" class="input">
                        </div>

                        <div class="field input-field">
                            <input type="password" placeholder="Create password" class="password">
                        </div>
```

```
                        <div class="field input-field">
                            <input type="password" placeholder="Confirm password" class="password">
                            <i class='bx bx-hide eye-icon'></i>
                        </div>

                        <div class="field button-field">
                            <button>Signup</button>
                        </div>
                    </form>

                    <div class="form-link">
                        <span>Already have an account? <a href="#" class="link login-link">Login</a></span>
                    </div>
                </div>

                <div class="line"></div>

                <div class="media-options">
                    <a href="#" class="field facebook">
                        <i class='bx bxl-facebook facebook-icon'></i>
                        <span>Login with Facebook</span>
                    </a>
                </div>

                <div class="media-options">
                    <a href="#" class="field google">
                        <img src="google.png" alt="" class="google-img">
                        <span>Login with Google</span>
                    </a>
                </div>

            </div>
        </section>

        <!-- JavaScript -->
        <script src="C:\Users\Rex\Desktop\crime prediction website\login.js"></script>
```

```
    </body>
</html>
```

crime.html

```
<!DOCTYPE html>
<html>
    <head>
        <title>CRIME PREDICTION & ANALYSIS</title>
        <script src="https://code.jquery.com/jquery-3.6.0.min.js"></script>

    </head>
    <body>
        <form action="/predict" method="POST" enctype="multipart/form-
data">
        <h2>CRIME PREDICTION & ANALYSIS</h2>
        <link rel="stylesheet" href="C:\Users\Rex\Desktop\crime prediction
website\crime.css">
        <label for="STATE/UT">STATE/UT:</label>
        <input type="text" id="STATE/UT" name="STATE/UT" required>
        <label for="CRIME TYPE ">CRIME TYPE:</label>
        <input type="text" id="CRIME TYPE" name="CRIME TYPE"
required>
        <Label for="YEAR">YEAR:</Label>
        <input type="number" id="year" name="year" min="1900"
max="2099" step="1" value="2022" required>
        <label for="dataset">Upload Dataset:</label>
        <input type="file" id="dataset" name="dataset" accept=".csv">
        <div class="button-wrapper">
            <button type="button" onclick="predict()">Predict Crime
Rate</button>
        </div>
      </form>
    </body>
</html>
```

contact.html

```
<!DOCTYPE html>
```

```
<!-- Created By CodingNepal -->
<html lang="en" dir="ltr">
    <head>
        <meta charset="utf-8">
        <title>Responsive Contact us Form | CodingNepal</title>
        <link rel="stylesheet" href="C:\Users\Rex\Desktop\crime prediction website\contact.css">
        <meta name="viewport" content="width=device-width, initial-scale=1.0">
    </head>
    <body>
     <div class="container">
          <div class="text"> Contact us Form</div>
          <form action="#">
              <div class="form-row">
                  <div class="input-data">
                      <input type="text" required>
                      <div class="underline"></div>
                      <label for="">First Name</label>
                  </div>
                  <div class="input-data">
                      <input type="text" required>
                      <div class="underline"></div>
                      <label for="">Last Name</label>
                  </div>
              </div>
              <div class="form-row">
                  <div class="input-data">
                      <input type="text" required>
                      <div class="underline"></div>
                      <label for="">Email Address</label>
                  </div>
                  <div class="input-data">
                      <input type="text" required>
                      <div class="underline"></div>
                      <label for="">Website Name</label>
                  </div>
              </div>
              <div class="form-row">
                  <div class="input-data textarea">
```

```
                    <textarea rows="8" cols="80" required></textarea>
                    <br />
                    <div class="underline"></div>
                    <label for="">Write your message</label>
                    <br />
                    <div class="form-row submit-btn">
                        <div class="input-data">
                            <div class="inner"></div>
                            <input type="submit" value="submit">
                        </div>
                    </div>
                </div>
            </div>
        </form>
    </div>
  </body>
</html>
```

about.html

```
<!DOCTYPE html>
<html lang="en" dir="ltr">
  <head>
    <meta charset="utf-8">
    <title>Project Guide and Team Members</title>
    <link rel="stylesheet" href="C:\Users\Rex\Desktop\crime prediction website\about.css">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <!-- Fontawesome Link for Icons -->
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/6.3.0/css/all.min.css">
    <script src="C:\Users\Rex\Desktop\crime prediction website\about.js" defer></script>
  </head>
  <body>
    <h2>Project Guide and Team Members</h2>
    <div class="wrapper">
      <i id="left" class="fa-solid fa-angle-left"></i>
      <ul class="carousel">
```

```
          <li class="card">
            <div class="img"><img src="images/img-1.jpg" alt="img"
draggable="false"></div>
            <h2>MR. D. PRABHU - (B.E, M.E)</h2>
            <span>Head of the department,LIT</span>
          </li>
          <li class="card">
            <div class="img"><img src="amy.png" alt="img"
draggable="false"></div>
            <h2>Amy Delphiya Mary R</h2>
            <span>Final year IT</span>
          </li>
          <li class="card">
            <div class="img"><img src="kee.jpg" alt="img"
draggable="false"></div>
            <h2>Keerthana v</h2>
            <span>Final year IT</span>
          </li>
          <li class="card">
            <div class="img"><img src="thilaga.jpg" alt="img"
draggable="false"></div>
            <h2>Thilagavathi S</h2>
            <span>Final year IT</span>
          </li>

        </ul>
        <i id="right" class="fa-solid fa-angle-right"></i>
      </div>

  </body>
</html>
```

css file

```
/* Import Google font - Poppins */
@import
url('https://fonts.googleapis.com/css2?family=Poppins:wght@400;500;600&
display=swap');
* {
  margin: 0;
```

```
  padding: 0;
  box-sizing: border-box;
  font-family: "Poppins", sans-serif;
}
body {
  display: flex;
  padding: 0 35px;
  align-items: center;
  justify-content: center;
  min-height: 100vh;
  background: linear-gradient(to left top, #4f07a1, #580c7d);
}
h2 {
  font-size: 24px;
  font-weight: bold;
  margin-bottom: 20px;
  text-align:center;
  color: white;
  border-bottom: #080564;

}

.wrapper {
  max-width: 1100px;
  width: 100%;
  position: relative;
}
.wrapper i {
  top: 50%;
  height: 50px;
  width: 50px;
  cursor: pointer;
  font-size: 1.25rem;
  position: absolute;
  text-align: center;
  line-height: 50px;
  background: hsla(240, 33%, 99%, 0.839);
  border-radius: 50%;
  box-shadow: 0 3px 6px rgba(0,0,0,0.23);
  transform: translateY(-50%);
```

```
  transition: transform 0.1s linear;
}
.wrapper i:active{
  transform: translateY(-50%) scale(0.85);
}
.wrapper i:first-child{
  left: -22px;
}
.wrapper i:last-child{
  right: -22px;
}
.wrapper .carousel{
  display: grid;
  grid-auto-flow: column;
  grid-auto-columns: calc((100% / 3) - 12px);
  overflow-x: auto;
  scroll-snap-type: x mandatory;
  gap: 16px;
  border-radius: 8px;
  scroll-behavior: smooth;
  scrollbar-width: none;
}
.carousel::-webkit-scrollbar {
  display: none;
}
.carousel.no-transition {
  scroll-behavior: auto;
}
.carousel.dragging {
  scroll-snap-type: none;
  scroll-behavior: auto;
}
.carousel.dragging .card {
  cursor: grab;
  user-select: none;
}
.carousel :where(.card, .img) {
  display: flex;
  justify-content: center;
  align-items: center;
```

```
}
.carousel .card {
   scroll-snap-align: start;
   height: 342px;
   list-style: none;
   background: rgb(251, 250, 251);
   cursor: pointer;
   padding-bottom: 15px;
   flex-direction: column;
   border-radius: 8px;
}
.carousel .card .img {
   background: #6d079c,#363295;
   height: 148px;
   width: 148px;
   border-radius: 50%;
}
.card .img img {
   width: 140px;
   height: 140px;
   border-radius: 50%;
   object-fit: cover;
   border: 4px solid #73139f;
}
.carousel .card h2 {
   font-weight: 500;
   font-size: 1.56rem;
   margin: 30px 0 5px;
}
.carousel .card span {
   color: #680f95;
   font-size: 1.31rem;
}

@media screen and (max-width: 900px) {
   .wrapper .carousel {
      grid-auto-columns: calc((100% / 2) - 9px);
   }
}
```

```
@media screen and (max-width: 600px) {
  .wrapper .carousel {
    grid-auto-columns: 100%;
  }
}
```

contact.css

```
@import
url('https://fonts.googleapis.com/css?family=Poppins:400,500,600,700&disp
lay=swap');
*{
  margin: 0;
  padding: 0;
  outline: none;
  box-sizing: border-box;
  font-family: 'Poppins', sans-serif;
}
body{
  display: flex;
  align-items: center;
  justify-content: center;
  min-height: 100vh;
  padding: 40px;
  background: linear-gradient(115deg, #56d8e4 10%, #9f01ea 90%);
}
.container{
  max-width: 800px;
  background: #fff;
  width: 800px;
  padding: 25px 40px 10px 40px;
  box-shadow: 0px 0px 10px rgba(0,0,0,0.1);
}
.container .text{
  text-align: center;
  font-size: 35px;
  font-weight: 600;
  background:  -webkit-linear-gradient(right,  #56d8e4,  #9f01ea,  #56d8e4,
#9f01ea);
  -webkit-background-clip: text;
  -webkit-text-fill-color: transparent;
}
```

```
.container form{
   padding: 30px 0 0 0;
}
.container form .form-row{
   display: flex;
   margin: 32px 0;
}
form .form-row .input-data{
   width: 100%;
   height: 40px;
   margin: 0 20px;
   position: relative;
}
form .form-row .textarea{
   height: 70px;
}
.input-data input,
.textarea textarea{
   display: block;
   width: 100%;
   height: 100%;
   border: none;
   font-size: 17px;
   border-bottom: 2px solid rgba(0,0,0, 0.12);
}
.input-data input:focus ~ label, .textarea textarea:focus ~ label,
.input-data input:valid ~ label, .textarea textarea:valid ~ label{
   transform: translateY(-20px);
   font-size: 14px;
   color: #3498db;
}
.textarea textarea{
   resize: none;
   padding-top: 10px;
}
.input-data label{
   position: absolute;
   pointer-events: none;
   bottom: 10px;
   font-size: 16px;
```

```
   transition: all 0.3s ease;
}
.textarea label{
   width: 100%;
   bottom: 40px;
   background: #fff;
}
.input-data .underline{
   position: absolute;
   bottom: 0;
   height: 2px;
   width: 100%;
}
.input-data .underline:before{
   position: absolute;
   content: "";
   height: 2px;
   width: 100%;
   background: #3498db;
   transform: scaleX(0);
   transform-origin: center;
   transition: transform 0.3s ease;
}
.input-data input:focus ~ .underline:before,
.input-data input:valid ~ .underline:before,
.textarea textarea:focus ~ .underline:before,
.textarea textarea:valid ~ .underline:before{
   transform: scale(1);
}
.submit-btn .input-data{
   overflow: hidden;
   height: 45px!important;
   width: 25%!important;
}
.submit-btn .input-data .inner{
   height: 100%;
   width: 300%;
   position: absolute;
   left: -100%;
   background:  -webkit-linear-gradient(right,  #56d8e4,  #9f01ea,  #56d8e4,
```

```
#9f01ea);
  transition: all 0.4s;
}
.submit-btn .input-data:hover .inner{
  left: 0;
}
.submit-btn .input-data input{
  background: none;
  border: none;
  color: #fff;
  font-size: 17px;
  font-weight: 500;
  text-transform: uppercase;
  letter-spacing: 1px;
  cursor: pointer;
  position: relative;
  z-index: 2;
}
@media (max-width: 700px) {
  .container .text{
    font-size: 30px;
  }
  .container form{
    padding: 10px 0 0 0;
  }
  .container form .form-row{
    display: block;
  }
  form .form-row .input-data{
    margin: 35px 0!important;
  }
  .submit-btn .input-data{
    width: 40%!important;
  }
}
```

crime.css

```
form {
```

```
  display: flex;
  flex-direction: column;
  align-items: center;
  margin-top: 50px;
}

h2 {
  color: white;
  font-size: 28px;
  margin-bottom: 20px;
}

label {
  display: block;
  font-size: 18px;
  margin-bottom: 10px;
  color: white;
}

input[type="text"],
input[type="number"] {
  padding: 10px;
  font-size: 16px;
  border: 5px solid #ccc;
  border-radius: 4px;
  margin-bottom: 20px;
  width: 50%;
  box-sizing: border-box;
}

button {
  background-color: #030434;
  color: #fff;
  border: none;
  padding: 10px 20px;
  font-size: 16px;
  border-radius: 4px;
  cursor: pointer;
}
```

```
  button:hover {
    background-color: #174868;
  }

  body {
    background-color:hsl(224, 92%, 15%);
  }


  input[type="file"] {
    padding: 10px;
    font-size: 16px;
    border: 5px solid #ccc;
    border-radius: 4px;
    margin-bottom: 20px;
    width: 50%;
    box-sizing: border-box;
    background-color: #fff; /* Optional: Set background color */
    color: #be5408; /* Optional: Set text color */
    outline: none; /* Optional: Remove outline on focus */
    cursor: pointer;
  }

  input[type="file"]:hover {
    background-color: #174868; /* Optional: Set hover background color */
  }

  input[type="file"]:focus {
    box-shadow: 0 0 5px #a0d4ff; /* Optional: Add focus shadow */
  }
```

login.css

```
/* Google Fonts - Poppins */
@import
url('https://fonts.googleapis.com/css2?family=Poppins:wght@300;400;500;6
00&display=swap');

*{
    margin: 0;
```

```
    padding: 0;
    box-sizing: border-box;
    font-family: 'Poppins', sans-serif;
}
.container{
    height: 100vh;
    width: 100%;
    display: flex;
    align-items: center;
    justify-content: center;
    background-color: hsl(224, 92%, 15%);
    column-gap: 30px;
}
.form{
    position: absolute;
    max-width: 430px;
    width: 100%;
    padding: 30px;
    border-radius: 6px;
    background: #FFF;
}
.form.signup{
    opacity: 0;
    pointer-events: none;
}
.forms.show-signup .form.signup{
    opacity: 1;
    pointer-events: auto;
}
.forms.show-signup .form.login{
    opacity: 0;
    pointer-events: none;
}
header{
    font-size: 28px;
    font-weight: 600;
    color: #232836;
    text-align: center;
}
form{
```

```
        margin-top: 30px;
    }
    .form .field{
        position: relative;
        height: 50px;
        width: 100%;
        margin-top: 20px;
        border-radius: 6px;
    }
    .field input,
    .field button{
        height: 100%;
        width: 100%;
        border: none;
        font-size: 16px;
        font-weight: 400;
        border-radius: 6px;
    }
    .field input{
        outline: none;
        padding: 0 15px;
        border: 1px solid#CACACA;
    }
    .field input:focus{
        border-bottom-width: 2px;
    }
    .eye-icon{
        position: absolute;
        top: 50%;
        right: 10px;
        transform: translateY(-50%);
        font-size: 18px;
        color: #8b8b8b;
        cursor: pointer;
        padding: 5px;
    }
    .field button{
        color: #fff;
        background-color: #0171d3;
        transition: all 0.3s ease;
```

```
        cursor: pointer;
}
.field button:hover{
        background-color: #016dcb;
}
.form-link{
        text-align: center;
        margin-top: 10px;
}
.form-link span,
.form-link a{
        font-size: 14px;
        font-weight: 400;
        color: #232836;
}
.form a{
        color: #0171d3;
        text-decoration: none;
}
.form-content a:hover{
        text-decoration: underline;
}
.line{
        position: relative;
        height: 1px;
        width: 100%;
        margin: 36px 0;
        background-color: #d4d4d4;
}
.line::before{
        content: 'Or';
        position: absolute;
        top: 50%;
        left: 50%;
        transform: translate(-50%, -50%);
        background-color: #FFF;
        color: #8b8b8b;
        padding: 0 15px;
}
.media-options a{
```

```
        display: flex;
        align-items: center;
        justify-content: center;
}
a.facebook{
        color: #fff;
        background-color: #4267b2;
}
a.facebook .facebook-icon{
        height: 28px;
        width: 28px;
        color: #0171d3;
        font-size: 20px;
        border-radius: 50%;
        display: flex;
        align-items: center;
        justify-content: center;
        background-color: #fff;
}
.facebook-icon,
img.google-img{
        position: absolute;
        top: 50%;
        left: 15px;
        transform: translateY(-50%);
}
img.google-img{
        height: 20px;
        width: 20px;
        object-fit: cover;
}
a.google{
        border: 1px solid #CACACA;
}
a.google span{
        font-weight: 500;
        opacity: 0.6;
        color: #232836;
}
```

```
@media screen and (max-width: 400px) {
    .form{
        padding: 20px 10px;
    }

}
```

javascript file

```
const wrapper = document.querySelector(".wrapper");
const carousel = document.querySelector(".carousel");
const firstCardWidth = carousel.querySelector(".card").offsetWidth;
const arrowBtns = document.querySelectorAll(".wrapper i");
const carouselChildrens = [...carousel.children];

let isDragging = false, isAutoPlay = true, startX, startScrollLeft, timeoutId;

// Get the number of cards that can fit in the carousel at once
let cardPerView = Math.round(carousel.offsetWidth / firstCardWidth);

// Insert copies of the last few cards to beginning of carousel for infinite scrolling
carouselChildrens.slice(-cardPerView).reverse().forEach(card => {
    carousel.insertAdjacentHTML("afterbegin", card.outerHTML);
});

// Insert copies of the first few cards to end of carousel for infinite scrolling
carouselChildrens.slice(0, cardPerView).forEach(card => {
    carousel.insertAdjacentHTML("beforeend", card.outerHTML);
});

// Scroll the carousel at appropriate postition to hide first few duplicate cards on Firefox
carousel.classList.add("no-transition");
carousel.scrollLeft = carousel.offsetWidth;
carousel.classList.remove("no-transition");

// Add event listeners for the arrow buttons to scroll the carousel left and right
arrowBtns.forEach(btn => {
```

```
    btn.addEventListener("click", () => {
        carousel.scrollLeft += btn.id == "left" ? -firstCardWidth : firstCardWidth;
    });
});

const dragStart = (e) => {
    isDragging = true;
    carousel.classList.add("dragging");
    // Records the initial cursor and scroll position of the carousel
    startX = e.pageX;
    startScrollLeft = carousel.scrollLeft;
}

const dragging = (e) => {
    if(!isDragging) return; // if isDragging is false return from here
    // Updates the scroll position of the carousel based on the cursor movement
    carousel.scrollLeft = startScrollLeft - (e.pageX - startX);
}

const dragStop = () => {
    isDragging = false;
    carousel.classList.remove("dragging");
}

const infiniteScroll = () => {
    // If the carousel is at the beginning, scroll to the end
    if(carousel.scrollLeft === 0) {
        carousel.classList.add("no-transition");
        carousel.scrollLeft = carousel.scrollWidth - (2 * carousel.offsetWidth);
        carousel.classList.remove("no-transition");
    }
    // If the carousel is at the end, scroll to the beginning
    else if(Math.ceil(carousel.scrollLeft) === carousel.scrollWidth - carousel.offsetWidth) {
        carousel.classList.add("no-transition");
        carousel.scrollLeft = carousel.offsetWidth;
        carousel.classList.remove("no-transition");
```

```
    }

    // Clear existing timeout & start autoplay if mouse is not hovering over carousel
    clearTimeout(timeoutId);
    if(!wrapper.matches(":hover")) autoPlay();
}

const autoPlay = () => {
    if(window.innerWidth < 800 || !isAutoPlay) return; // Return if window is smaller than 800 or isAutoPlay is false
    // Autoplay the carousel after every 2500 ms
    timeoutId = setTimeout(() => carousel.scrollLeft += firstCardWidth, 2500);
}
autoPlay();
```

login.js

```
const forms = document.querySelector(".forms"),
      pwShowHide = document.querySelectorAll(".eye-icon"),
      links = document.querySelectorAll(".link");

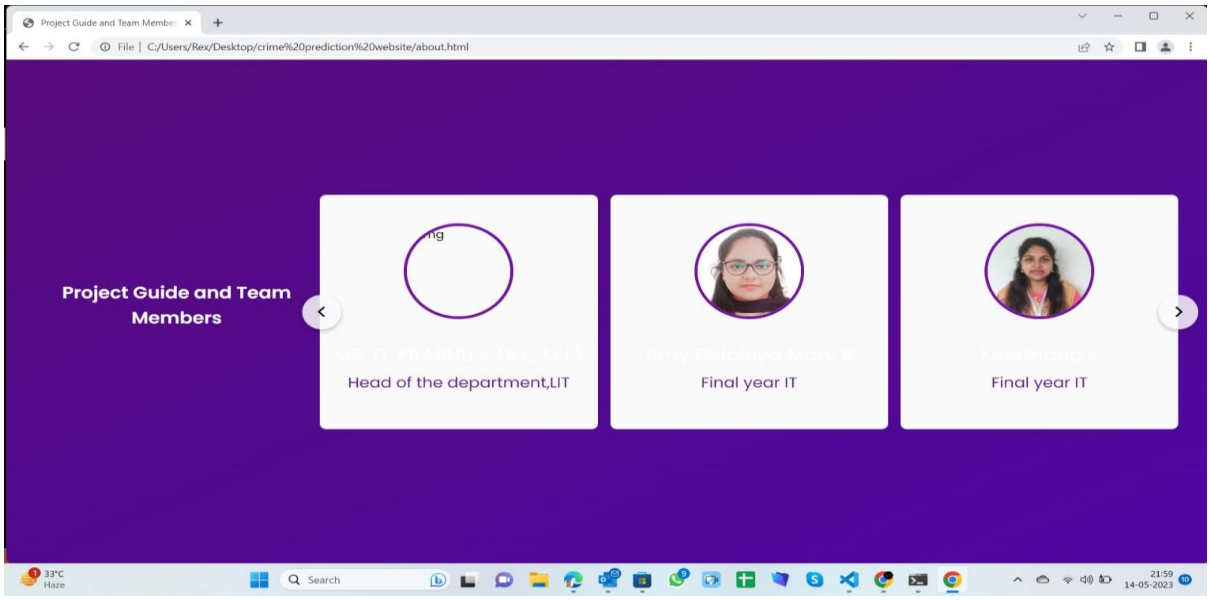
pwShowHide.forEach(eyeIcon => {
    eyeIcon.addEventListener("click", () => {
        let pwFields = eyeIcon.parentElement.parentElement.querySelectorAll(".password");

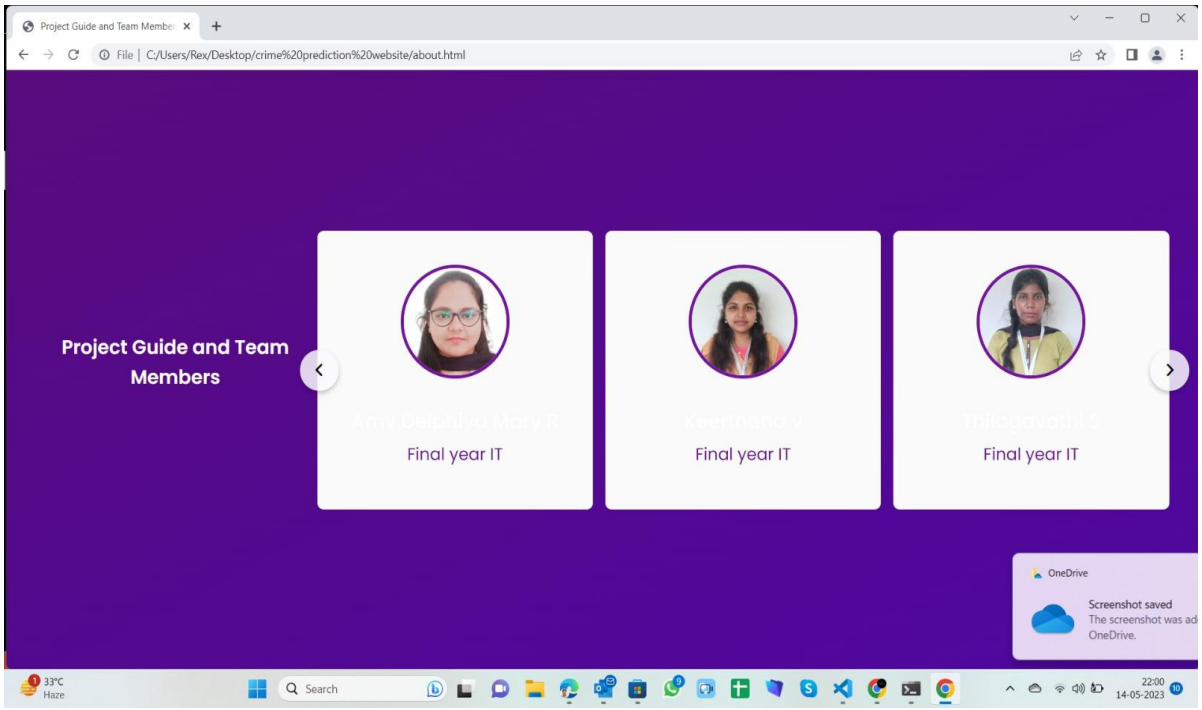
        pwFields.forEach(password => {
            if(password.type === "password"){
                password.type = "text";
                eyeIcon.classList.replace("bx-hide", "bx-show");
                return;
            }
            password.type = "password";
            eyeIcon.classList.replace("bx-show", "bx-hide");
        })

    })
})
```

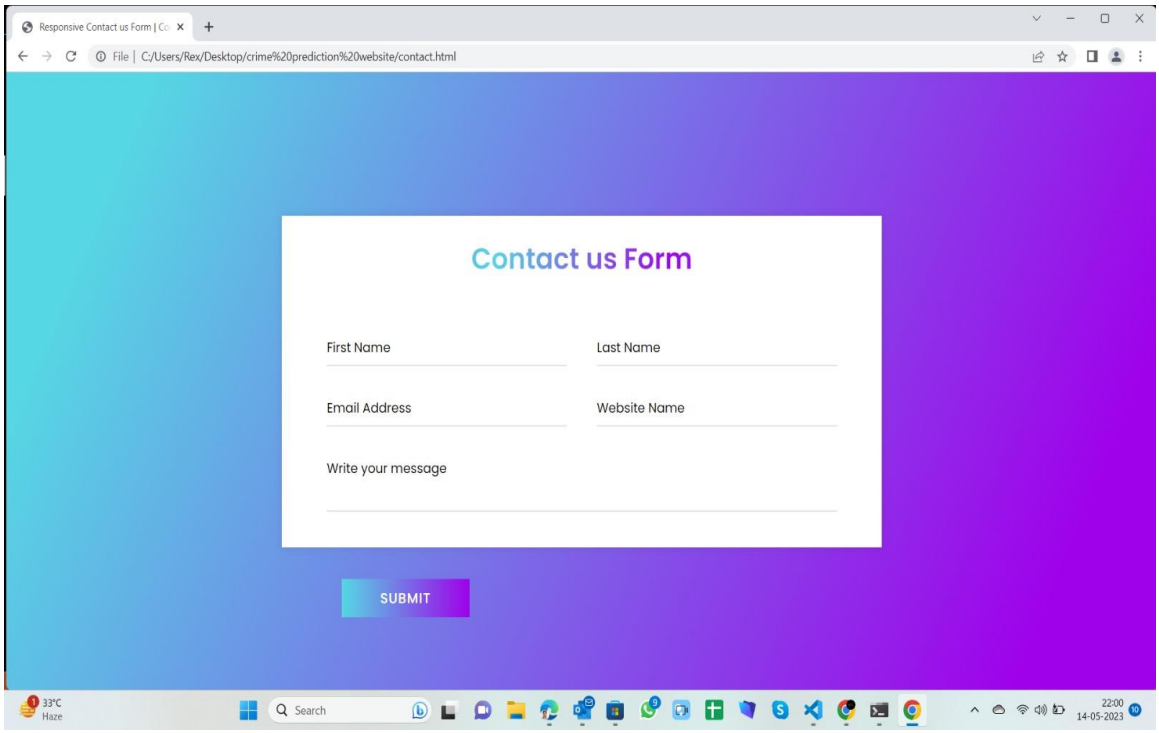
```
links.forEach(link => {
    link.addEventListener("click", e => {
        e.preventDefault(); //preventing form submit
        forms.classList.toggle("show-signup");
    })
})
```

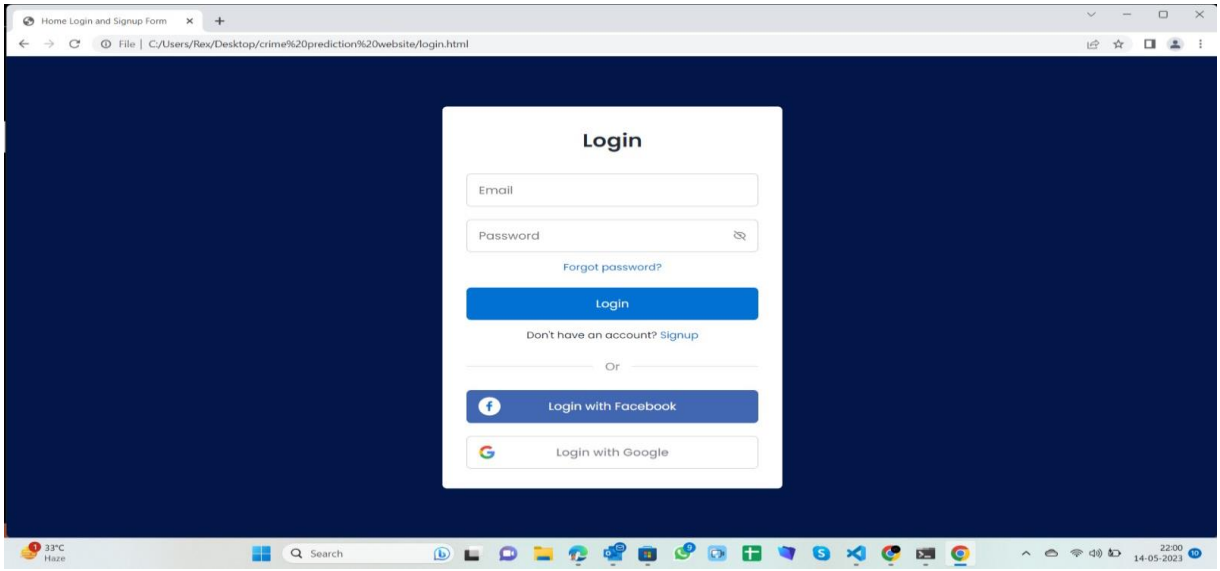
WEBSITE OUTPUT:

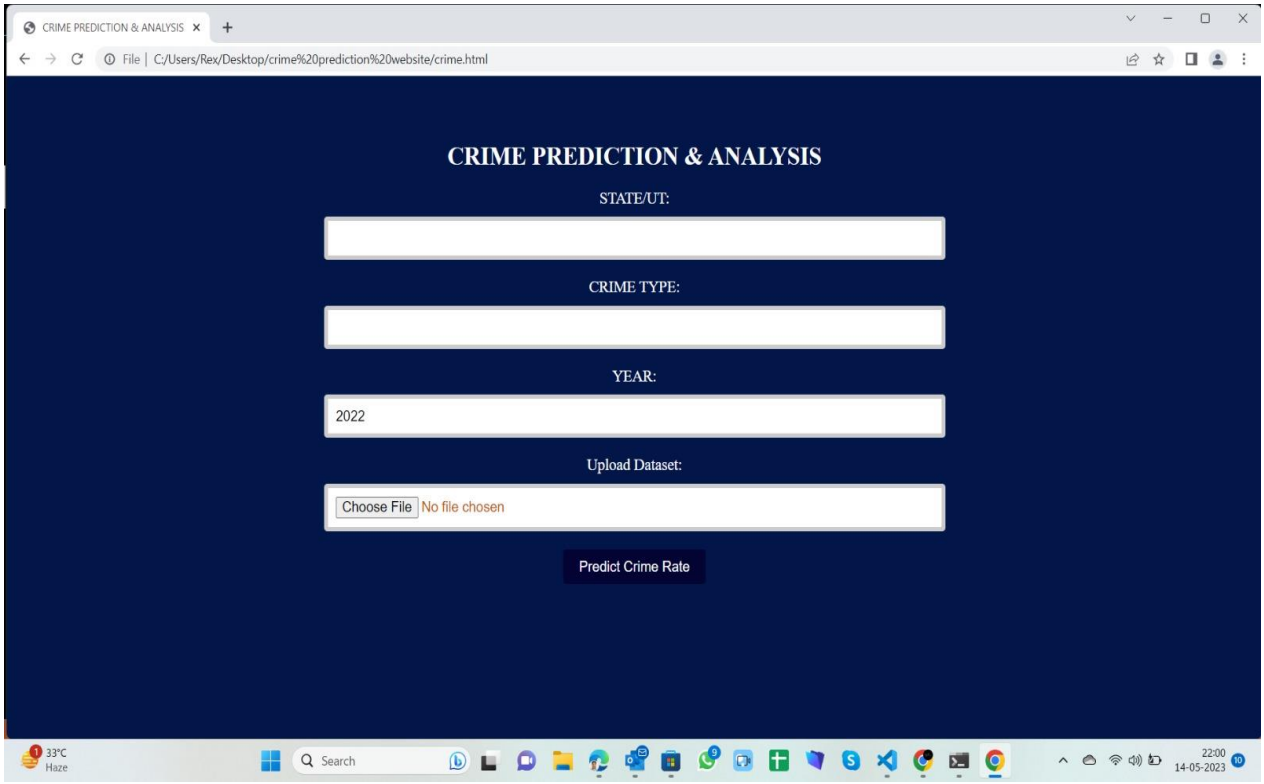


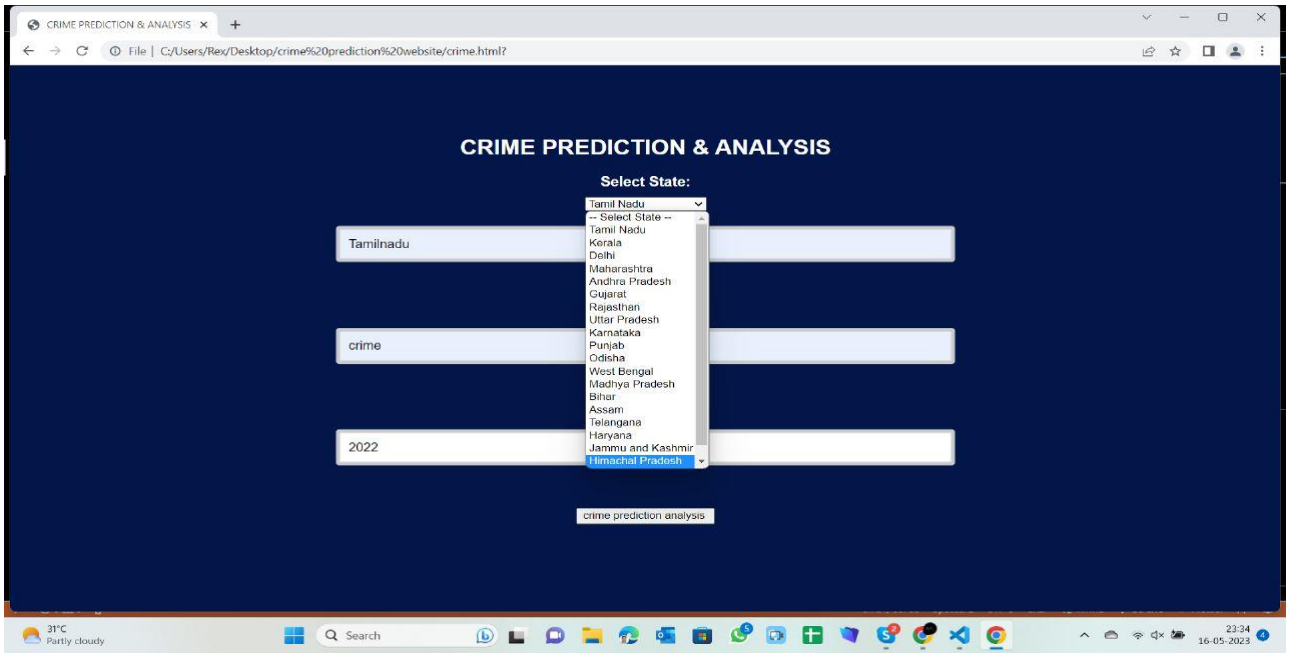


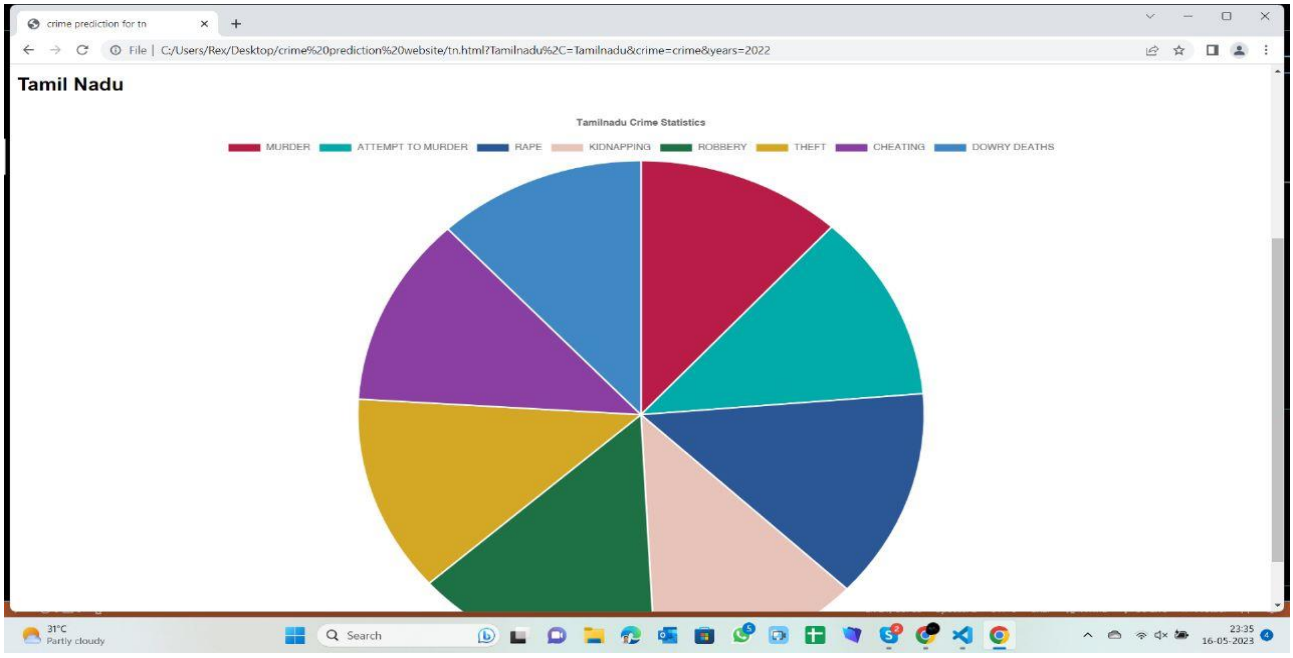

Responsive Navbar
File | C:/Users/Rex/Desktop/crime%20prediction%20website/navi.html
CRIME PREDICTION & ANALYSIS
HOME
ABOUT
SERVICES
CONTACT
STOP
Crime is a term used to describe an unlawful or illegal act that violates a set of established laws or regulations. It is an action that goes against the moral or ethical standards of a society or community. Crimes can range from minor offenses,such as traffic violations or petty theft, to more serious offenses, such as murder, robbery, and assault. To combat crime, law enforcement agencies and justice systems are in place in most countries. These systems work to prevent and investigate crimes, arrest and prosecute offenders, and ensure that justice is served. The aim is to provide a safe and secure environment for individuals and communities to live and work in. However, crime continues to be a significant challenge, and understanding the root causes, such as poverty and social inequality, is essential in developing effective strategies to prevent it.
33°C
Haze
Search
21:59
14-05-2023

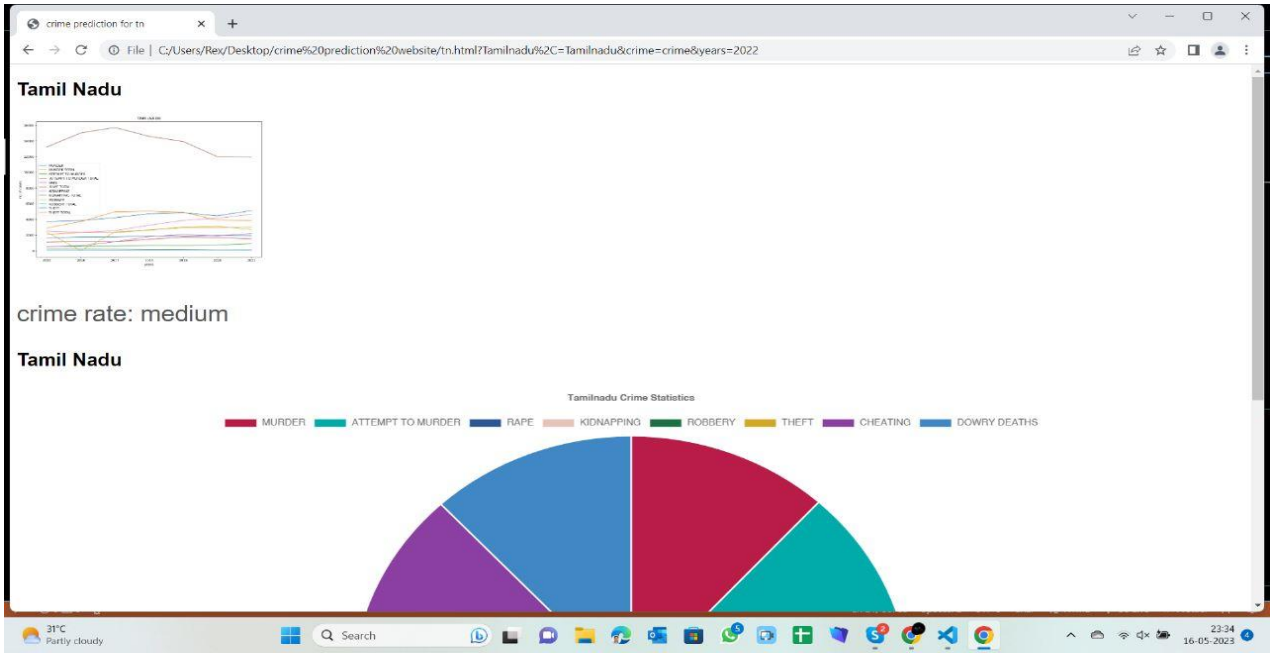

Responsive Contact us Form | Co
File | C:/Users/Rex/Desktop/crime%20prediction%20website/contact.html
Contact us Form
First Name
Last Name
Email Address
Website Name
Write your message
SUBMIT
33°C
Haze
Search
22:00
14-05-2023

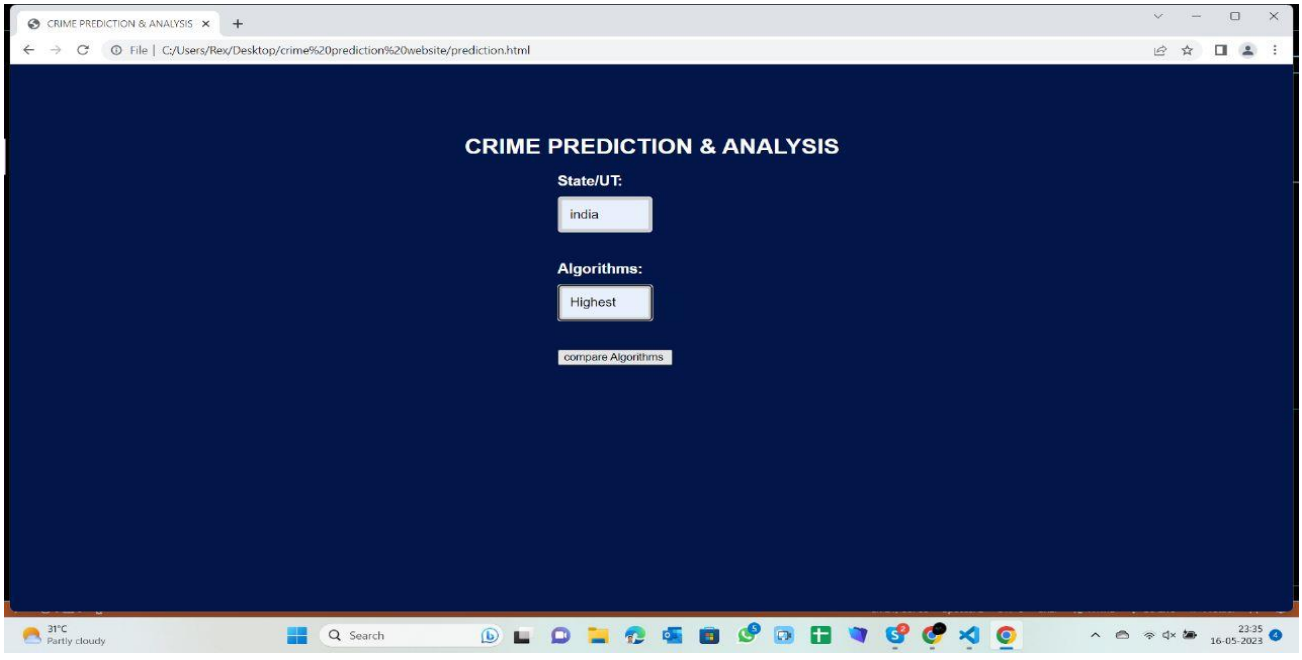

Home Login and Signup Form
File | C:/Users/Rex/Desktop/crime%20prediction%20website/login.html
Login
Email
Password
Forgot password?
Login
Don't have an account? Signup
Or
Login with Facebook
Login with Google
Search

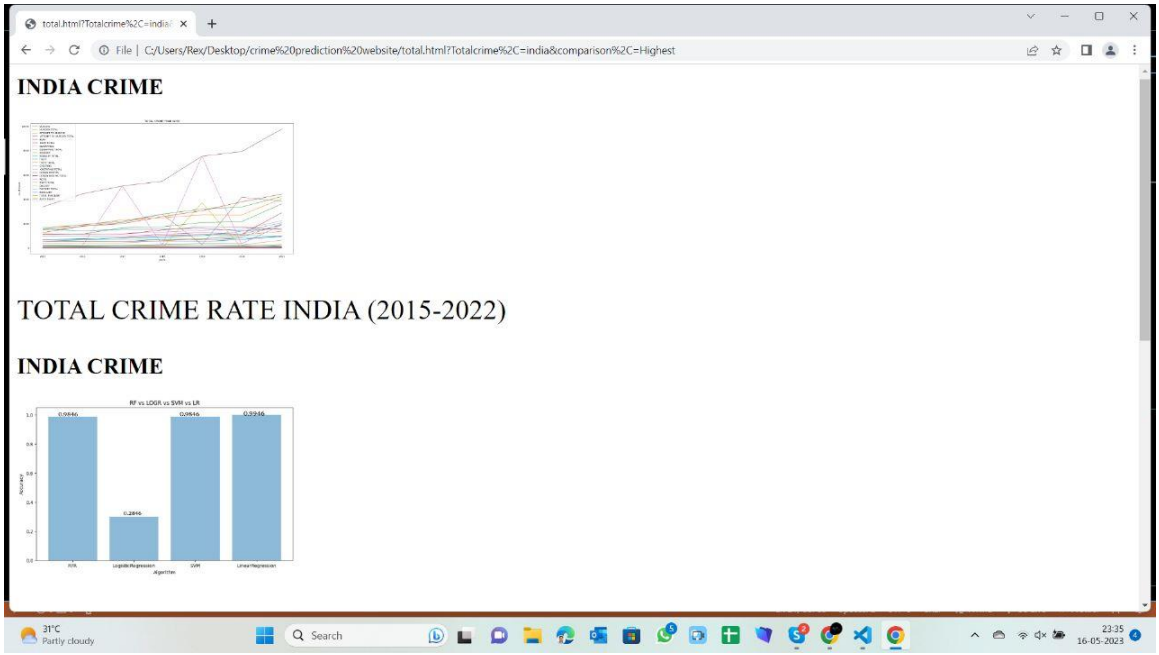

CRIME PREDICTION & ANALYSIS
File | C:/Users/Rex/Desktop/crime%20prediction%20website/crime.html
CRIME PREDICTION & ANALYSIS
STATE/UT:
CRIME TYPE:
YEAR:
2022
Upload Dataset:
Choose File
No file chosen
Predict Crime Rate
Search


CRIME PREDICTION & ANALYSIS
File | C:/Users/Rex/Desktop/crime%20prediction%20website/crime.html?
CRIME PREDICTION & ANALYSIS
Select State:
Tamil Nadu
-- Select State --
Tamil Nadu
Kerala
Delhi
Maharashtra
Andhra Pradesh
Gujarat
Rajasthan
Uttar Pradesh
Karnataka
Punjab
Odisha
West Bengal
Madhya Pradesh
Bihar
Assam
Telangana
Haryana
Jammu and Kashmir
Himachal Pradesh
Tamilnadu
crime
2022
crime prediction analysis
31°C
Partly cloudy
Search
23:34
16-05-2023


crime prediction for tn
File | C:/Users/Rex/Desktop/crime%20prediction%20website/tn.html?Tamilnadu%2C=Tamilnadu&crime=crime&years=2022
Tamil Nadu
Tamilnadu Crime Statistics
MURDER
ATTEMPT TO MURDER
RAPE
KIDNAPPING
ROBBERY
THEFT
CHEATING
DOWRY DEATHS
31°C
Partly cloudy
Search
23:35
16-05-2023

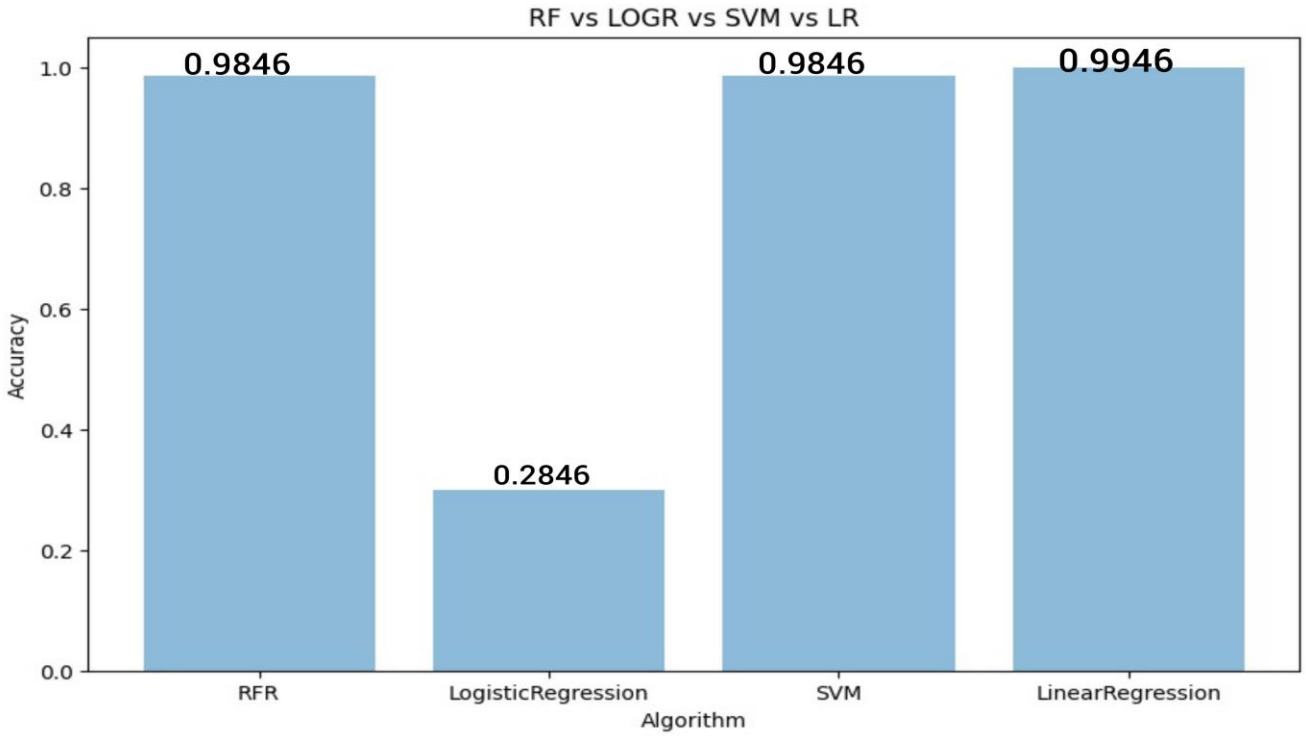

crime prediction for tn
File | C:/Users/Rex/Desktop/crime%20prediction%20website/tn.html?Tamilnadu%2C=Tamilnadu&crime=crime&years=2022
Tamil Nadu
crime rate: medium
Tamil Nadu
Tamilnadu Crime Statistics
MURDER
ATTEMPT TO MURDER
RAPE
KIDNAPPING
ROBBERY
THEFT
CHEATING
DOWRY DEATHS
31°C
Partly cloudy
Search
23:34
16-05-2023


CRIME PREDICTION & ANALYSIS
File | C:/Users/Rex/Desktop/crime%20prediction%20website/prediction.html
CRIME PREDICTION & ANALYSIS
State/UT:
india
Algorithms:
Highest
compare Algorithms
31°C
Partly cloudy
Search
23:35
16-05-2023


total.html?Totalcrime%2C=india
File | C:/Users/Rex/Desktop/crime%20prediction%20website/total.html?Totalcrime%2C=india&comparison%2C=Highest
INDIA CRIME
TOTAL CRIME RATE INDIA (2015-2022)
INDIA CRIME
RF vs LOGR vs SVM vs LR
0.9846
0.2846
0.9846
0.9246
Accuracy
Algorithm
31°C
Partly cloudy
Search
23:35
16-05-2023

CHAPTER 9

RESULT ANALYSIS



7.1 Accuracy graph.

CHAPTER 10

CONCLUSION AND FUTURE ENHANCEMENT

CONCLUSION:

In this paper focused on building predictive models for crime frequencies per crime type per month. The crime rates in India are increasing day by day due to many factors such as increase in poverty, implementation, corruption, etc. The proposed model is very useful for both the investigating agencies and the police official in taking necessary steps to reduce crime. The project helps the crime analysis to analysis these crime networks by means of various interactive visualization.The proposed method was analysed with different classification algorithm the accuracy of Linear Regression found to be good with the accuracy of 95.122%. We generated many graphs and found interesting statistics that helped in understanding India crimes datasets that can help in capturing the factors that can help in keeping society safe.

FUTURE ENHANCEMENT:

From the encouraging results, we believe that crime data mining has a promising future for increasing the effectiveness and efficiency of criminal and intelligence analysis. Visual and intuitive criminal and intelligence investigation techniques can be developed for crime pattern. Future enhancement of this research work on training bots to predict the crime prone areas by using machine learning techniques. Since, machine learning is similar to data mining advanced concept of machine learning can be used for better prediction.

CHAPTER 11

APPENDIX

11.1 APPENDIX 1-CODE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        "import pandas as pd\n",
        "import numpy as np\n",
        "import seaborn as sns\n",
        "import matplotlib.pyplot as plt\n",
        "from sklearn.cluster import KMeans\n",
        "from sklearn.linear_model import LinearRegression\n",
        "from sklearn.model_selection import train_test_split\n",
        "from sklearn.metrics import mean_squared_error, r2_score\n",
        "from sklearn.ensemble import RandomForestRegressor\n"
      ],
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      },
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      "outputs": []
    },
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      ],
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      },
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      "outputs": []
    },
    {
```

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    ],
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      "outputId": "63f991f2-33bc-4779-de44-b0891dc515cf",
      "colab": {
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      }
    },
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    "outputs": [
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            "                  STATE/UT CRIME HEAD  2015  2016
2017  2018  2019  2020  2021  \\\n",
            "0         ANDHRA PRADESH     MURDER  2665  2690
2449  2538  2808  2717  2484  \n",
            "1  ARUNALACHALA PRADESH     MURDER    68
72    59    75    65    73    69  \n",
            "2                  ASSAM     MURDER  1374  1426
1323  1223  1303  1368  1354  \n",
            "3                  BIHAR     MURDER  3034  3139
3152  3362  3198  3566  3441  \n",
            "4           CHHATTISGARH     MURDER  1097  1169
1083  1065  1110   998   945  \n",
            "\n",
            "    2022  \n",
            "0  1175  \n",
            "1    86  \n",
            "2  1451  \n",
            "3  3403  \n",
            "4   998  "
          ],
          "text/html": [
            "\n",
```

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"      <div class=\"colab-df-container\">\n",
"        <div>\n",
"<style scoped>\n",
"      .dataframe tbody tr th:only-of-type {\n",
"          vertical-align: middle;\n",
"      }\n",
"\n",
"      .dataframe tbody tr th {\n",
"          vertical-align: top;\n",
"      }\n",
"\n",
"      .dataframe thead th {\n",
"          text-align: right;\n",
"      }\n",
"</style>\n",
"<table border=\"1\" class=\"dataframe\">\n",
"   <thead>\n",
"      <tr style=\"text-align: right;\">\n",
"        <th></th>\n",
"        <th>STATE/UT</th>\n",
"        <th>CRIME HEAD</th>\n",
"        <th>2015</th>\n",
"        <th>2016</th>\n",
"        <th>2017</th>\n",
"        <th>2018</th>\n",
"        <th>2019</th>\n",
"        <th>2020</th>\n",
"        <th>2021</th>\n",
"        <th>2022</th>\n",
"      </tr>\n",
"   </thead>\n",
"   <tbody>\n",
"      <tr>\n",
"        <th>0</th>\n",
"        <td>ANDHRA PRADESH</td>\n",
"        <td>MURDER</td>\n",
"        <td>2665</td>\n",
"        <td>2690</td>\n",
```

```
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"        <td>2538</td>\n",
"        <td>2808</td>\n",
"        <td>2717</td>\n",
"        <td>2484</td>\n",
"        <td>1175</td>\n",
"      </tr>\n",
"      <tr>\n",
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"        <td>59</td>\n",
"        <td>75</td>\n",
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"        <td>86</td>\n",
"      </tr>\n",
"      <tr>\n",
"        <th>2</th>\n",
"        <td>ASSAM</td>\n",
"        <td>MURDER</td>\n",
"        <td>1374</td>\n",
"        <td>1426</td>\n",
"        <td>1323</td>\n",
"        <td>1223</td>\n",
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"        <td>1354</td>\n",
"        <td>1451</td>\n",
"      </tr>\n",
"      <tr>\n",
"        <th>3</th>\n",
"        <td>BIHAR</td>\n",
"        <td>MURDER</td>\n",
"        <td>3034</td>\n",
"        <td>3139</td>\n",
"        <td>3152</td>\n",
```

```
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"      <td>3198</td>\n",
"      <td>3566</td>\n",
"      <td>3441</td>\n",
"      <td>3403</td>\n",
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"      <th>4</th>\n",
"      <td>CHHATTISGARH</td>\n",
"      <td>MURDER</td>\n",
"      <td>1097</td>\n",
"      <td>1169</td>\n",
"      <td>1083</td>\n",
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"        \n",
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"          width=\"24px\">\n",
"    <path d=\"M0 0h24v24H0V0z\" fill=\"none\"/>\n",
"    <path d=\"M18.56 5.44l.94 2.06.94-2.06 2.06-.94-2.06-.94-.94-2.06-.94 2.06-2.06.94zm-11 1L8.5 8.5l.94-2.06 2.06-.94-2.06-.94L8.5 2.5l-.94 2.06-2.06.94zm10 10l.94 2.06.94-2.06 2.06-.94-2.06-.94-.94-2.06-.94 2.06-2.06.94z\"/><path d=\"M17.41 7.96l-1.37-1.37c-.4-.4-.92-.59-1.43-.59-.52 0-1.04.2-1.43.59L10.3 9.45l-7.72 7.72c-.78.78-.78 2.05 0 2.83L4 21.41c.39.39.9.59 1.41.59.51 0 1.02-.2 1.41-.59l7.78-7.78 2.81-2.81c.8-.78.8-2.07 0-2.86zM5.41 20L4 18.59l7.72-7.72 1.47 1.35L5.41
```

```
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                "       cursor: pointer;\n",
                "       display: none;\n",
                "       fill: #1967D2;\n",
                "       height: 32px;\n",
                "       padding: 0 0 0 0;\n",
                "       width: 32px;\n",
                "     }\n",
                "\n",
                "     .colab-df-convert:hover {\n",
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1px 3px 1px rgba(60, 64, 67, 0.15);\n",
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                "     }\n",
                "\n",
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                "       fill: #FFFFFF;\n",
```

```
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            "    </style>\n",
            "\n",
            "      <script>\n",
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'none';\n",
            "\n",
            "        async function convertToInteractive(key) {\n",
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939cdfa7-29df-428d-af8a-53ca4ea35232');\n",
            "          const dataTable =\n",
            "                                                    await
google.colab.kernel.invokeFunction('convertToInteractive',\n",
            "                                                    [key],
{});\n",
            "          if (!dataTable) return;\n",
            "\n",
            "          const docLinkHtml = 'Like what you see? Visit the
' +\n",
            "                                          '<a target=\"_blank\"
href=https://colab.research.google.com/notebooks/data_table.ipynb>data
table notebook</a>'\n",
            "            + ' to learn more about interactive tables.';\n",
            "          element.innerHTML = '';\n",
            "          dataTable['output_type'] = 'display_data';\n",
            "          await google.colab.output.renderOutput(dataTable,
element);\n",
            "          const docLink = document.createElement('div');\n",
            "          docLink.innerHTML = docLinkHtml;\n",
            "          element.appendChild(docLink);\n",
            "        }\n",
            "      </script>\n",
            "    </div>\n",
            "  </div>\n",
            "  "
        ]
```

```
        },
        "metadata": {},
```

python code

```
# -*- coding: utf-8 -*-
"""Crime prediction

Automatically generated by Colaboratory.

Original file is located at
    https://colab.research.google.com/drive/18_55amsKyoAVWmR-OIpsrUVCLouGHqkF
"""

import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_squared_error, r2_score
from sklearn.ensemble import RandomForestRegressor

df=pd.read_csv('/content/CRIME DATA.csv')

df.head()

years_title=[str(i)for i in range(2015,2022)]

STATES_IN_INDIA=df['STATE/UT'].unique()
STATES_IN_INDIA=STATES_IN_INDIA[:-4]
STATES_IN_INDIA

TYPES_OF_CASES=df['CRIME HEAD'].unique()
TYPES_OF_CASES=TYPES_OF_CASES[:-1]
TYPES_OF_CASES
```

```
df.info()

sns.pairplot(df)

mask = np.tril(df.corr())
fig, ax = plt.subplots(figsize=(15, 15))
sns.heatmap(df.corr(), fmt='.1g', annot=True, cmap= 'coolwarm', mask=mask,ax=ax)

for state in STATES_IN_INDIA:
  fig=plt.figure(figsize=(12,8), dpi=80, facecolor='w',edgecolor='k')
  plt.title(state)
  plt.xlabel('years')
  plt.ylabel('no of cases')
  for case in TYPES_OF_CASES:
    temp_df=df[(df['STATE/UT']==state) & (df['CRIME HEAD']== case )]
    if len(temp_df) > 0:
      N_cases=[temp_df[c].values[0]for c in years_title]
      plt.plot(years_title,N_cases)
  plt.legend(TYPES_OF_CASES)

fig=plt.figure(figsize=(20,10), dpi=80, facecolor='w',edgecolor='k')
plt.title('TOTAL CRIME YEAR WISE')
plt.xlabel('years')
plt.ylabel('no of cases')
for state in STATES_IN_INDIA:
    temp_df=df[(df['STATE/UT']==state) & (df['CRIME HEAD']=='KIDNAPPING' )]
    if len(temp_df) > 0:
      N_cases=[temp_df[c].values[0]for c in years_title]
      plt.plot(years_title,N_cases)
      plt.legend(TYPES_OF_CASES)

from sklearn import preprocessing
lab=preprocessing.LabelEncoder()
df['CRIME HEAD']=lab.fit_transform(df['CRIME HEAD'])
df.head()

from sklearn.cluster import KMeans
```

```
kmeans = KMeans(n_clusters=9)
kmeans.fit(df.iloc[:,1:])

kmeans.cluster_centers_

import numpy as np

unique, count=np.unique(kmeans.labels_, return_counts=True)

dict_data=dict(zip(unique, count))
dict_data

df["cluster"]=kmeans.labels_

kmeans.inertia_

kmeans.score

df

cust = [[13,2665,2690,2449,2538,2808,2717,2484,1175]]
kmeans.predict(cust)[0]

f, ax= plt.subplots(figsize=(24,15))

stats = df.sort_values(["cluster", "STATE/UT"], ascending=True)
sns.set_color_codes("pastel")
sns.barplot(y="STATE/UT",x="2018",data=stats)

sns.despine(left=True, bottom=True)

x = df.iloc[:,1:14]
y = df.iloc[:,df.columns=='cluster']

print(x.head())

y.head()

x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.3,
random_state=0)
```

```
from sklearn.ensemble import RandomForestClassifier

rfc = RandomForestClassifier(n_estimators=100, )

rfc.fit(x_train, y_train)

y_pred = rfc.predict(x_test)
print(y_pred)

from sklearn.metrics import accuracy_score,classification_report
accuracy = accuracy_score(y_test, y_pred)
print('Accuracy:', accuracy)

clf=classification_report(y_pred,y_test)
print(clf)

from sklearn.linear_model import LogisticRegression

log_reg = LogisticRegression()

log_reg.fit(x_train, y_train)

y_pred2 = log_reg.predict(x_test)

accuracy2 = accuracy_score(y_test, y_pred2)
print("Accuracy:", accuracy2)

clf2=classification_report(y_pred2, y_test)
print(clf2)

from sklearn.svm import SVC
from sklearn.metrics import accuracy_score

svm = SVC(kernel='linear', random_state=0)

svm.fit(x_train, y_train)

y_pred3 = svm.predict(x_test)
```

```
accuracy3 = accuracy_score(y_test, y_pred3)
print('Accuracy:', accuracy3)

clf3=classification_report(y_pred3, y_test)
print(clf3)

from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error

print("Shape of X_test:", x_test.shape)
print("Shape of y_test:", y_test.shape)

lg = LinearRegression()

lg.fit(x, y)

y_pred4 = lg.predict(x)

mse = mean_squared_error(y, y_pred4)
print("Mean Squared Error:", mse)

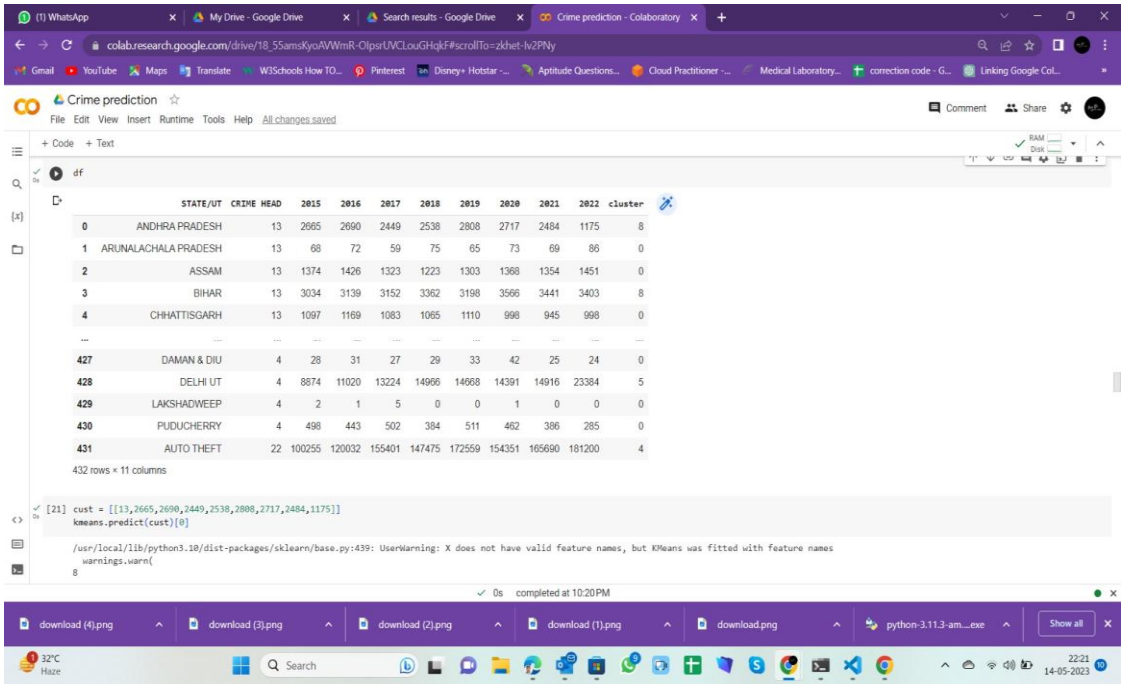
linreg =LinearRegression()
linreg.fit(x_train, y_train)
y_pred4 = linreg.predict(x_test)
mse = np.mean((y_pred4 - y_test)**2)
accuracy4 = linreg.score(x_test, y_test)

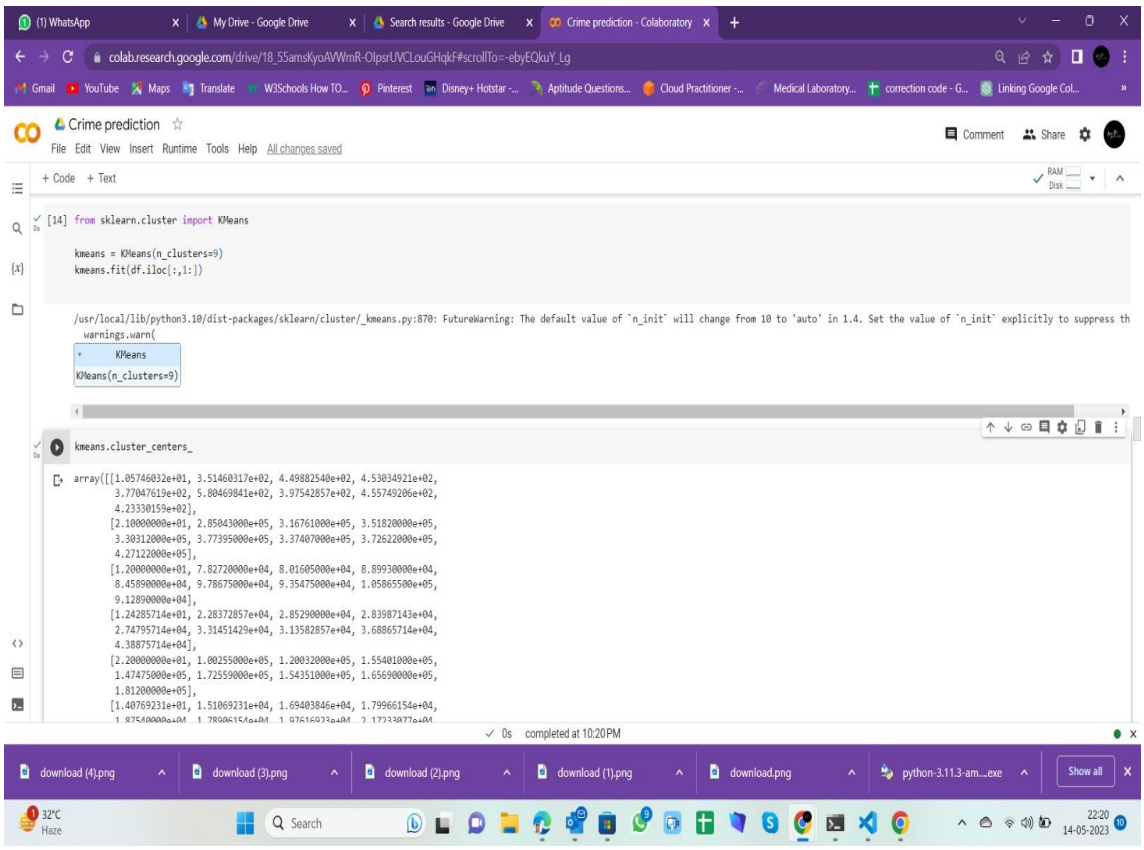
import matplotlib.pyplot as plt; plt.rcdefaults()

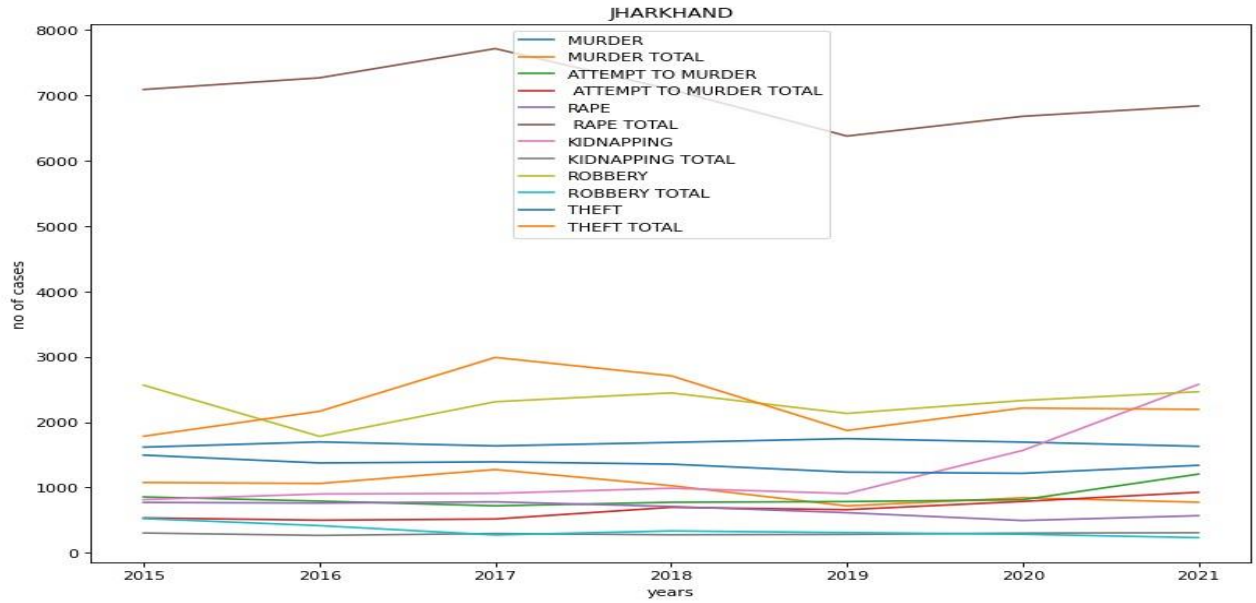
objects = ('RFR', 'LogisticRegression', 'SVM', 'LinearRegression')
y_pos = np.arange(len(objects))
performance = (accuracy, accuracy2, accuracy3, accuracy4)

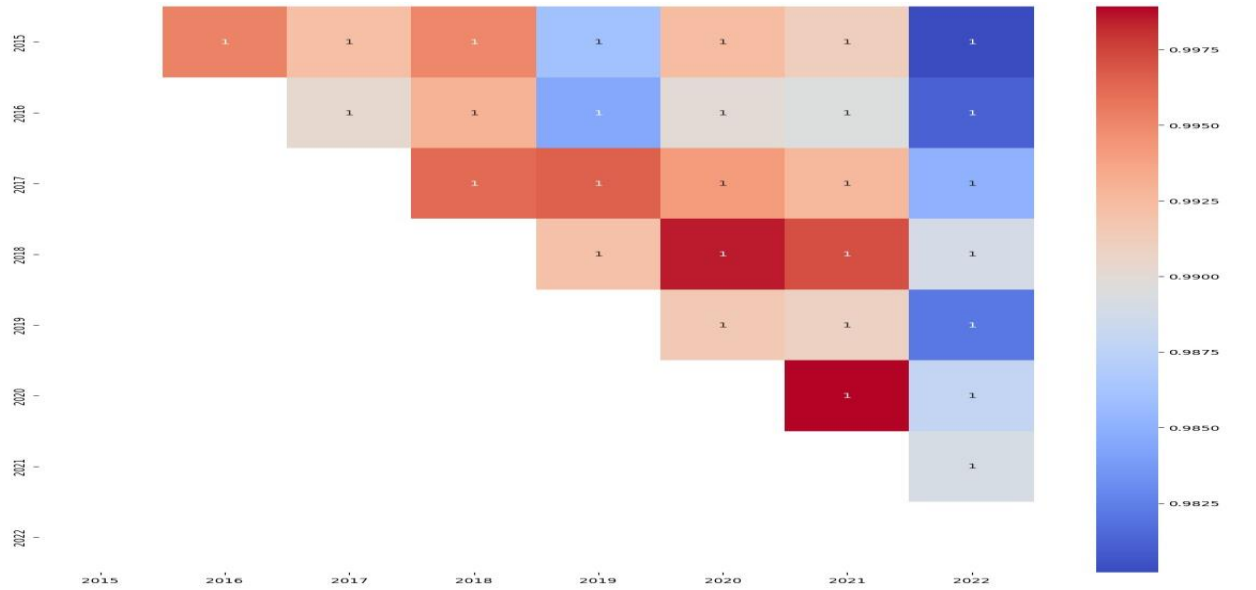
fig, ax = plt.subplots(figsize=(10, 6))
plt.bar(y_pos, performance, align='center', alpha=0.5, )
plt.xticks(y_pos, objects)
plt.xlabel('Algorithm')
plt.ylabel('Accuracy')
plt.title('RF vs LOGR vs SVM vs LR')
plt.show()
```

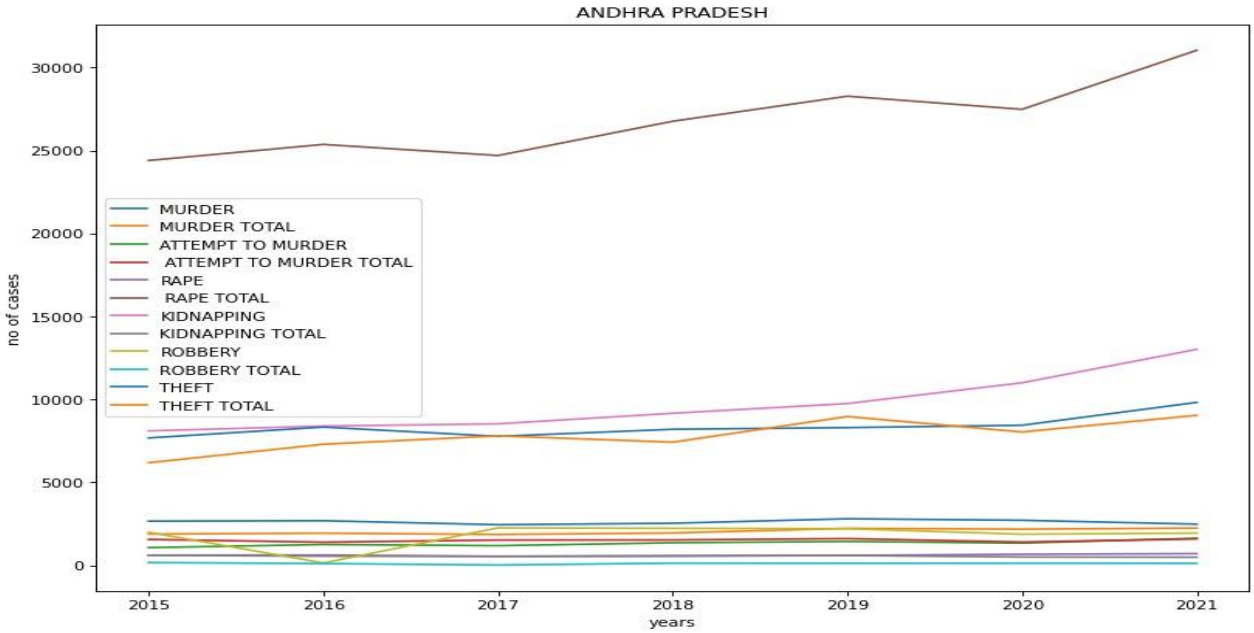
APPENDIX 2-SCREENSHOTS

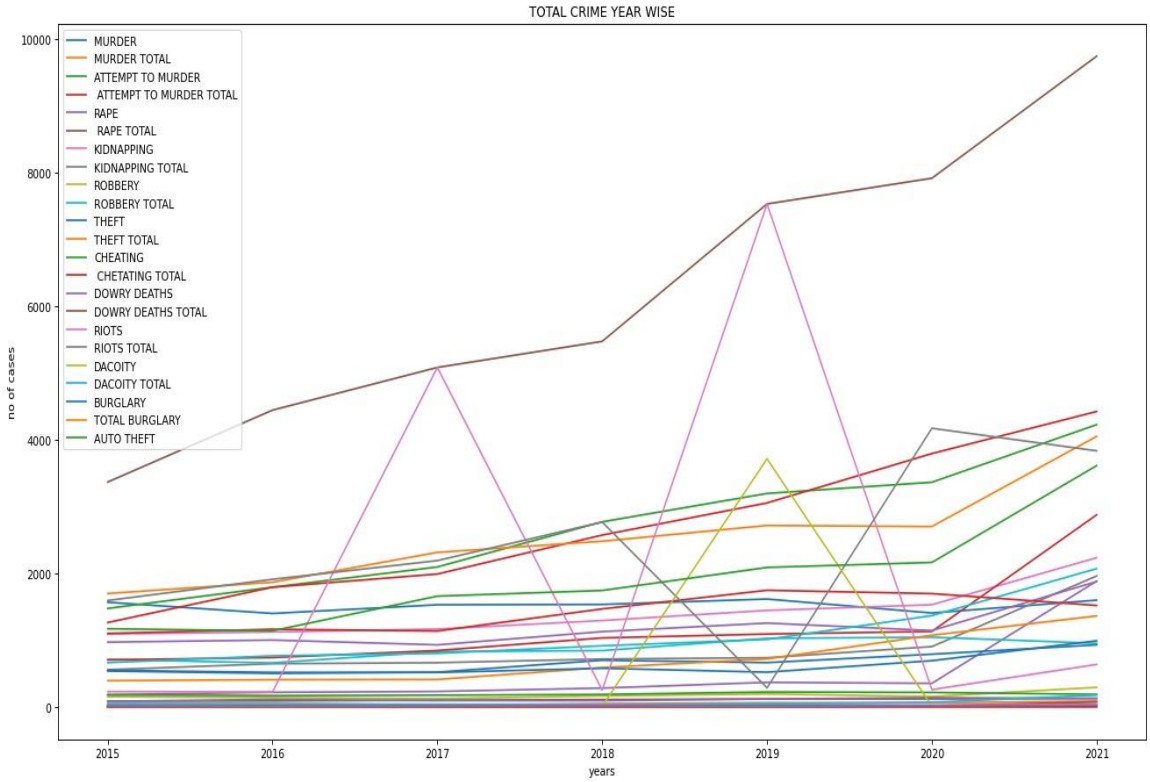


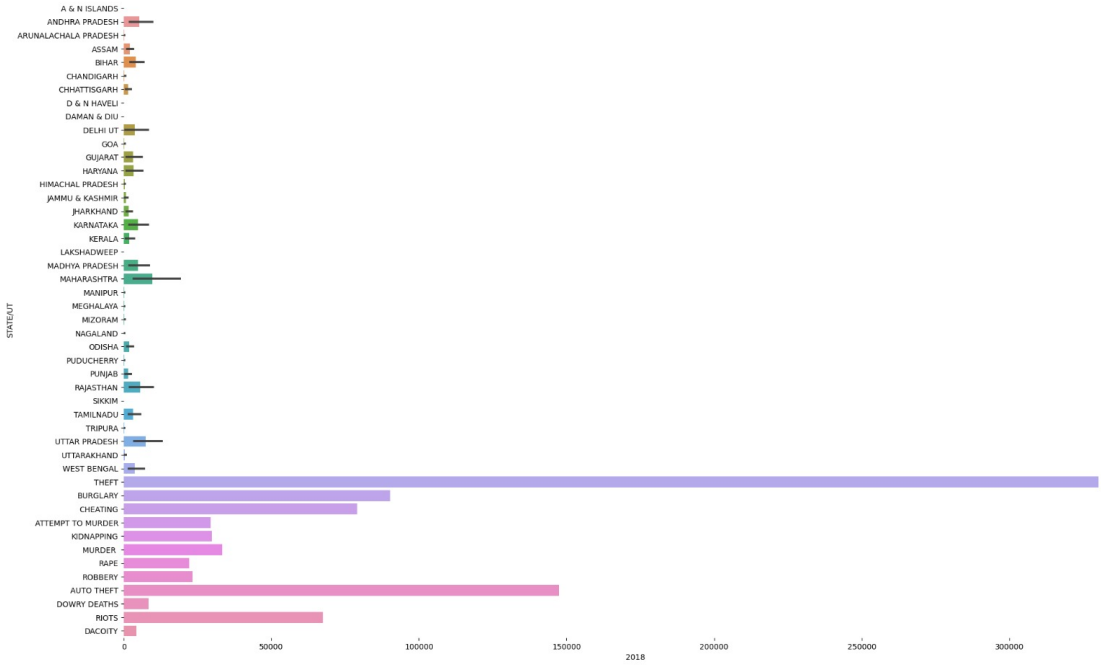



JHARKHAND
MURDER
MURDER TOTAL
ATTEMPT TO MURDER
ATTEMPT TO MURDER TOTAL
RAPE
RAPE TOTAL
KIDNAPPING
KIDNAPPING TOTAL
ROBBERY
ROBBERY TOTAL
THEFT
THEFT TOTAL
no of cases
years




ANDHRA PRADESH
MURDER
MURDER TOTAL
ATTEMPT TO MURDER
ATTEMPT TO MURDER TOTAL
RAPE
RAPE TOTAL
KIDNAPPING
KIDNAPPING TOTAL
ROBBERY
ROBBERY TOTAL
THEFT
THEFT TOTAL
no of cases
years


TOTAL CRIME YEAR WISE
MURDER
MURDER TOTAL
ATTEMPT TO MURDER
ATTEMPT TO MURDER TOTAL
RAPE
RAPE TOTAL
KIDNAPPING
KIDNAPPING TOTAL
ROBBERY
ROBBERY TOTAL
THEFT
THEFT TOTAL
CHEATING
CHETATING TOTAL
DOWRY DEATHS
DOWRY DEATHS TOTAL
RIOTS
RIOTS TOTAL
DACOITY
DACOITY TOTAL
BURGLARY
TOTAL BURGLARY
AUTO THEFT
no of cases
years


STATE/UT
A & N ISLANDS
ANDHRA PRADESH
ARUNALACHALA PRADESH
ASSAM
BIHAR
CHANDIGARH
CHHATTISGARH
D & N HAVELI
DAMAN & DIU
DELHI UT
GOA
GUJARAT
HARYANA
HIMACHAL PRADESH
JAMMU & KASHMIR
JHARKHAND
KARNATAKA
KERALA
LAKSHADWEEP
MADHYA PRADESH
MAHARASHTRA
MANIPUR
MEGHALAYA
MIZORAM
NAGALAND
ODISHA
PUDUCHERRY
PUNJAB
RAJASTHAN
SIKKIM
TAMILNADU
TRIPURA
UTTAR PRADESH
UTTARAKHAND
WEST BENGAL
THEFT
BURGLARY
CHEATING
ATTEMPT TO MURDER
KIDNAPPING
MURDER
RAPE
ROBBERY
AUTO THEFT
DOWRY DEATHS
RIOTS
DACOITY
2018

CHAPTER 12

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