

Innovating and Inspiring Smart Traffic Control through Deep Learning and Future Implementation

Kranti Choudhary¹, Dr. Yatendra Kashyap², Dr. Saurabh Mandloi³

¹Ph.d Research Scholar SAM Global University, BHOPAL, M.P

²Dean Engineering Department SAM Global University, BHOPAL, M.P

³HOD CSE SAM Global University, BHOPAL, M.P

ABSTRACT:

In today's daily life, with the increase in population and the growing number of vehicles, and due to the higher use of vehicles, the continuous rise in the number of vehicles has made smart traffic control a major problem in the world. To solve this problem, deep learning based smart traffic control system appears to be a new approach in modern times. In smart traffic system, by collecting data from deep learning like CNN, YOLO all version algorithms and IoT sensors, that data is analyzed on the basis of its features like identifying vehicles, knowing traffic density in real time, predicting flocks. Traffic is controlled by the analysis done so that unnecessary issues do not arise in traffic control. If seen from a technological point of view, deep learning based technology focuses on the development of smart traffic control system. Deep learning based system takes its own decision in real time to control the traffic. Which shows a new innovation, inspiring and implementation point of view in smart traffic control. DeepLearning based smart traffic control system makes traffic/transportation easy and manages traffic efficiently. This plays an important role in reducing traffic accidents, fuel shortages, environmental pollution and life safety by giving priority to emergency vehicles. This system is one effective and motivating system technology for planning smart cities and secure world.

Keywords:-Deep Learning based traffic Control Technology, YOLO, Sensor, Environmental ,Pollution ,CNN,AI, Emergency Vehicles, YOLO,ML,DL

1. INTRODUCTION

Deep learning is a subset of machine learning. Whereas machine learning is a subset of special intelligence. In which all the features of the object are described in machine learning, whereas in deep learning many layers work, which are more in number as compared to ML, so that complex whereas in deep learning many layers work, which are more in number as compared to ML, so that complex problems can be solved It is being used in many fields like face recognition, voice recognition, NLP, autonomous driving, text summarization, translations recommendation system, traffic detection and control, management, educational fields, research etc.

The working system of deep learning is like the human mind structure. It has hidden networks and connections connected to it. It has many hidden layers which help in understanding the data deeply. The models created in deep learning are accurate models which give final result with accuracy. Sensors are

being used in deep learning technology. These are being used to detect user problems. This is a type of electronic device which works as a detection device in deep learning technology. In deep base technology, the data received through sensors is collected and referred to the deep learning model, which after processing provides instructions to the deep learning model for identifying any object or identifying its activities and making decisions. Sensors based on deep learning are the following such as camera sensors, IR sensors, ultrasonic sensors, LiDAR-3D mapping, environmental sensors.

Now adays, Deep Learning based sensors are an important part of modern technology which makes traditional sensors decision capable, smart and independent. That is, deep learning based technology is a type of advanced technology which is emerging as an implementation in the future.

2. LITERATURE REVIEW:-

Previous research on smart traffic control suggests that deep learning-based technology can easily solve critical problems in smart traffic control. Research suggests that traditional signal systems do not adapt to changing conditions. At present, deep learning-based technology is an innovative, inspiring, innovative, and future-proof technology for smart traffic control.

Some research is as follows:-

Ref .NO.	YEAR	AUTHOR NAME	DESCRIPTION/METHOD
[1]	2022	Avinash padmakar rangari, Ashwani RavindraChouthmol	Deep learning based smart traffic light system using image processing with yolov7/
[2]	2022	Zh,Yanming, yz.wang2,Xuefeiyth	Deep learning in Drivers intelligent Sensor based systems/CNN,YOLO Method
[3]	2018	Jindong Wangab ,Yiqiangchenab	Deep lerning for Sensor based activity Recongnition/DeepLearning Combine Method
[4]	2024	Human Almkhafi,Ayman Noor,Talal H. Noor	Traffic Management Approaches using Machine Learning and Deep Learning Techniques/ML And DL Method
[5]	2015	Y.LeCun,Y.Bengio,and G.Hinton	“Deep Learngng”,Natture,/Deep Learning Model and Method
[6]	2018	J.Redman,S.Divvala	Deep Learning based yolo Unified,Real-time object detection in traffic control)Major Type Count Color and Hidden Mark YOLO Modal and optimization method

3.PROPOSED METHODOLOGY

3.1. Data capturing process:-Data capturing process is the first phase of deep learning traffic control in which traffic data analysis, traffic monitoring and data is collected again through cameras and IoT sensors. This is done robotically through AIDC technology which runs without human interface.

3.2 Change to video frame:- This is the second phase of traffic control method using deep learning technology in which a special moment from a video is converted into a static image.

3.3 IMAGE PRE-PROCESSING:- This is the third phase of traffic control in deep learning technology in which the image captured by the camera/IoT sensors is cleaned and formatted correctly so that the deep learning model (CNN/YOLO) can identify the correct type of traffic.

3.4 Using Deep Learning Model:- Deep learning model is classified according to the characteristics of any object by using CNN/YOLO algorithms, which is a removal method.

3.5 Max polling for feature selection:- For traffic control, max polling process is performed to select important variables from a large dataset using deep learning technology, in which many methods like filter method, embedded method, wrapper are used. It supports RFE which keeps useful features as well as detects unnecessary features.

3.6 Traffic Density Calculation:- Deep Learning technology has six phases in which the density of transportation is calculated. These phases include the processes of vehicle detection, object counting, classification and real-time analysis.

3.7 Emergency Vehicle Detection:- Emergency vehicles are a type of advances and intelligence method in Deep Learning technology, in which emergency transportation is given priority first like fire brigade, police vehicle, ambulance.

3.8 Traffic Signal Controller:- In deep learning technology, the traffic signal controller uses Deep Q-Learning and Multi-Agent system to track real-time traffic. This helps determine traffic density, speed, and queue length.

3.9 Repeat/Process/End:- This is the last phase of traffic control in Deep Learning technology. The model gives the result after completing all the above phases. If the result is accurate then the phases are considered successful at that time and the processes are stopped and if the result is not accurate then the above methodology is repeated again.

4. INNOVATING, INSPIRING AND IMPLEMENTATION :- Many innovations, inspirations and future implementations for smart traffic control through deep learning technology are continuing to progress, the key points of which are like this.

4.1 Real time Decision System:- Deep learning algorithms like CNN, all versions of YOLO make it possible to quickly analyze data and make decisions for smart traffic control. In other words, it considers practical road reality.

4.2 Hybrid Deep Learning model:- Hybrid deep learning architecture is a new innovation for Bisham, inspiring and implementing a future point of view. Hybrid Deep Learning Architecture is a new innovation, inspiration and point of implementation for the future for Bisham. Hybrid Deep Learning model works together with multiple algorithms like CNN, RNN/LSTM, GANS and identifies complex cyber attacks, which is helpful in smart traffic control.

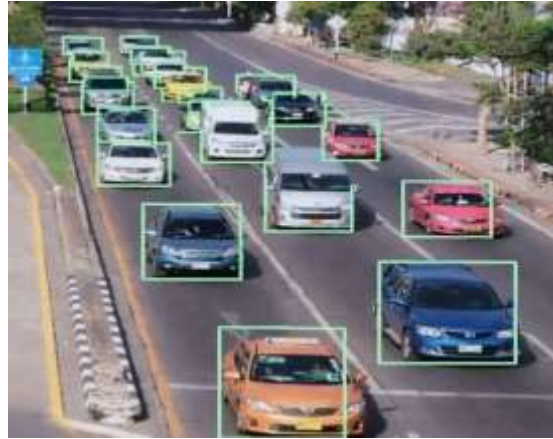
4.3 Emergency Vehicles Priority System:- Deep Learning's Emergency Vehicle Priority System is an advanced innovation for life saving. It supports deep learning algorithms like YOLO WORD, YOLOv3 system.

4.4 Lan-Wise and Vehicle Aware control system:- Through this system, road reality considerations like lane analysis, weight information of car, bus, bike, truck, etc. have been translated and type aware control has been enabled.

4.5 Real-Time Adaptive Signal control:- This system moves smart traffic control from a static system to an intelligent decision system. This is a kind of core innovation technology which solves complex traffic problems at a large level

4.6 Predictive Traffic Management:- When viewed in Inspiring view, this management is not reactive, it mainly supports a predictive system in which congestion prediction is shown from old real-time data.

4.7 Smart City And ITS Integration system:- Smart City and ITS Integration is a type of implementative ready approach. Which is a special smart city mission compatible design for the future.



4.8 Max Pooling management System:- Using deep learning's max pooling technology, traffic conditions can be predicted in advance for traffic control. And the model being used for traffic control has been successful to some extent. This is a kind of innovative, inspiring and future implementation principal.



5. SOCIAL IMPACT AND EXPERIMENTAL RESULTS

- Deep Learning based traffic control technology improves high accuracy and traffic efficiency.
- Emergency vehicles detect and improve priority.
- The wall improves the efficiency of traffic control by giving more green time to heavy traffic lanes and less green time to light traffic lanes.
- Deep learning based model like CNN solves the complex problems of YOLO modal traffic control.

- Reduces waiting time.
- Deep learning-based technology is much more advanced than traditional traffic Control.
- Deep learning based traffic control technology strengthens the infrastructure of smart cities traffic.
- The use of deep learning based technology in traffic control has brought revolutionary changes such as emergency vehicles will be identified quickly and green signal will be given immediately.
- Deep learning based traffic control technology is expected to bring about a paradigm shift in the future.

6. ADVANTAGES OF DEEP LEARNING TECHNOLOGY IN TRAFFIC CONTROL:-

6.1 It became possible to analyze historical data and current data in an easy way.

6.2 It became possible to easily analyze historical and current data, and to predict future traffic volumes.

6.3 Traffic control can be done very easily in smart cities and urban areas. 6.4 Future rules and regulations can be made for traffic control.

7. LIMITATION OF DEEP LEARNING IN TRAFFIC CONTROL:-

- The maintenance of the model is difficult and computational complexity is high.
- Deep learning based traffic control scalability challenges are greater.

8. FUTURE USE/POSSIBILITIES/ CONCLUSION:-

Deep learning based technology is not just a technological innovation but a motivating and advanced implementation technology for the future. It provides solutions to many complex problems arising in the traffic control system with great accuracy. Many studies have shown that this technology gives better results than the traditional system and will also increase the lifespan. That means deep learning based technology is innovative, inspiring, future plan implementation technology for traffic control.

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