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Vehicle Model and Owner Registration, Detection & Car Price Prediction

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Abstract: ***The key algorithm in autonomous driving is vehicle recognition based computer vision, which tries to recognize whether vehicles are being located by digital photos or videos. Identifying "blocks," which represent the position of the vehicle in photos or videos, is the fundamental concept behind vehicle detection. Additionally, this work explores 3D stereo-based vehicle identification methods, which emerged from sophisticated planar vehicle detection perception. In terms of the differences between the feature extraction approach and the perceived results, this research concludes by summarizing the vehicle detection algorithms used in recent years. It offers theories for more thorough investigation of the vehicle detection systems. With the rapid advancement of machine learning techniques, this tool is now even more essential for object detection. Compared to manually developed features, machine learning-based picture features are more representative. This review paper focuses on object recognition methods based on machine learning and other deep convolutional neural networks however the traditional object detection techniques will also be briefly reviewed.***
Keywords: Vehicle model detection, Image, Serialization, Clipping, Video stream Convolutional Neural Network (CNN).

I. INTRODUCTION

The goal of visual object recognition is to group observed things into categories that have semantic significance. This study focuses on the classification of moving objects in a mid-field video surveillance system with a single fixed camera. Our work is motivated by several possibilities. The administration of road transport networks is increasingly using intelligent transportation systems (ITS), as the infrastructure is under stress from regularly rising traffic flow levels, which results in subpar network performance. High levels of congestion and delay as a result anger drivers more and more, and they also have a negative impact on the environment. In order to produce a profile of real-time information on traffic flow, densities, vehicle kinds, and usage, as well as incident detection, such as inappropriately halted vehicles and accidents, ITS relies on methods for detecting traffic conditions by analysing data from sensors. The necessity of intelligent transportation systems has been confirmed by the steadily rising number of vehicles on the road. Automation in transportation systems has drawn a lot of interest from the auto industry in an effort to meet the expanding demand for transportation infrastructure. Governments, automakers, and research organizations have made clever measures to create advanced driving assistance systems (ADAS). ADAS systems are integrated systems created from sensors and algorithms that have been trained to understand the vehicle surroundings and communicate necessary information to the driver to help him anticipate potential risks while driving.

II. MACHINE LEARNING

The first stage in utilizing machine learning to detect vehicles is to Find the best feature descriptors to use for feature engineering. Implement a predictive model using SVM training that can determine whether a feature vector belonged to a vehicle or not. Sliding-window search: Look for images with sliding windows and identify whether or not each window is a vehicle. Combine overlapping detections and eliminate false positives via heatmap thresholding. Results: Show the algorithm's final findings for detecting vehicles. Automating the process of recognizing automobiles in photos or videos is the function of machine learning in vehicle detection. Machine learning algorithms can identify patterns unique to automobiles after being taught on massive datasets of photos. They can now accurately recognize automobiles in photos because to this. License plate recognition is one of the most widely used uses of machine learning in vehicle detection 2 Vehicle identification in intelligent transportation systems has benefited greatly from the development of deep learning-based categorization and detection techniques. 3. Vehicle detection technology based on shallow machine learning, which accomplishes vehicle recognition by integrating machine learning algorithm on the basis of vehicle characteristics, is another component of traditional vehicle detection techniques.

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III. CNN

Convolutional Neural Networks (CNNs) are a form of deep learning algorithm that are used in self-driving automobiles to identify and categorize various road features and make sound judgments. 12. CNNs have also been applied to the identification of vehicles in aerial photos. 3. For real-time detection on inexpensive embedded hardware, the standard CNN model has been substantially enhanced. In addition to vehicle detection, CNNs have excelled at object detection tasks 4. The state-of-the-art in general object identification is faster R-CNN, however a straightforward application of this technique to a sizable car dataset performs poorly. 5. A number of machine learning-based software systems exist that can predict the price of used cars using a variety of factors, including the make, model, manufacturing year, fuel consumption, transmission, road tax, fuel type, engine size, city, version, dimensions, safety, color, dealer/individual status, mileage, alloy rims, braking system, acceleration, etc.

IV. LITERATURE SURVEY

1) *Dr. Benila S1, Karan Kumar R2, Karthikraja N 3, Kavimukilan M4 2019 "Survey of Deep Learning Techniques for Vehicle Detection"*

The paper focuses on the survey and analysis of machine learning-based object identification algorithms for vehicle detection, with a particular emphasis on deep convolutional neural networks. It discusses traditional object detection architectures, backbone networks, loss functions, and training procedures, as well as difficult issues, datasets, evaluation metrics, applications, and future development. The paper also highlights the use of Unmanned Aerial Vehicles (UAVs) for surveillance purposes, specifically the detection of on-ground cars from UAV photos, which has gained substantial attention due to its potential in various applications.

The literature review section of the paper provides an overview of the R-CNN algorithm and its shortcomings, as well as the improvements made by the Fast R-CNN algorithm in addressing these issues. It explains how the R-CNN algorithm uses selective search to locate region proposals (RPs) and feed them to a CNN, while the Fast R-CNN algorithm creates a convolutional feature map from the input image and uses RoI pooling to process the RPs more efficiently.

2) *Rahib Abiyev, Murat Arsla, 2020"Vehicle detection system for intelligent driving using deep convolutional neural networks"*

The paper proposes a vision-based vehicle identification system for autonomous intelligent car driving using convolutional neural networks (CNN). The CNN structure proposed in the paper provides high-accuracy detection of vehicle images and achieves more accurate and faithful contours of vehicles. The experiments using the GTI dataset demonstrate that the CNN-based vehicle detection system achieves very accurate results and is more robust to different variations of images. The paper also discusses the implementation of pooling operations using max pooling and the use of a Dense layer or fully-connected layer for classification. The ReLU activation function is used in the fully-connected network, which has been shown to provide faster calculations and results compared to sigmoid or tanh activation functions. The paper highlights the contributions of the proposed system, including the design of the CNN architecture, analysis of four CNN models for detecting cars at various distances, and the effectiveness of the system in avoiding crashes, preventing accidents, and improving traffic qualit. The simulation results show that the 64 x 64 image size version of the model had the best performance in the testing stage.

3) *To cite this article: Chaochao Menget al 2020, "Vehicle Detection"*

The paper discusses vehicle detection algorithms in the field of computer vision for autonomous driving, focusing on identifying and locating vehicles in digital images or videos. It also explores 3D vehicle detection algorithms based on stereo perception, which originated from advanced planar vehicle detection perception. The paper summarizes recent vehicle detection algorithms, specifically highlighting the difference between the feature extraction approach and the perceived results. It proposes further in-depth study of these algorithms. The paper mentions RetinaNet as a one-stage algorithm model with comparable accuracy to two-stage detection algorithms, but with slower inference time. It also discusses the use of manual feature design and data-driven characterization learning as feature extraction techniques in image-based vehicle detection methods, The paper mentions the use of histogram of oriented gradients (HOG), Haar feature, and local binary pattern (LBP) as standard extraction operators for vehicle detection.

- It highlights a fusion algorithm that combines HOG and LBP features, resulting in improved detection rates compared to single-feature methods.
- The method uses the histogram intersection kernel support vector machine for training and classification, offering fast classification speed and high efficiency.

4) *Kaustubh V. Sakhare 1 · Tanuja Tewari 1 · Vibha Vyas 1, 2020 "Review of Vehicle Detection Systems in Advanced Driver Assistance Systems"*

The paper provides a detailed study of vehicle detection in dynamic conditions, discussing various approaches such as feature-based techniques and model-based techniques .The literature review section of the paper highlights different methods used for vehicle detection, including low-level image features like edges, shadows, symmetry, perceived motion, and texture .Vision-based vehicle detection is predominantly studied for intelligent vehicles, traffic monitoring, and scene understanding .Various techniques are used for vehicle detection, such as extracting key points from test images and comparing them with a vocabulary of key points from the training image dataset . Gradient-based descriptors like Histogram of Gradients (HoG) are commonly used for vehicle detection. Other approaches include using thermal infrared sensors, synthetic aperture radar sensors (SAR), and stereo vision for vehicle detection. Machine learning techniques, such as neural networks and support vector machines, are used for more effective detection. Overall, the paper provides a comprehensive literature survey on vehicle detection techniques, highlighting the challenges and advancements in the field.

5) *Nitika Arora1 · Yogesh Kumar 2021 "Vehicle Detection and Recognition 2021"*

The paper provides a panoramic review of automatic vehicle detection systems in day and night mode, highlighting the challenges and applications in the field of intelligent transportation systems (ITS). It discusses the use of different sensors for vehicle detection, including loop detectors, ultrasonic and supersonic sensors, and cameras. Among these, road-side monitoring cameras are considered efficient due to their broad area coverage and low installation cost. The authors mention that ITS-based systems are being employed in various traffic planning and security areas for extracting meaningful information. This includes vehicle sensing, vehicle count, vehicle orientation and trajectory, flow rate, density of vehicles, speed analysis, and license plate recognition. The paper also highlights the application of ITS in efficient parking management, which helps drivers find parking spaces in advance. The literature review section provides an introduction to vehicle surveillance and recognition systems, methods of vehicle detection, and a framework showcasing the phases of vehicle detection and classification. It also emphasizes the role of ITS in vehicle detection.

6) *Rohit Binu Mathew, Sandra Varghese, Sera Elsa Joy, Swanthana Susan Alex, 2019 "Vehicle mode Detection and price prediction"*

The paper mentions a research by Tang.Y. Zhang and team in 2015, titled "Vehicle detection and recognition for intelligent traffic surveillance system " The research by Tang.Y. Zhang and team focuses on developing a hybrid algorithm for vehicle detection and recognition.For vehicle detection, the algorithm uses Haar-like features, heat maps, and the AdaBoost algorithm. For vehicle recognition, the algorithm utilizes Gabor's wavelet transformation, histogramic sequencing, and principal component analysis.The research by Tang.Y. Zhang and team achieved a superfast processing time, a recognition rate of 92% with an accuracy of 97.3%, and a false rate of 3% The algorithm developed by Tang.Y. Zhang and team is considered the most efficient one for detecting and recognizing vehicles.

7) *M. Umair Arif, M. U. Farooq, R. H. Raza, Z. U. A. Lodhi and M. A. R. Hashmi, , 2022 "A Comprehensive Review of Vehicle Detection Techniques under Varying Moving Cast Shadow Conditions Using Computer Vision and Deep Learning"*

Vehicle detection by feature engineering methods Summarizes 3D vehicle detection algorithms based on stereo perception. Vision-based vehicle identification system for autonomous driving Accurate detection of obstacles (vehicles) during driving. YOLO proposes an end-to-end neural network for object detection Discusses methods for minimizing computing overhead. Vehicle detection and recognition using static image datasets Improving vehicle detection using live CCTV surveillance. Vehicle detection is widely researched in this area. Study of vehicle detection in dynamic conditions Use of shape representation for efficient vehicle detection. Transfer of images to servers for processing Open challenges in the field of vehicle detection and classification. Examined vehicles in surveillance systems. Used camera and dataset for recognition and classification.

8) *Preetha Jagannathan,1 Sujatha Rajkumar ,2 Jaroslav Frnda, Parameshachari Bidare Divakarachari,4 and Prabu Subramani, 2021 "Moving Vehicle Detection and Classification Using Gaussian Mixture Model and Ensemble Deep Learning Technique".*

Liu et al. developed a Generative Adversarial Nets (GANs) approach for vehicle classification using traffic surveillance videos. The approach involved training GAN on a collected traffic dataset, generating adversarial samples for rare classes, training an ensemble-based Convolutional Neural Network (CNN) on the imbalanced dataset, eliminating lower quality adversarial samples, and refining

the ensemble model on the augmented dataset. The approach achieved effective performance in vehicle classification on MIO-TCD dataset. Fu et al. developed a hierarchical multi-SVM classifier for vehicle classification. The technique involved using a multi-Support Vector Machine (SVM) classifier and a hierarchical structure. The foreground was initially extracted, and then the hierarchical multi-SVM classifier was used for classification. The current paper proposes a technique for vehicle type classification using a Gaussian Mixture Model and ensemble deep learning. The technique involves collecting data from the Beijing Institute of Technology Vehicle Dataset and the MIOvision Traffic Camera Dataset, enhancing the quality of collected vehicle images, detecting vehicles using adaptive histogram equalization and the Gaussian mixture model, extracting feature vectors using the Steerable Pyramid Transform and the Weber Local Descriptor, and using an ensemble deep learning technique for vehicle classification. The proposed technique achieved high classification accuracy on both datasets

9) *Seda Kul, Süleyman Eken, Ahmet Saya, "A Concise Review on Vehicle Detection and Classification"*

The paper provides a concise review on vehicle detection and type classification in the context of traffic surveillance and control systems. The authors mention that videos from traffic surveillance cameras are processed for early warning and extracting information through real-time analysis, specifically through the detection and classification of vehicles.

The study utilizes the background subtraction method, also known as foreground detection, to determine the location and information of objects, including moving cars. Blob analysis is used to detect moving cars in the images obtained through background subtraction. Overall, the paper focuses on the use of image processing techniques, such as background subtraction and blob analysis, for vehicle detection and classification in traffic surveillance and control systems.

10) *S. Zhou, Y. Zhao and D. Guo, "YOLOv5-GE Vehicle Detection Algorithm Integrating Global Attention Mechanism" (2022)."*

Vehicle detection by feature engineering methods Summarizes 3D vehicle detection algorithms based on stereo perception. [6] Vision-based vehicle identification system for autonomous driving Accurate detection of obstacles (vehicles) during driving. YOLO proposes an end-to-end neural network for object detection Discusses methods for minimizing computing overhead. Vehicle detection and recognition using static image datasets Improving vehicle detection using live CCTV surveillance. Vehicle detection is widely researched in this area. Study of vehicle detection in dynamic conditions Use of shape representation for efficient vehicle detection. Transfer of images to servers for processing Open challenges in the field of vehicle detection and classification. Examined vehicles in surveillance systems. Used camera and dataset for recognition and classification.

The importance of data representation is highlighted, and the paper mentions the challenge of making chatbot discussions feel human-like and natural. The paper also references two methods for word segmentation in chatbots: one introduced by Mohammed Javed et al. and another proposed by Naeun Lee et al.

11) *Y. Ding et al., "Long-Distance Vehicle Dynamic Detection and Positioning Based on Gm-APD Lidar and LIDAR-YOLO" (2021). [3]. X. Zhang, B. Story and D. Rajan, "Night Time Vehicle Detection and Tracking by Fusing Vehicle Parts From Multiple Cameras (2021)."*

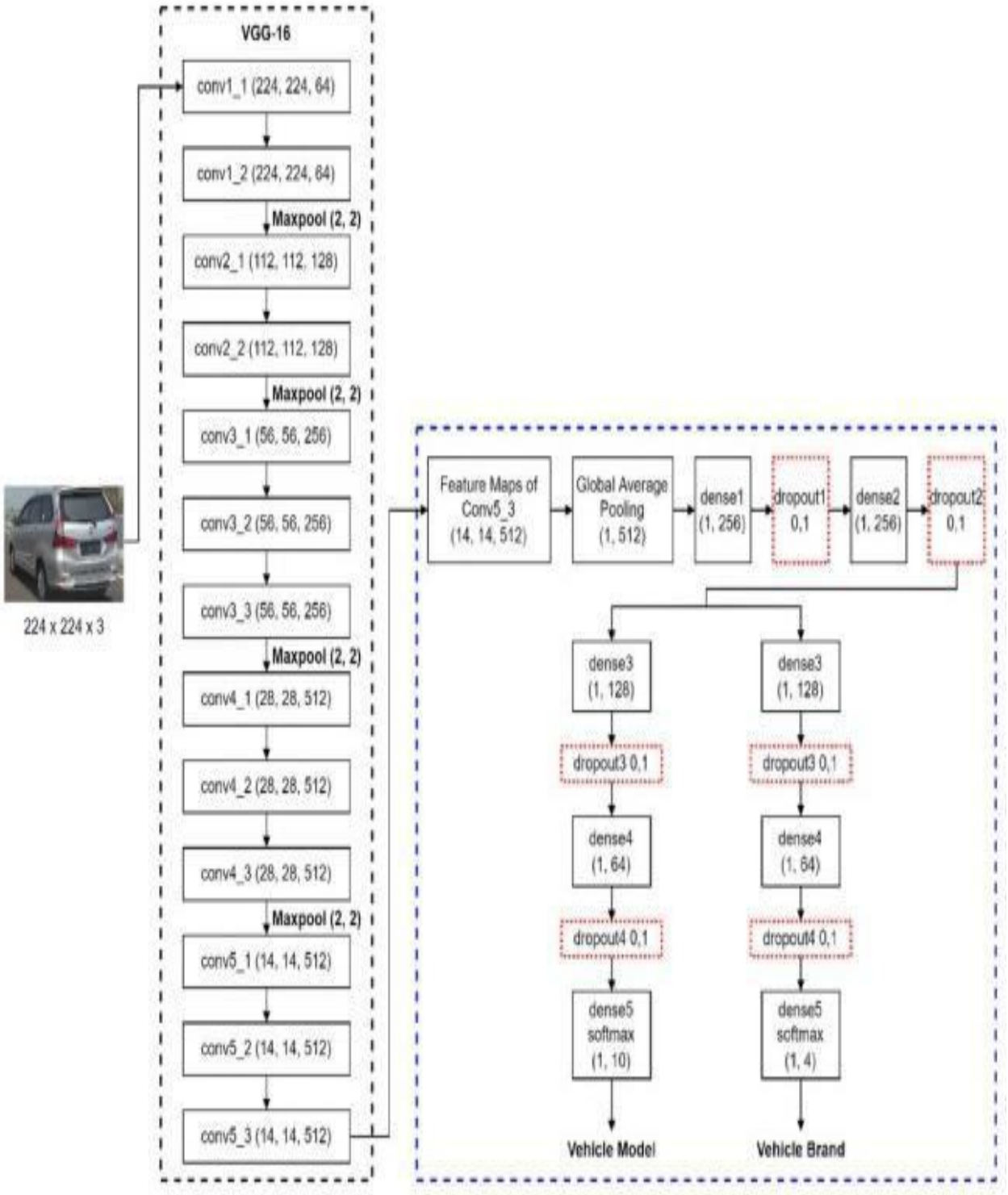
Robustness issues with object blocking, truncation, and dynamic environment. Reliance on surface texture or structural features of objects can lead to confusion in detection results. Issues with vehicle detection: occlusion, illumination, object form changes Need to enhance tiny object, occlusion, and real-time capabilities. Cameras can be hacked or attacked illegally. Installation of cameras can be challenging. Detection and identification of vehicles in day and night vision is challenging. Various challenges in detecting vehicles are observed. Unique partitioning of objects in images Combining information from different sensors in intelligent vehicles.

V. PROPOSED WORK

1) *Data Collection:* Gather vehicle text data for training and testing the chatbot.
2) *CNN (Convolutional Neural Network):* Utilize CNN for image processing, allowing the to interpret vehicle images.
3) *Machine Learning Algorithms:* Train ML models to provide vehicle recommendations, detectionprice prediction, and owner registration based on user queries and data analysis.
4) *User Interface:* Develop a user-friendly app interface for seamless interaction and information retrieval.
5) *Privacy and Security:* Implement robust security measures to protect sensitive personal data and ensure compliance with traffic regulations.
6) *Testing and Validation:* Thoroughly test the app accuracy, response time, and reliability using vehicle experts and real-world car industry.

7) *Continuous Learning:* Enable the app to adapt and improve by incorporating feedback and continuously updating its knowledge base.
8) *Deployment:* Deploy the chatbot in car settings to assist owners, and provide accurate vehicle information.

System Architecture



Sr.NO.	Authors	Problem discussed and solved	Method/ Algorithm/ Tools Used	Results
1.	- Seda Kul - Süleyman Eken - Ahmet Sayar	- Heavily biased data set - Similar size and shape of different vehicles	-Background subtraction method used for object detection -Adaptive Background Learning algorithm used for real-time systems	- vehicle detection and classification. - Image processing used for traffic surveillance and control.
2.	-Preetha Jagannathan, -Sujatha Rajkumar, - Jaroslav Frnda, -Parameshachari Divakarachari, -Prabu Subramani	- Vehicle detection and classification in visual traffic surveillance systems. - Proposed ensemble deep learning technique for vehicle classification.	- Gaussian Mixture Model (GMM) for vehicle detection - Ensemble deep learning technique for vehicle classification	-Ensemble deep learning technique achieved 99.13% and 99.28% classification accuracy. -Results are effective compared to existing benchmark techniques.
3.	- Sriashika Addala	- Vehicle detection and recognition in traffic surveillance system. - Hybrid algorithm for vehicle detection and recognition.	- Vehicle detection and recognition using static image datasets - Tang.Y. Zhang's algorithm for vehicle detection.	- Average accuracy of vehicle detection: 97% - Tang Yang's model is proven to be the best.
4.	- Chaochao Meng - Hong Bao - Yan Ma	- The problem discussed is vehicle detection in computer vision. - The paper proposes solutions and algorithms for vehicle detection.	- Faster RCNN: Uses RPN networks and Smooth L1 loss. - AVOD algorithm: Uses visual and radar information.	- The paper discusses 3D vehicle detection algorithms based on stereo perception. - The paper summarizes vehicle detection algorithms in recent years.
5.	- Rahib Abiyev - Arslan	- Vision-based vehicle identification system for intelligent car driving - Accurate detection of obstacles (vehicles) to prevent accidents	- Convolutional Neural Networks (CNN) algorithm used for vehicle detection -Data augmentation technique used for learning stage	- CNN-based vehicle detection system achieves very accurate results - 64 x 64 image size had the best result (0.9981)

6.	- Karan Kumar -Süleyman Eken -Ahmet Saya	- Category imbalance problem in object detection - Sample overpowering problem in picture anchor classification	- Machine learning-based object detection algorithms - Deep convolutional neural networks (CNN) model	- Comparative assessment of moving cast shadow detection techniques - Investigation of the YOLO model for more accurate results
7.	-Sriashika Addala -Y. Zhao	- Vehicle detection and recognition in traffic surveillance system - Hybrid algorithm for vehicle detection and recognition	- Vehicle detection and recognition using static image datasets -Tang.Y. Zhang's algorithm for vehicle detection	- Average accuracy of vehicle detection: 97% - Tang Yang's model is proven to be the best.
8.	- Nitika Arora - Yogesh Kumar	- Automatic vehicle detection and tracking system - Application areas: traffic planning, security, parking management	- Machine learning algorithms and computer vision methodologies - Deep learning techniques for vehicle detection and classification	- Machine learning techniques for object detection - Focus on deep convolutional neural networks
9.	- Kaustubh Sakhare - Tanuja Tewari	- Vehicle detection in dynamic conditions - Vehicle detection in aerial images	- Loop detectors, ultrasonic and supersonic sensors, cameras -Road-side monitoring cameras are most efficient	- Feature based techniques and model based techniques - Object proposal methods and deep learning techniques
10.	- V Kiran - Priyadarsan Parida - Sonali Dash	- Vehicle detection and classification using video-based traffic monitoring - Integration of vision sensors and other sensors for improved performance	-Hypotheses generation (HG) method –Hypotheses verification (HV) method	- Corner feature points and template matching algorithm - Mixture of Gaussians (MoG) and SVM classifier

VI. CONCLUSIONS

Vehicle detection technology needs improvement in small objects, occlusion, and real-time. -Future cars will become more intelligent and practical with vision -based vehicle detection and tracking technology.

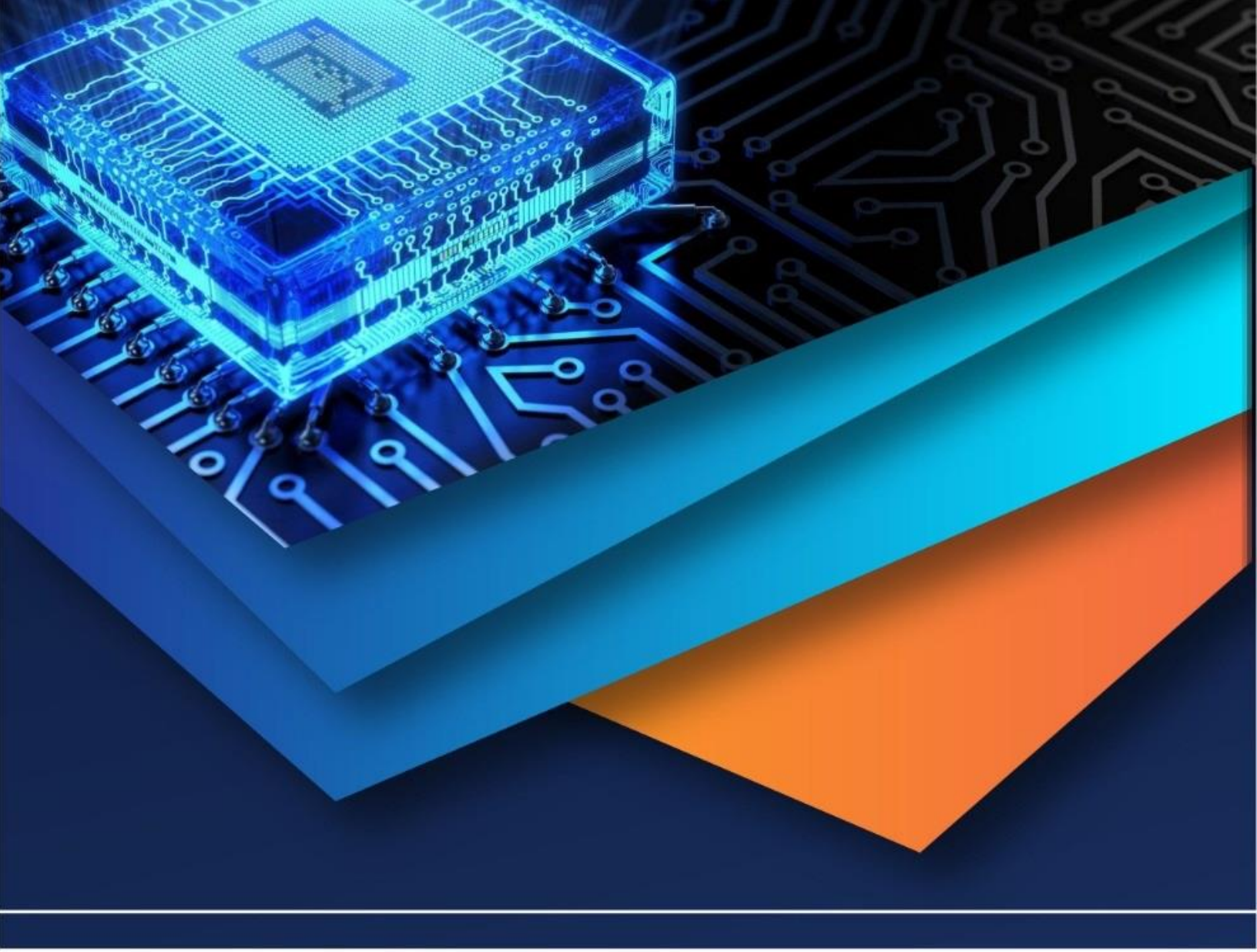
1) System is robust to variations
2) Can be used in real life and assist drivers.
3) System is robust to variations

4) Can be used in real life and assist drivers.
5) Object proposal methods are better than sliding window approach for vehicle detection in aerial images.
6) Future work should focus on improving the accuracy of deep learning classifiers for vehicle detection in aerial images.
7) Detailed overview of literature on video-based traffic monitoring and classification systems using computer vision methods.

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