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SIMULINK Model for Crime Intention Detection Using Convolutional Neural Network (CNN-Based)

Prof Ejiofor Chukwuemeke[1], Prof Hyacinth Inyiama[1], Prof Scholastictic Nebe[1], Prof Nnenna Harmony Nwobodo-Nzeibe[2], Dr Theophilus Alumona[1], *Engr Afam Samuel Eneh[3]

[1]*Department of Computer Science, Nnamdi Azikwe University Awka, Anambra State, Nigeria*
[2]*Department of Computer Engineering, Enugu State University of Science and Technology, Enugu State, Enugu State,Nigeria*
[3]*Department of Biomedical Engineering, David Umahi Federal University of Health Science,Uburu, Ebonyi State, Nigeria*

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ABSTRACT
Development and Implementation of Convolutional Neural Network (CNN-Based) Crime-Intention Detection System" this journal aim at developing a system that reliably detects and forecasts possible criminal activity in real-time. The approach overcomes CNN limitations by integrating contextual information and multimodal data. Because ethical factors like privacy and surveillance are taken into account, the technology is scalable for practical uses. In order to enhance timely crime detection and location monitoring, the crime-intention detection system was created utilizing a CNN rule-based system and a traditional SIMULINK architecture. The study contrasted the criminal detection rate of the CNN-enhanced system with that of a traditional system. Findings indicated that traditional problems with inadequate financing and resources led to poor crime detection at a rate of 35%; the CNN method improved this percentage by 5.07%, to 29.93%. Crime detection was impacted by inadequate training by 28%; however, with CNN integration, this decreased to 23.94%, indicating a 4.06% improvement. Furthermore, the total crime detection rate rose from 32% to 43.77%, indicating an 11.77% improvement, whereas data management problems decreased detection by 10% and improved to 8.55% using CNN (1.45% better). These results contribute to the development of AI-driven crime detection technology by demonstrating that CNN algorithms are more successful than traditional techniques at increasing crime detection rates.

Keyword: Convolutional Neural Network; Simulink model

I. INTRODUCTION

The prevention and detection of crime is one of the most significant problems that law enforcement agencies worldwide are dealing with. Urbanization and population density have increased the complexity and diversity of criminal activities, necessitating the use of advanced technologies to help identify and prevent them. Traditional criminal detection techniques usually rely on reactive methods, which may result in inadequate crime prevention and delayed reactions, claim [1]. As a result, there is an increasing need for proactive systems that are able to anticipate and identify potential criminal conduct before it occurs [2]. Conventional methods of criminal detection usually rely on reactive techniques, which may result in delayed reactions and inadequate crime prevention. As a result, there is an increasing need for proactive systems that are able to anticipate and identify potential criminal conduct before it occurs [3]. There has been a lot of interest recently in the use of CNNs for criminal detection. Researchers are now looking into how these algorithms may improve the accuracy and effectiveness of crime-intention detection systems. However, the promise of CNNs in this area is still unfulfilled, and there are a number of holes in the current study. Although many studies focus on using CNNs for image classification, there is a lack of research on CNNs' application in real-time criminal detection

scenarios that combine multimodal data sources such as video feeds, social media postings, and sensor data [4]. Traditional criminal detection systems frequently use reactive techniques, which have limitations in terms of anticipating and stopping crimes before they happen. Slow reaction times, inadequate resource allocation, and inadequate data analysis typically hinder these systems, resulting in less-than-ideal crime detection rates. Furthermore, traditional approaches' efficacy in complex dynamic contexts is limited by their inability to collect and interpret vast volumes of multimodal data (such as photos, videos, and sensor data) in real time. Interest in creating systems that can identify and stop illegal activities is rising as a result of the development of artificial intelligence (AI) and machine learning (ML). A subclass of deep learning called coevolutionary neural networks (CNNs) has shown remarkable success in a variety of image and pattern recognition applications. CNN's capacity to identify criminal intent hasn't been properly investigated, though, and putting such systems into place is fraught with difficulties, such as privacy ethics and the possibility of false positives. Better real-time predictive criminal intention detection systems that can handle complicated data and deliver more precise actionable insights are desperately needed.By creating a CNN-based system for detecting criminal intent, including multimodal data, increasing the precision of crime detection, and taking ethical considerations into account, the project seeks to close this gap and eventually strengthen law enforcement's capacity to deter crime and effectively respond to it. Numerous studies have been conducted. Crime Scene Image Classification with Deep CNN Using Deep Convolution Neural Network (CNN) is suggested by [5]. created a CNN model to help with criminal investigations by categorizing photos from crime scenes. High classification accuracy for images; efficient feature extraction In order to analyze video surveillance data for crime detection, [6] suggested an upgraded CNN architecture for video surveillance analysis utilizing upgraded CNN with LSTM. This study included combining an enhanced CNN model with Long Short-Term Memory (LSTM). Better handling of video data and enhanced temporal pattern detection are computationally demanding and need a large amount of computing resources, yet investigation of less computationally intensive designs, [7] suggested CNN with Transfer Learning Real-time Crime Detection CNN with Transfer Learning used a CNN model that leverages transfer learning to improve real-time crime detection with pre-trained networks. quicker deployment; using pre-trained models cuts down on training time. It might not be as successful when used to unusual or groundbreaking crime kinds. [8] Hybrid CNN for Image + Text Hybrid CNN for Multi-modal Crime Data Analysis. In order to analyze multi-modal crime data, including social media postings and surveillance photos, they created a hybrid CNN model that combines text and picture data. combines many data formats and offers extensive analytical tools. Complex model: integrating several data modalities might be difficult, however performance can be increased by streamlining data integration techniques. [9] Using CNN Algorithms That Are Optimized for Crime Pattern Recognition. centered on enhancing CNN architectures to better identify patterns of criminal activity in huge datasets. improved performance on big datasets and improved pattern recognition. Research on adaptive optimization strategies for different data sizes may be necessary, but it may also call for more sophisticated optimization methods and experience. The following research gaps were revealed by the evaluated literature. Limitations on Real-Time Detection Accuracy: CNN-based crime detection systems struggle to produce precise real-time results in dynamic environments, which makes it challenging to make good behavioral predictions. Insufficient Contextual Data Incorporation: Current algorithms place too much emphasis on visual data while ignoring contextual elements like historical or environmental cues, which lowers prediction accuracy. Multimodal Information Processing Challenges: CNNs have challenges when trying to integrate several data forms, such as text, audio, and video, which reduces their overall efficacy. Problems with Overfitting in Complex Situations: CNNs have a tendency to overfit when trained on small datasets, which results in subpar generalization in real-world criminal scenarios. Implications for Ethics and Privacy: Using CNNs to identify crimes poses privacy issues, which calls for research that strikes a balance between efficiency and individual rights protection. Implementation and Scaling Challenges: CNN models need to be more scalable in order to be used in wider, more varied geographic or cultural contexts. Limited Capability to Adapt to Changing Criminal Tactics: The incapacity of current models to adapt to changing criminal behaviors underscores the necessity for improved continuous learning capabilities. Finally, by suggesting a CNN rule basis to improve detection speed and accuracy,

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our study fills the research gap noted by Garcia et al. (2023).

II. METHOD

The creation of a simple model that mimics criminal detection procedures using MATLAB/SIMULINK. incorporating actual crime scenes to validate the model.A criminal intention detection model will be designed and simulated using MATLAB/SIMULINK. The intricate simulations of several actual criminal situations will be managed by the CPU and RAM of the computer. The SIMULINK model will be improved to solve difficulties found by simulating various criminal signs and system behaviors, guaranteeing an effective detection system. Reviewing the literature and analyzing current criminal detection methods. Collect information about detecting issues and failures from real-world systems or case studies. Large datasets will be processed by the powerful computer in order to examine current crime detection methods. Data analysis will be done using R or Python, and statistical analyses will be conducted to find trends that might be causing inadequate crime detection. Crime reports and case studies will be stored in databases such as MySQL or PostgreSQL, making it simple to retrieve pertinent information for reporting and analysis

III. SYSTEM MODEL

The system flow diagram and the block diagram is as shown in figure 3.1 and 3.2 respectively.

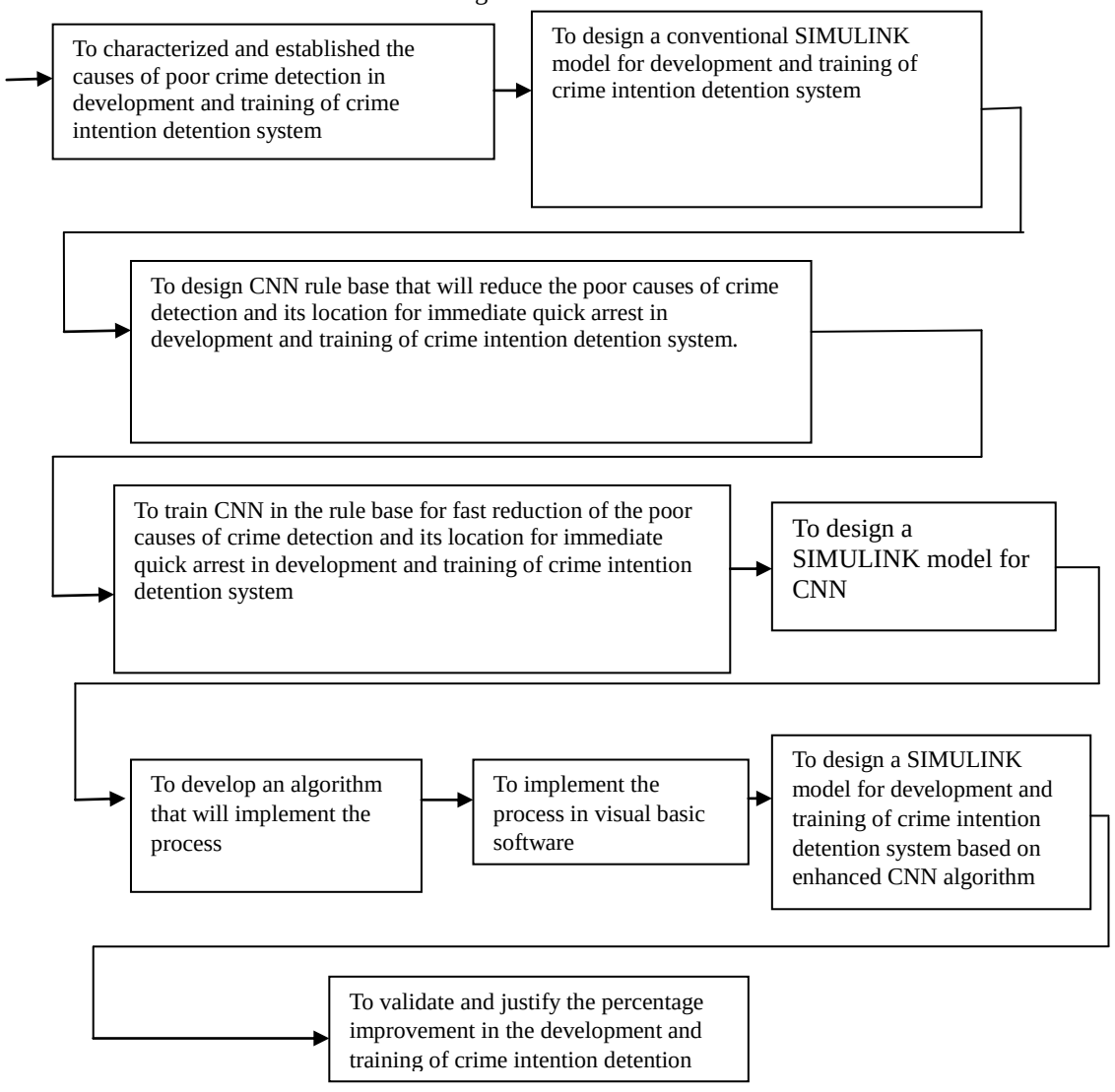

Figure 1The system flow diagram

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Table 1 Characterized and established the causes of poor crime

Factor	Relative Importance (Estimated)	Percentage of the causes of poor crime detection in development and training of crime intention detention system (%)
Insufficient Funding and Resources	High	35
Lack of Proper Training and Education	High	28
Ethical Concerns and Privacy Issues	Moderate to High	20
Cultural and Social Factors	Moderate	7
Challenges in Data Management and Analysis	Moderate	10

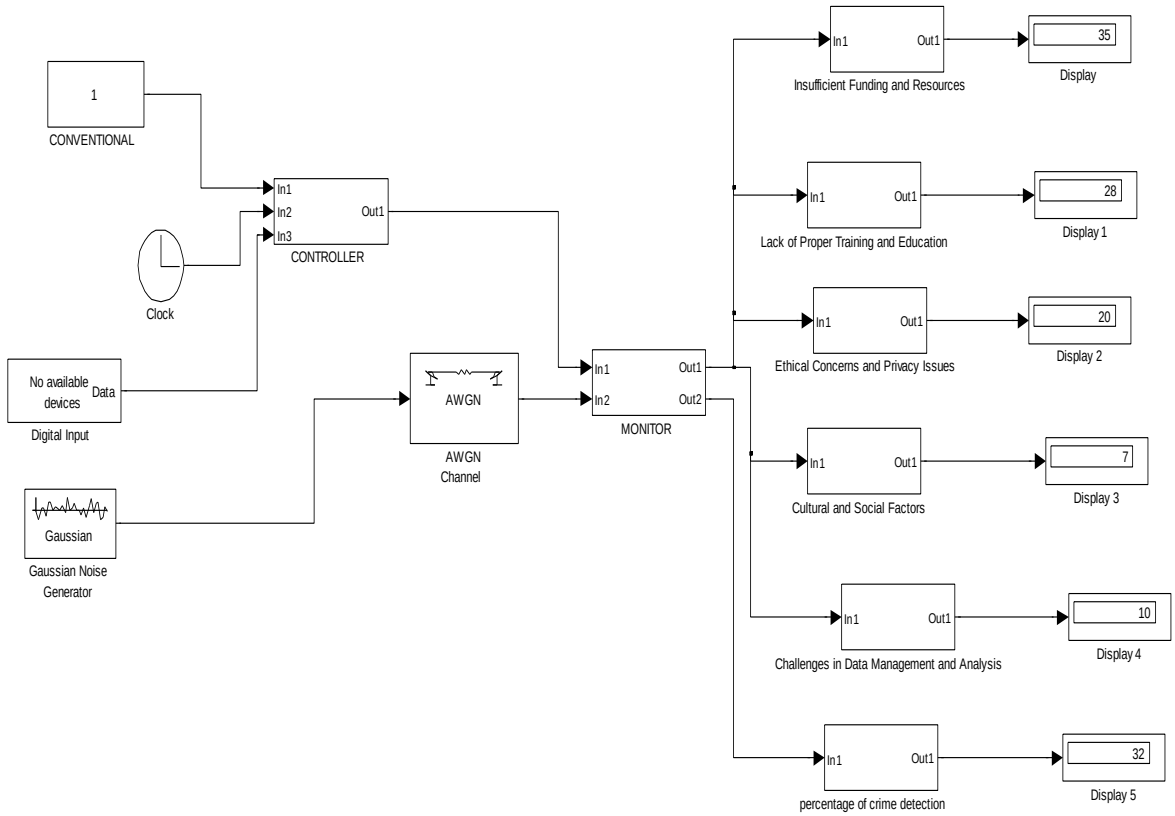

Figure 2 Conventional SIMULINK model crime detection

To design CNN rule base that will reduce the poor causes of crime detection and its location for immediate quick arrest in development and training of crime intention detention system

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Figure 3 shows the result in MATLAB environment.

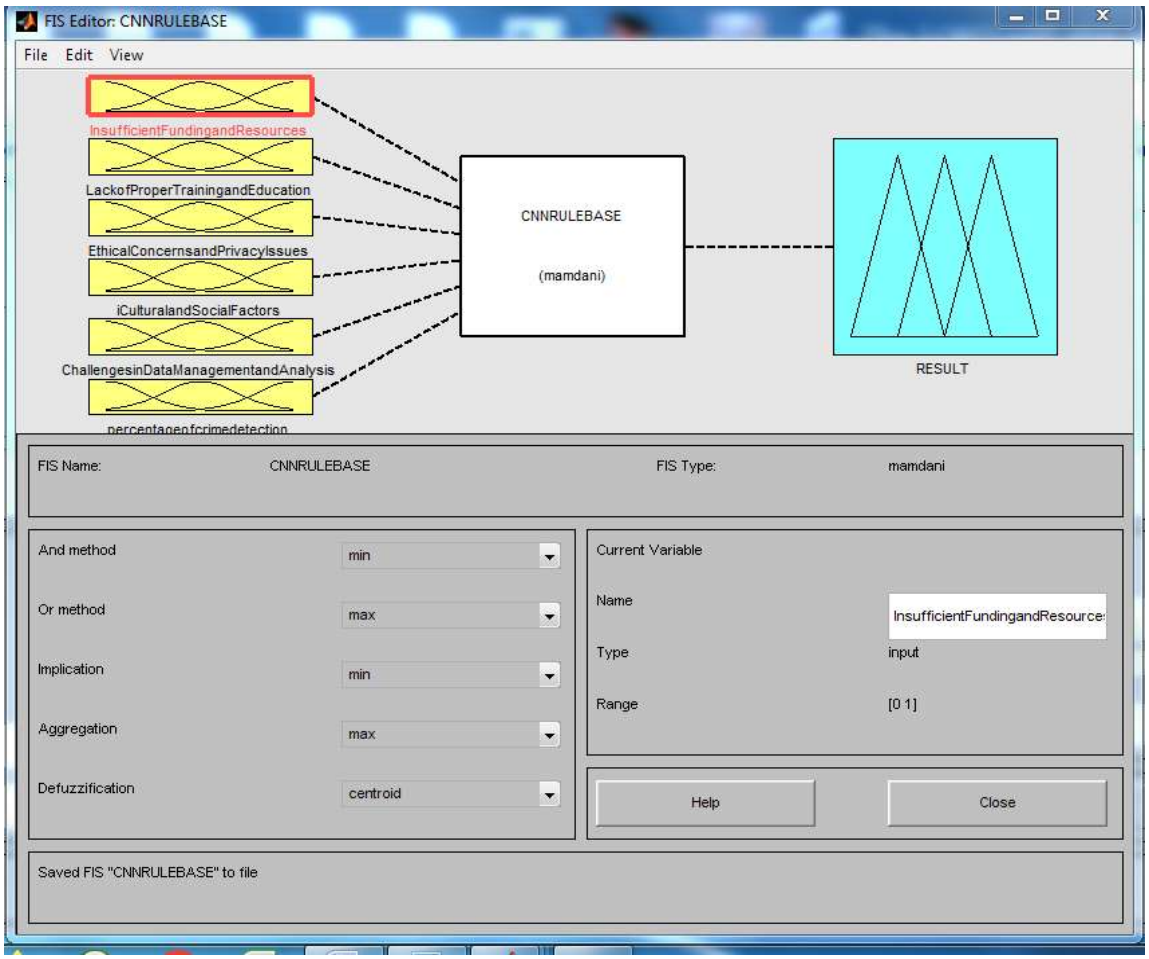

Figure 3.: Conventional SIMULINK model crime detection MATLAB environment

In the construction and training of the criminal intention detention system, Figure 3 depicted the CNN fuzzy inference system basis that would minimize the bad causes of crime detection and its location for instantaneous swift arrest. Inadequate funding and resources, inadequate training and education, privacy and ethical concerns, cultural and social factors, difficulties with data management and analysis, and criminal detection are the six inputs of this. It has a result as an output as well. Figure 4 designed CNN rule base that will reduce the poor causes of crime detection and its location for immediate quick arrest in development and training of crime intention detention system.

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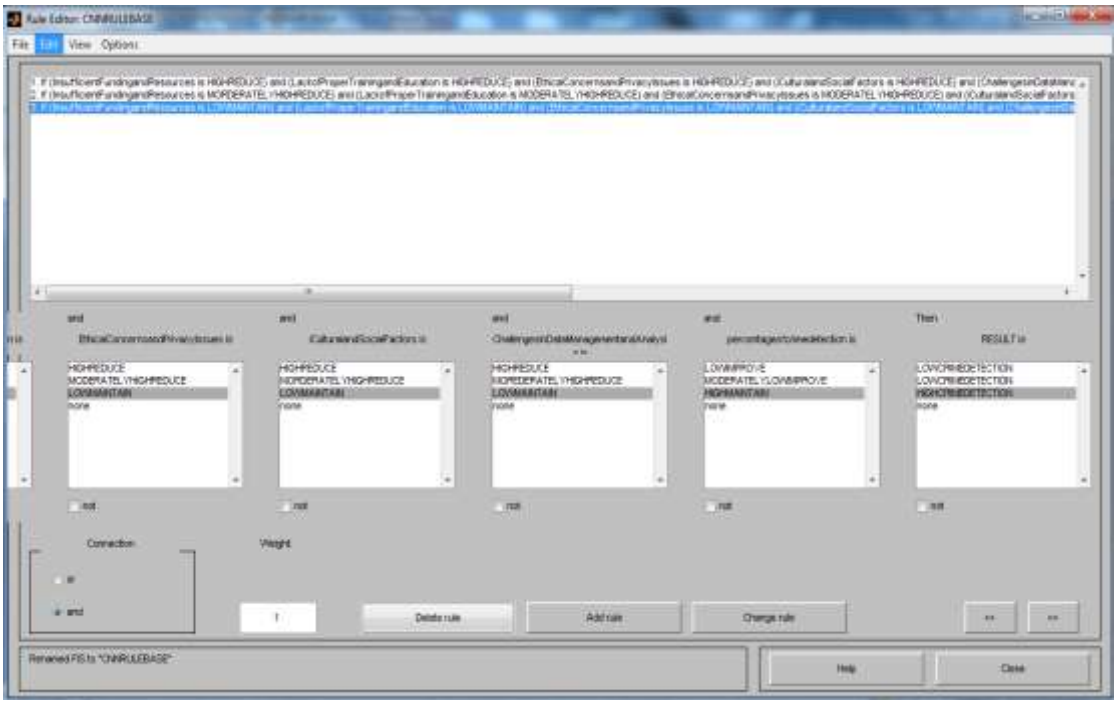

Figure 4: CNN fuzzy inference system base

In order to design and train a criminal intention detention system, CNN will be trained in the rule basis for quickly reducing the poor causes of crime detection and locating them for prompt, immediate arrest.

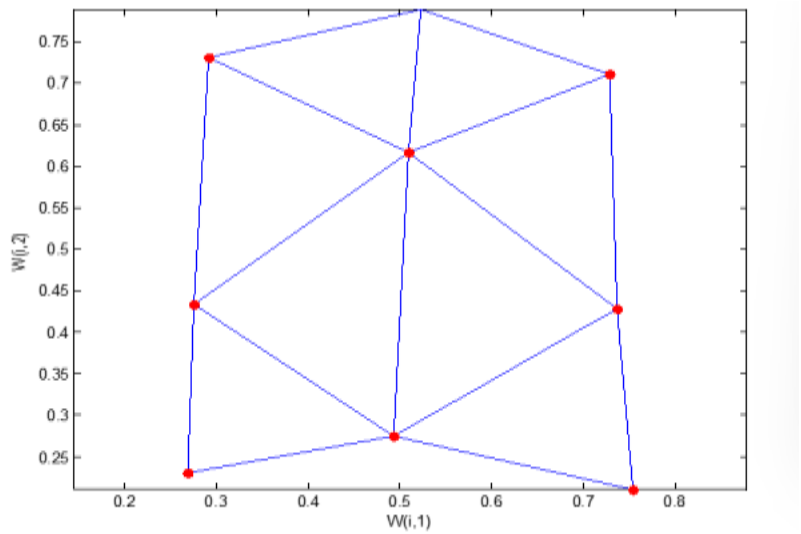

Figure5 trained CNN in the rule base for fast

In order to create and train a criminal intention detention system, Fig. 5 trained CNN in the rule base for quick reduction of the poor causes of crime detection and its location for instant swift arrest. CNN was trained three times using the three rules 3 x 3 = 9 to produce nine neurons that resemble the human brain and are capable of quickly and effectively detecting criminal activity.Fig 6 number of times CNN was trained in the rule base for fast reduction of the poor causes of crime detection and its location for immediate

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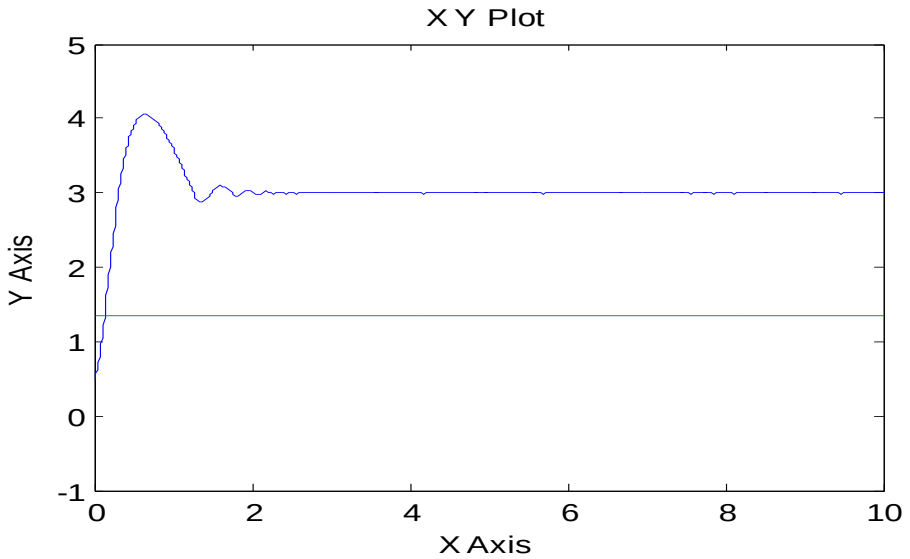
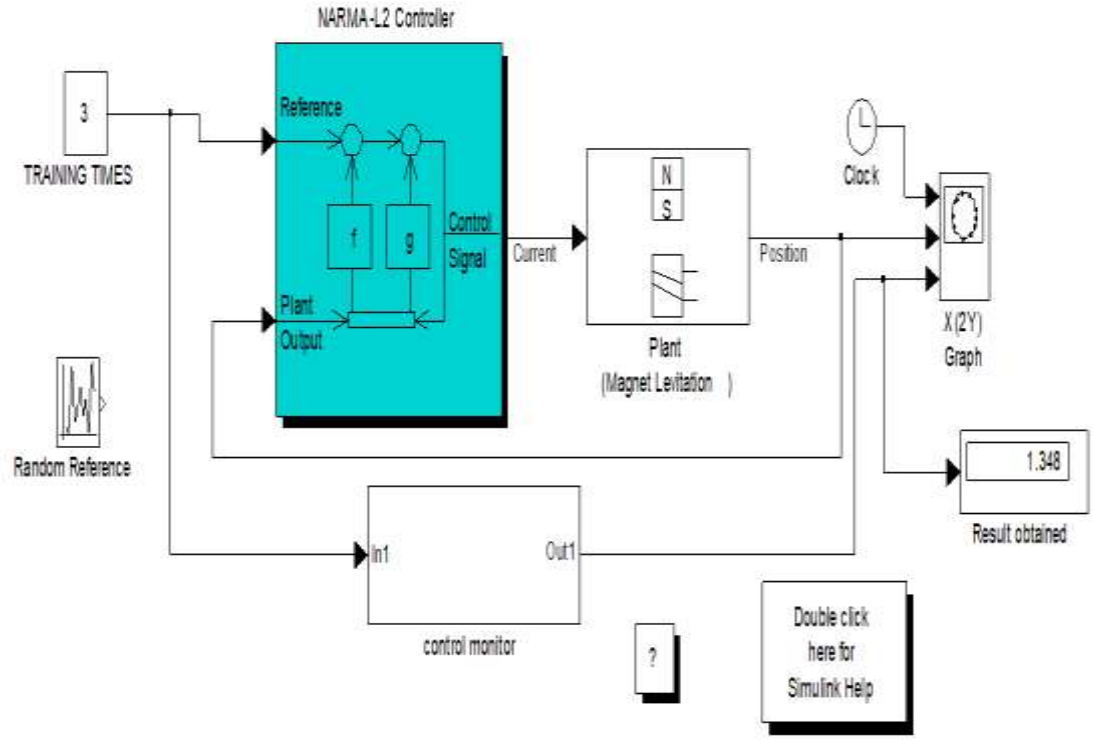


Figure6: Number of times CNN was trained in the rule base reduction

Fig 7 results obtained in CNN trained in the rule base for fast reduction of the poor causes of crime detection and its location for immediate



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To design a SIMULINK model for CNN.This will be integrated in the conventional SIMULINK model for development and training of crime intention detention system to enhance the detecting

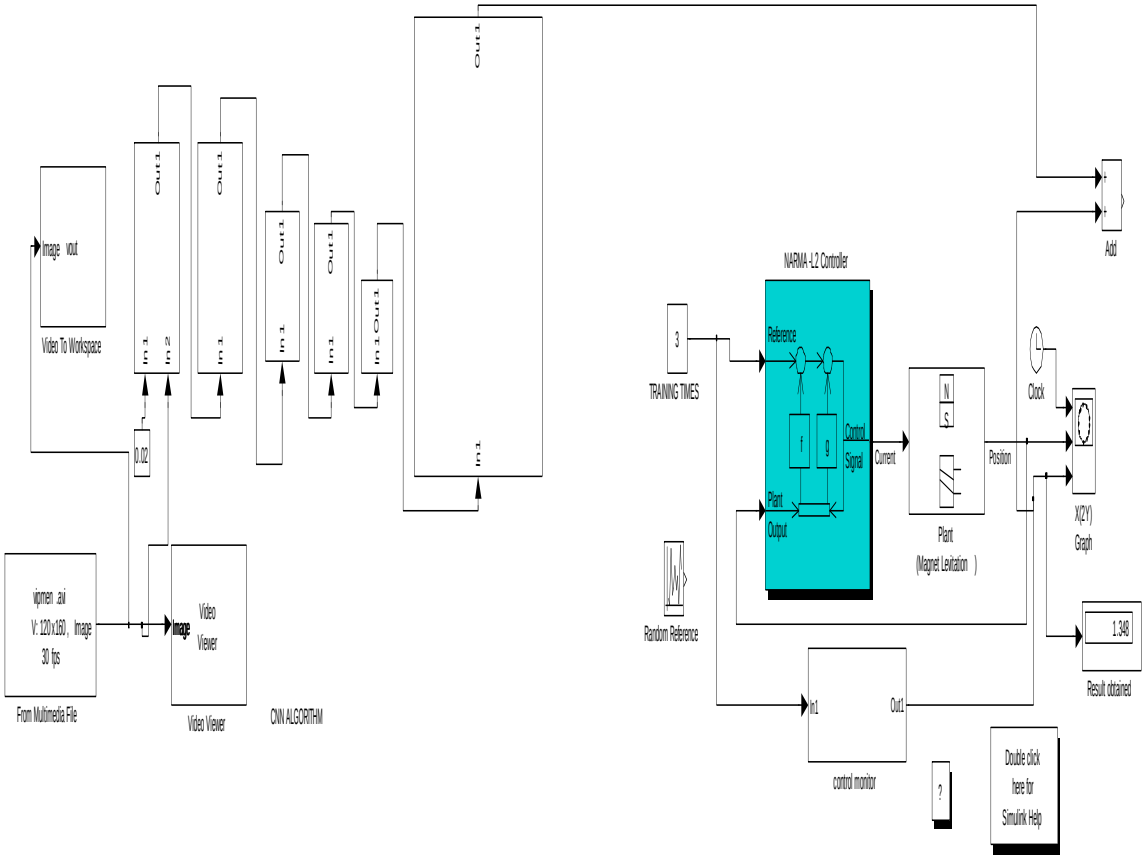

Figure8 designed SIMULINK model for CNN reductionmechanism.

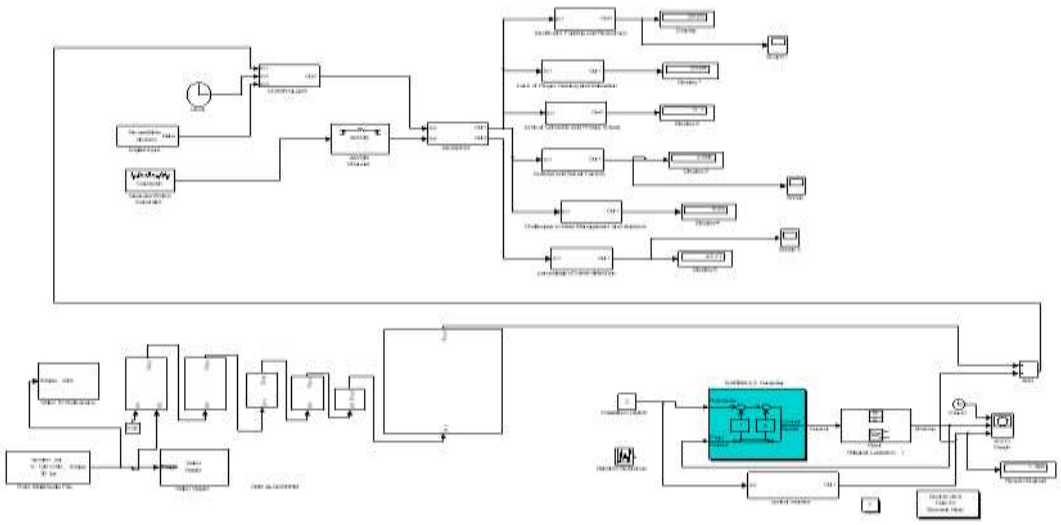

FIG 9 Designed SIMULINK model for development and training of crime intention detention system based on enhanced CNN algorithm

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IV. RESULT

Figures 10 display the results that were achieved.to confirm and defend the percentage increase in the creation and instruction of the crime intention detention system using the CNN algorithm vs not.to determine the percentage increase in the reduction of inadequate funds and resources that result in inadequate crime detection throughout the creation and training of the criminal intention detention system after the CNN algorithm was incorporated into the system.

Traditional lack of resources and funds = 35%

CNN algorithm lack of resources and finance = 29.93%

Table 2 comparison of conventional and CNN algorithmlack of proper training and education

Time(s)	Conventional Lack of Proper Training and Education in development and training of crime intention detention system(%)	CNN algorithm Lack of Proper Training and Education in development and training of crime intention detention system (%)
0	28	23.94
1	28	23.94
2	28	23.94
3	28	23.94
4	28	23.94
10	28	23.94

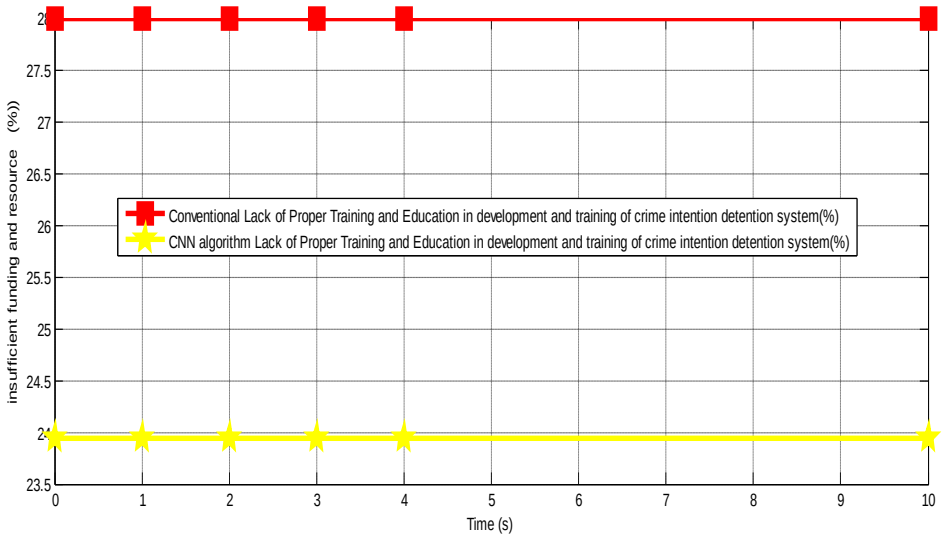

Fig 11 comparison of conventional and CNN algorithmlack of proper training and education

The traditional lack of knowledge and training that prevents prompt identification of crime in the construction and training of the criminal intention detention system was 28% in figure 11. Nevertheless, the CNN algorithm automatically decreased the cause of detecting crime to 23.94% when it was integrated into the system. These findings demonstrate that the integration of the CNN algorithm into the system resulted in a 4.06% increase in crime detection compared to the traditional method.

V. CONCLUSION

Inadequate funding and resources, inadequate training and education, ethical concerns and privacy issues, cultural and social factors, and difficulties with data management and analysis are the main causes of the nation's steady rise in crime that is hard to identify. In order to get around this, a criminal intention detention system based on an improved CNN algorithm has been developed and trained.

Creating a conventional SIMULINK model for the development and training of the crime intention detention system, characterizing and establishing the causes of poor crime detection

in the development and training of the crime intention detention system, creating a CNN rule base that will reduce the poor causes of crime detection and its location for immediate quick arrest in the development and training of the crime intention detention system, and training CNN in the rule base for quick reduction of the poor causes of crime detection and its location for immediate quick arrest in the development and training of the crime intention detention system are the steps taken to accomplish this,creating a CNN SIMULINK model, creating an algorithm to carry out the procedure, putting the procedure into practice using Visual Basic software, and creating a SIMULINK model for the creation and instruction of a criminal intention detention system based on an improved CNN algorithm. According to the data, 35% of crimes were not detected properly due to a lack of financing and resources. However, when the CNN algorithm was incorporated into the system, it significantly decreased to 29.93%, improving the CNN algorithm's detection mechanism to 5.07%. The traditional lack of appropriate education and training that hinders quick crime detection in the creation and training of the crime intention detention system was 28%. Nevertheless, the CNN algorithm automatically decreased the cause of detecting crime to 23.94% when it was integrated into the system. According to these findings, the typical main cause of crime detection as a consequence of data management and analysis was 10%, whereas the CNN algorithm's integration into the system resulted in a 4.06% improvement in crime detection over the conventional way. However, the reason of inadequate crime detection decreased to 8.55% once the CNN algorithm was incorporated into the system.According to these findings, the percentage increase in crime detection after the CNN algorithm was incorporated into the system was 1.45%, whereas the traditional percentage of crime detection throughout the creation and training of the crime intention detention system was 32%. In the meanwhile, the system automatically increased the crime detection to 43.77% when the CNN algorithm was entered. Lastly, there was an 11.77% increase in crime detection when the CNN algorithm was incorporated into the system compared to its traditional

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