Edge Assisted Crime Prediction and Evaluation Framework for Machine Learning Algorithms

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Abstract—The growing global populations, particularly in major cities, have created new problems, notably in terms of public safety regulation and optimization. As a result, in this paper, a strategy is provided for predicting crime occurrences in a city based on historical events and demographic observation. In particular, this study proposes a crime prediction and evaluation framework for machine learning algorithms of the network edge. Thus, a complete analysis of four distinct sorts of crimes, such as murder, rapid trial, repression of women and children, and narcotics, validates the efficiency of the proposed framework. The complete study and implementation process have shown a visual representation of crime in various areas of country. The total work is completed by the selection, assessment, and implementation of the Machine Learning (ML) model, and finally, proposed the crime prediction. Criminal risk is predicted using classification models for a particular time interval and place. To anticipate occurrences, ML methods such as Decision Trees, Neural Networks, K-Nearest Neighbors, and Impact Learning are being utilized, and their performance is compared based on the data processing and modification used. A maximum accuracy of 81% is obtained for Decision Tree algorithm during the prediction of crime. The findings demonstrate that employing Machine Learning techniques aids in the prediction of criminal events, which has aided in the enhancement of public security.

Index Terms—Machine Learning, Edge Computing, Crime Prediction, Impact Learning, Decision Tree, KNN, MLP

I. INTRODUCTION

One of the primary concerns of the global population is public safety. Several causes, such as the rapid pace of urbanization, have led to the rise in worry. The migration of people to cities has been well-known in recent years, and according to UN predictions, over 70% of the world's population will live in cities by 2050 [1]. In addition, according to the Global Terrorism Database, which defines terrorist attacks as "acts of violence by non-state actors perpetrated against civilian populations, intended to cause fear, in order to achieve a political objective," the number of terrorist attacks in the last decade was the highest ever recorded. Machine learning (ML) techniques are critical for smart city applications and may be used to reduce crime since they aid with difficulties concerning

urban development and the extraction of value from the data obtained [2].

This paper provides a graphical representation of crime in several areas of country, such as Bangladesh.. We used data from 2012 to 2019 to show the seniors. Using the crime prediction model, we observed that region 1 is more corrupted than other cities whereas region 2 is less corrupted. Using all of this information, we created a model that predicts crime in 2021 (check this). We present a crime comparison between 2019 and 2021. We have incidents to inform residents and municipal officials about the most dangerous places, therefore providing value to the community and increasing public safety. In this regard, this sort of prediction can be beneficial in a variety of ways, including more efficient and effective patrol route planning, as well as for tourists who are ignorant of the city's most hazardous locations.

Machine learning techniques such as Impact Learning [3], Decision Tree [4], K-Nearest Neighbors [5], and MLP Classifier are used to make the predictions. These algorithms are graded based on the data processing and transformation techniques are utilized. We summarize the key contribution as follows:

1) First, we have proposed a crime prediction and evaluation framework for ML algorithms of the network edge. That not only can learn historical analysis for crime detection but it also can evaluate based on the current data to protect the crime.

2) Second, we have implemented several ML algorithms, such as Decision Trees, Neural Networks, K-Nearest Neighbors, and Impact Learning on top of the proposed framework. In which, real crime data of the country are used to verify the effectiveness of the proposed framework by a comprehensive study.

3) Finally, our results show the efficacy to predict the crime, such as Murder, Speedy trial, Woman and Child Repression, and Narcotics in terms of accuracy to protect the society.

The rest of this paper is laid out as follows. The related work is described in Section II, and the Proposed Framework is presented in Section III. The results and discussions are then provided in Section IV, along with a description of the machine learning methods. Finally, we conclude in section V.