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HUMAN SAFETY AND PREVENTION THROUGH CRIME IDENTIFICATION AND TRACKING

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Abstract - Crime is a pervasive issue that affects communities around the world, and its prediction and prevention are crucial for ensuring the safety and well-being of citizens. This project focuses on the development of a deep learning-based predictive model for estimating crime rates in a given geographic area. By harnessing the power of deep learning techniques, such as neural networks and convolutional neural networks (CNNs), we aim to provide law enforcement agencies and policymakers with a valuable tool for proactive crime prevention and resource allocation.Moreover, this project contributes to the broader field of deep learning applications in social issues, highlighting the potential of artificial intelligence to address complex societal challenges.

Keywords: **deep learning, lstm, cnn, crime area, predictions, location, feature selection, sos**

I.INTRODUCTION

Crime rate prediction is a critical area of research and application, driven by the need to proactively address and reduce criminal activities in our communities. This project aims to develop a sophisticated predictive model using deep learning techniques to forecast crime rates in specific geographic areas and human safety. By leveraging historical data, demographic information, economic indicators, and environmental factors, the project seeks to provide law enforcement agencies, State planners, and policymakers with a powerful tool for making informed decisions, allocating resources efficiently, and ultimately enhancing public safety. This innovative approach combines data science with artificial intelligence to tackle one of society's most pressing challenges – crime prevention. Experimental validation on a benchmark violence dataset demonstrate that

II. LITERATURE SURVEY

We have examined various research papers in the domain of Crime Prediction and Identification for our project to delve deeper into the details of the various researches conducted in the field of Crime Rate Prediction.

The article introduces a novel technique, TSODL-VD, for real-time violence detection in smart video surveillance systems. Leveraging Tuna Swarm Optimization and Deep Learning, this approach employs a residual-DenseNet model to extract features from surveillance video frames, subsequently passing them through a stacked autoencoder (SAE) classifier to distinguish violent from non-violent actions. To enhance accuracy, the TSO protocol is employed
TSODL-VD outperforms current state-of-the-art methods, offering precise and rapid violence detection, addressing the growing need for enhanced public safety and security in surveillance systems [1]. This project aims to develop a robust crime and fraud prediction system tailored for urban areas, with a particular focus on assisting law enforcement agencies. The primary objective is to enhance the accuracy of crime prediction by leveraging advanced data analytics and machine learning techniques. By harnessing the power of predictive analytics, this tool seeks to empower law enforcement with actionable insights to proactively address and prevent criminal activities, ultimately contributing to improved public safety and security in cities [2]. his project combines LSTM (Long Short-Term Memory) and ARIMA (AutoRegressive Integrated Moving Average) models for crime prediction, analysis, and forecasting. It integrates the strengths of both deep learning and traditional time series analysis methods. The LSTM model captures complex temporal patterns in the crime data, while the ARIMA model is employed for time series forecasting. By leveraging a range of machine learning algorithms, including ARIMA, this project aims to provide law enforcement agencies with accurate and actionable predictions, ultimately contributing to improved crime analysis and enhanced crime rate forecasting capabilities [3]. In this study, the research employed a variety of machine learning algorithms, including K-Nearest Neighbors, AdaBoost, Random Forest, and Neural Networks, to construct predictive models for forecasting future crimes and crime locations. These algorithms were used to analyze

historical crime data and identify patterns to make accurate predictions. Additionally, the project utilized the Folium API for data visualization, enabling the representation of crime-related information on maps for enhanced spatial analysis and understanding. The integration of these algorithms and data visualization tools contributes to a comprehensive approach to crime prediction and analysis, aiding law enforcement and decision-makers in proactive crime prevention and resource allocation [4]. The project employs a hybrid approach that combines deep learning techniques to predict crime events, addressing the shortcomings of existing strategies. It recognizes the potential to enhance crime prediction by honing in on patterns and trends derived from a multitude of contributing factors. By leveraging deep learning, this approach aims to overcome limitations in traditional methods and offer more accurate and proactive crime event prediction. It emphasizes the importance of considering a comprehensive range of data sources and factors

III.PROBLEM STATEMENT

To develop a website to identify criminal activities, predict the frequent crime occuring at a certain location using deep learning algorithms and SOS system alert addressing emergency response challenges.

IV.PROJECT SCOPE

This project aims to develop a deep learning-based crime identification, crime rate prediction and SOS system that integrates historical crime data, demographic variables, economic indicators, and geospatial information. The scope includes designing and training deep neural networks to capture complex spatiotemporal patterns in crime data, with a focus on improving prediction accuracy. The project also involves the creation of a user-friendly interface for visualizing and interpreting predictions. Additionally, it encompasses rigorous evaluation of the model's performance and the potential for future enhancements, making it a valuable tool for law enforcement agencies and policymakers in their efforts to proactively address and reduce crime rates.

V.PROPOSED SYSTEM

Analysis/Framework/ Algorithm

Long Short-Term Memory (LSTM) is a type of recurrent neural network (RNN) that is particularly effective for sequence prediction tasks. Here's a high-level algorithm for using LSTM for sequence prediction:

Data Preprocessing:

Collect and preprocess our dataset, which should consist of sequences of data. This data can be in various forms, such as time series data, text, or any sequential information.

Data Splitting:

Split our dataset into training, validation, and test sets. The training set is used to train the model, the validation set is used to fine-tune hyperparameters and monitor training progress, and the test set is used to evaluate the final model.

Sequence Padding (if necessary):

If our sequences have varying lengths, we may need to pad or truncate them to ensure that all sequences have the same length. This is important for batch processing.

Model Architecture:

Build an LSTM-based neural network model. We can choose the number of LSTM layers, the number of LSTM units in each layer, and any additional layers or components based on the complexity of our prediction task.

Compile the Model:

Specify a loss function and an optimization algorithm. For sequence prediction tasks, mean squared error (MSE) or categorical cross-entropy are common loss functions. Common optimizers include Adam or RMSprop.

Training:

Train the LSTM model on our training data, specifying the number of epochs (iterations over the entire dataset), batch size (the number of sequences in each training batch), and other training hyperparameters. Monitor the model's performance on the validation set to avoid overfitting.

Validation and Fine-Tuning:

Fine-tune hyperparameters, such as the number of LSTM units or layers, learning rate, and batch size, based on the validation set's performance. Iterate on training and validation until we achieve satisfactory results.

Testing and Evaluation:

Evaluate our LSTM model on the test set to assess its predictive performance. Use appropriate evaluation metrics for our specific task, such as mean absolute error (MAE) for regression tasks or accuracy and F1-score for classification tasks.

Prediction:

Use the trained LSTM model to make predictions on new, unseen data sequences.

Post-processing:

Depending on our specific prediction task, we may need to apply post-processing steps such as scaling predictions back to the original data range or converting predicted values into actionable insights.

System Requirements:

This section will provide the user the required specification of the hardware and software components on which the proposed system is to be implemented.

Hardware Requirements;

This subsection will provide the minimum requirements that must be fulfilled by the hardware components. The hardware requirements are as follows: -

- A smart phone with
1. Camera – minimum 5 megapixels
2. Storage – minimum 200 megabytes free
3. RAM – minimum 2 gigabytes
4. Processor – minimum dual core

- A desktop with

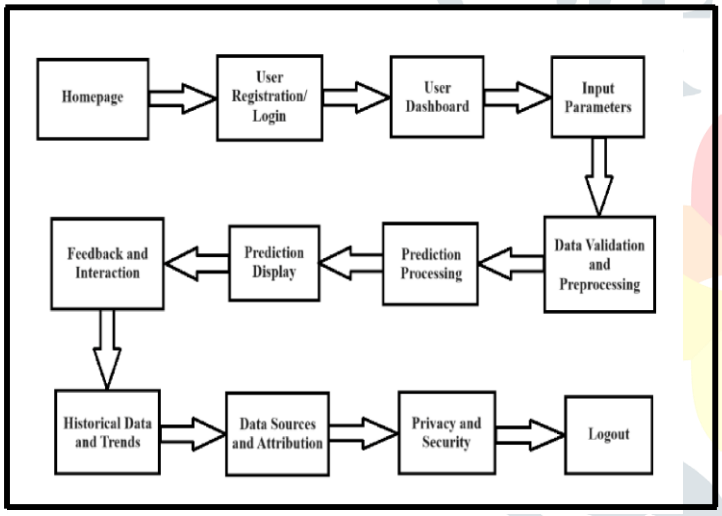
1. RAM – minimum 4 gigabytes
2. Storage – minimum 100 gigabytes
3. Processor – minimum quad core or hexa core

Software Requirements;

This subsection will provide the versions of software applications that must be installed. The software requirements are as follows: -

Python 3.7
Visual Studio Code
Python IDE

VI. SYSTEM ARCHITECTURE



Designing the flow of a crime rate prediction website involves defining how users will interact with the site from the moment they arrive to when they receive predictions. Here's a high-level flow for such a website:

1**. Homepage:**
Users land on the homepage, which provides an overview of the website's purpose and capabilities.
Include a navigation menu or links to key sections of the site.

2. User Registration / Login:
If the website requires user accounts, provide options for users to either log in or create a new account.
User authentication is necessary to track user preferences and maintain privacy.

3. **User Dashboard:**
After logging in, users are directed to a personalized dashboard.
Here, users can manage their profiles, preferences, and view past predictions.

4. Input Parameters:

A dedicated section allows users to input parameters for the crime rate prediction. These parameters may include:
Location (e.g., State, neighborhood)
Date and time
Demographic information
Additional context (e.g., weather conditions)
Users can input these details through forms or interactive maps.

5. Data Validation and Preprocessing:
The website validates user inputs to ensure they are within acceptable ranges and formats. ➔ Preprocess the input data, such as converting location names to coordinates, handling missing values, or normalizing inputs.

6. Prediction Processing:
Submit the processed input data to the deep learning model for prediction.
While waiting for the prediction, display a loading indicator or progress bar to keep users informed.

7. Prediction Display:
Present the predicted crime rate to the user in a user-friendly format, such as charts, graphs, or a simple textual representation.
Include relevant context and explanations for the prediction.

8**. Feedback and Interaction**:
Allow users to provide feedback on the prediction's accuracy or usefulness. This feedback can be valuable for model improvement.
Users may have the option to adjust input parameters and re-run predictions.

9. Historical Data and Trends:
Include a section or visualization that shows historical crime rate data and trends for the selected location. This provides context for the user.

10. Data Sources and Attribution:
If the website uses external data sources (e.g., weather data), provide proper attribution and links to the sources.

11. Privacy and Security:
Ensure that user data is handled securely and provide information about the website's privacy policy.

12. Logout:
Users can log out from their accounts to end their session securely.

VI. Problem Statement and Objective

To develop a website to identify criminal activities, predict the frequent crime occuring at a certain location using deep learning algorithms and SOS system alert addressing emergency response challenges.

This project aims to develop a deep learning-based crime identification, crime rate prediction and SOS system that integrates historical crime data, demographic variables, economic indicators, and geospatial information. The scope includes designing and training deep neural networks to capture complex spatiotemporal patterns in crime data, with a focus on improving prediction accuracy. The project also involves the creation of a user-friendly interface for visualizing and interpreting predictions. Additionally,

it encompasses rigorous evaluation of the model's performance and the potential for future enhancements, making it a valuable tool for law enforcement agencies and policymakers in their efforts to proactively address and reduce crime rates.

VIII. Methodology

Crime rate prediction using deep learning typically involves a structured methodology that includes data collection, preprocessing, model selection, training, evaluation, and deployment. Here's a step-by-step methodology for crime rate prediction using deep learning:

Data Collection:
Gather historical crime data, which should include details about the type of crime, location, date and time, and any other relevant information. Collect supplementary data, such as demographic information, environmental factors, and previous law enforcement actions.

Data Preprocessing:
Clean and preprocess the collected data. Handle missing values, outliers, and inconsistencies. Normalize or scale numerical features. Convert categorical data into a suitable format for deep learning models.

Feature Engineering:
Extract and engineer relevant features from the data. This may include creating time-related features, spatial features, and aggregating data to various temporal resolutions.

Model Selection:
Choose an appropriate deep learning architecture for the task. For crime rate prediction, recurrent neural networks (RNNs), convolutional neural networks (CNNs), long short-term memory networks (LSTMs), or hybrid models may be suitable.

Model Training:
Split the data into training, validation, and test sets. Train the selected deep learning model on the training data. Use loss functions suitable for regression tasks, such as mean squared error (MSE).

Model Evaluation:
Evaluate the trained model on the validation set using appropriate evaluation metrics, such as root mean squared error (RMSE), mean absolute error (MAE), or others suitable for regression tasks. Fine-tune hyperparameters to improve performance.

Model Deployment:
Once the model achieves satisfactory performance, deploy it for making predictions on new data. This can involve setting up a real-time prediction system or a batch prediction process.

Monitoring and Maintenance:
Continuously monitor the model's performance in a real-world setting. Implement a system to retrain the model periodically with new data to ensure it remains up to date.

Visualization and Interpretation:
Visualize the model's predictions and their interpretations, providing actionable insights to law enforcement and decision-makers. Visualization tools like maps and charts can be used to convey results effectively.

Feedback Loop:
Establish a feedback loop with law enforcement agencies to receive their input and improve the model. Adapt the model to changing crime patterns and emerging trends.

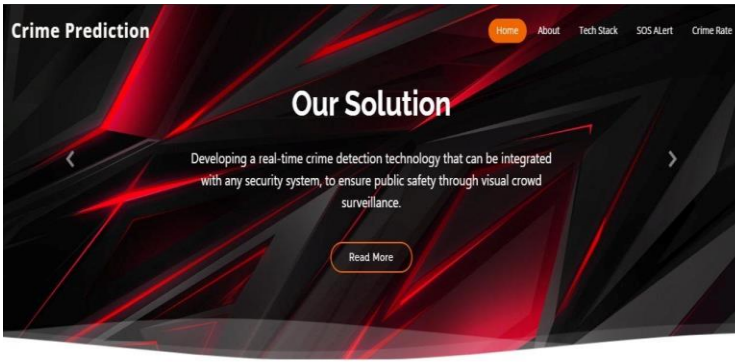
Documentation and Reporting:
Maintain thorough documentation of the methodology, data sources, model architecture, and results. Generate regular reports to communicate the effectiveness of the crime rate prediction system.

This methodology provides a structured approach to crime rate prediction using deep learning. Keep in mind that the specific details and techniques employed may vary depending on the dataset, goals, and the deep learning model chosen for the project.

IX. Result and Discussion

PROPOSED SYSTEM RESULT

The proposed system for crime rate prediction employs deep learning techniques to enhance the accuracy and effectiveness of crime prediction. It leverages a sophisticated neural network architecture, such as Long Short-Term Memory (LSTM) or Convolutional Neural Network (CNN), to analyze historical crime data, incorporating diverse features, including spatial, temporal, and environmental factors. The system aims to provide law enforcement agencies with a proactive tool for predicting and preventing criminal activities by capturing intricate patterns and relationships within the data. By harnessing deep learning, this system offers the potential to contribute to improved public safety and security through precise and timely crime rate predictions.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Our Solution
Developing a real-time crime detection technology that can be integrated with any security system, to ensure public safety through visual crowd surveillance.
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Call to Action
Want to test our solution without getting your hands dirty? Just upload a video here and see the magic happen!
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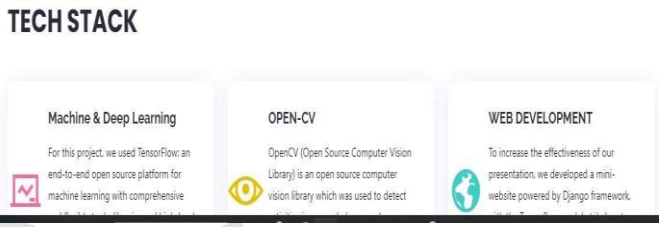
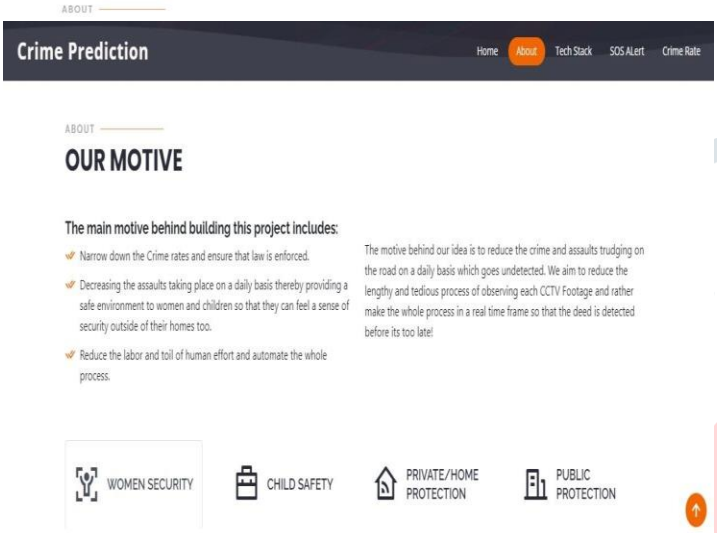

TECH STACK
Machine & Deep Learning
For this project, we used TensorFlow: an end-to-end open source platform for machine learning with comprehensive
OPEN-CV
OpenCV (Open Source Computer Vision Library) is an open source computer vision library which was used to detect
WEB DEVELOPMENT
To increase the effectiveness of our presentation, we developed a mini-website powered by Django framework,


ABOUT
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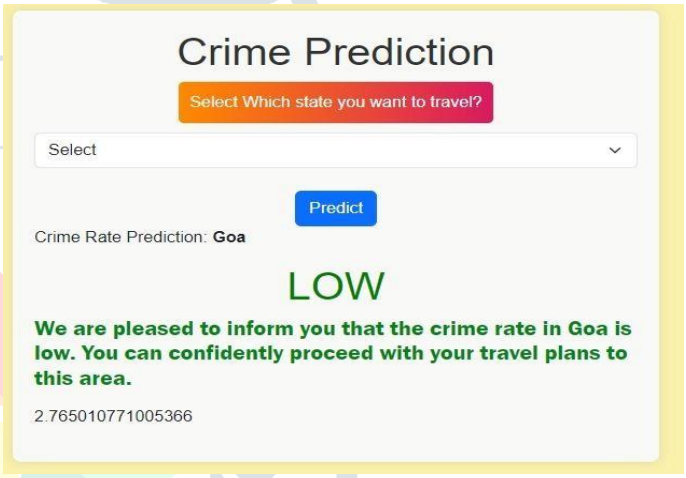
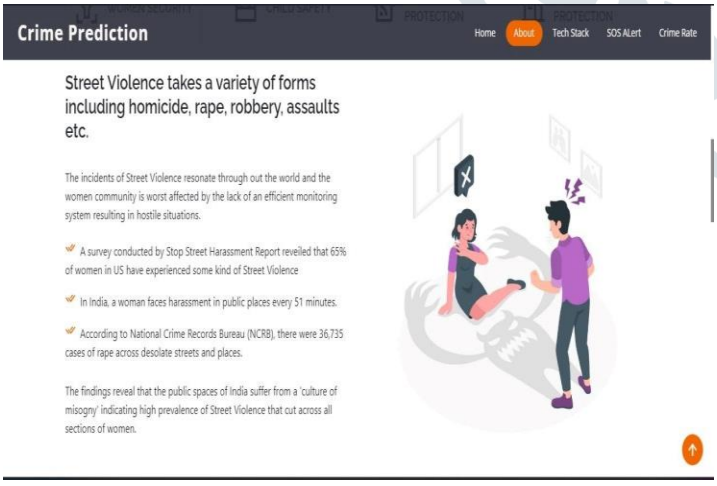
ABOUT
OUR MOTIVE
The main motive behind building this project includes:
Narrow down the Crime rates and ensure that law is enforced.
Decreasing the assaults taking place on a daily basis thereby providing a safe environment to women and children so that they can feel a sense of security outside of their homes too.
Reduce the labor and toil of human effort and automate the whole process.
The motive behind our idea is to reduce the crime and assaults trudging on the road on a daily basis which goes undetected. We aim to reduce the lengthy and tedious process of observing each CCTV Footage and rather make the whole process in a real time frame so that the deed is detected before its too late!
WOMEN SECURITY
CHILD SAFETY
PRIVATE/HOME PROTECTION
PUBLIC PROTECTION


Crime Prediction
Select Which state you want to travel?
Select
Predict
Crime Rate Prediction: Goa
LOW
We are pleased to inform you that the crime rate in Goa is low. You can confidently proceed with your travel plans to this area.
2.765010771005366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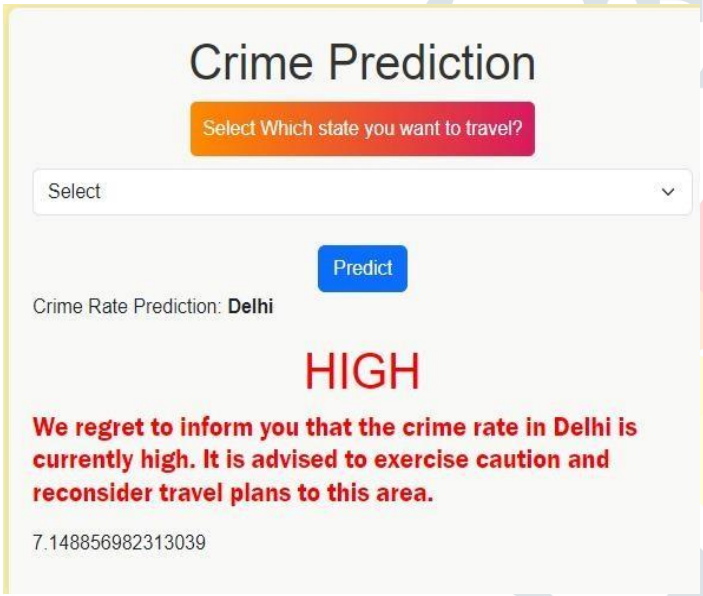
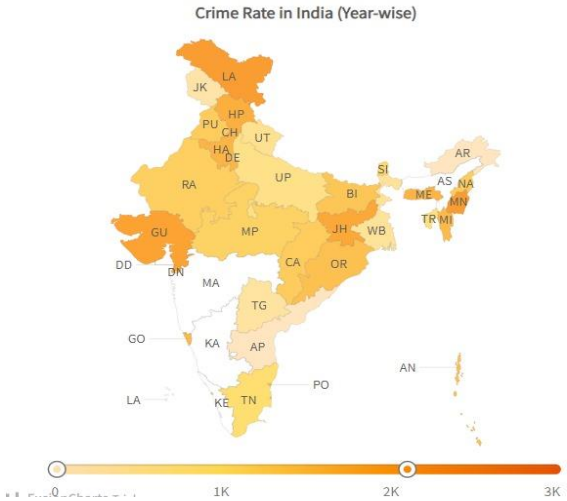
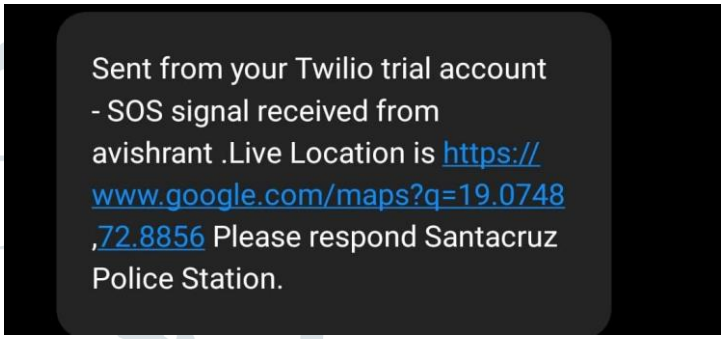
Crime Rate
Street Violence takes a variety of forms including homicide, rape, robbery, assaults etc.
The incidents of Street Violence resonate through out the world and the women community is worst affected by the lack of an efficient monitoring system resulting in hostile situations.
A survey conducted by Stop Street Harassment Report reveiled that 65% of women in US have experienced some kind of Street Violence
In India, a woman faces harassment in public places every 51 minutes.
According to National Crime Records Bureau (NCRB), there were 36,735 cases of rape across desolate streets and places.
The findings reveal that the public spaces of India suffer from a 'culture of misogny' indicating high prevalence of Street Violence that cut across all sections of women.







X. CONCLUSION

In conclusion, the "Human Safety and Prediction through Crime Identification and Tracking" project demonstrates the significant potential of deep learning in addressing complex societal challenges. By harnessing the power of deep neural networks, this project offers a data-driven approach to predicting and ultimately reducing crime rates in specific geographic areas. The integration of diverse datasets, including historical crime data, demographic information, economic indicators, and environmental factors, enriches the predictive model, allowing it to capture nuanced patterns and dependencies. The project not only provides law enforcement agencies and policymakers with a valuable tool for resource allocation and strategic planning but also contributes to the broader field of artificial intelligence's application in social issues. The ability to proactively address and prevent crime through data-driven insights highlights the impact of advanced technology in enhancing public safety and decision-making processes. As society continues to grapple with crime-related challenges, this project underscores the potential for deep learning to shape a safer and more secure future.

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