International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 10 Issue 5, Sep-Oct 2026 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Image Recognition in Automotive Industry

Matthew N. O. Sadiku[1], Paul A. Adekunte[2], Janet O. Sadiku[3]

[1]Roy G. Perry College of Engineering, Prairie View A&M University, Prairie View, TX, USA
[2]International Institute of Professional Security, Lagos, Nigeria
[3]Juliana King University, Houston, TX, USA

ABSTRACT

Image recognition has become an important technology in the modern automotive industry. It is a branch of artificial intelligence and computer vision that enables machines to identify, classify, and interpret objects and patterns contained in digital images or video. In automobiles, image recognition allows vehicles and automotive systems to understand visual information from their surroundings. Cameras installed on vehicles capture images of roads, pedestrians, traffic signs, other vehicles, lane markings, and obstacles, while artificial intelligence algorithms analyze these images and determine what they represent. As vehicles become increasingly intelligent and connected, image recognition is being applied to improve safety, automation, manufacturing, maintenance, security, and the overall driving experience. Image recognition represents mature technology solving practical challenges across automotive and transportation sectors. This paper presents the transformative impact of image recognition on automotive industry.

KEYWORDS: *Image recognition, image classification, image segmentation, automotive industry, car, manufacturing.*

How to cite this paper: Matthew N. O. Sadiku | Paul A. Adekunte | Janet O. Sadiku "Image Recognition in Automotive Industry" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-10 | Issue-5, October 2026, pp.1274-1284, URL: www.ijtsrd.com/papers/ijtsrd142195.pdf

IJTSRD142195

Copyright © 2026 by author (s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (http://creativecommons.org/licenses/by/4.0)

INTRODUCTION

Image recognition technology is transforming the automotive industry by enhancing safety, efficiency, and automation. This technology is integral to various applications, including autonomous driving, vehicle identification, and advanced driver-assistance systems (ADAS). Powered by artificial intelligence (AI), computer vision, machine learning, and deep learning, image recognition enables vehicles and automotive systems to identify and interpret objects, people, road signs, traffic conditions, and other visual information. The technology is increasingly used in advanced driver assistance systems (ADAS), autonomous vehicles, manufacturing, inspection, maintenance, and security. Its adoption offers significant benefits to vehicle manufacturers, drivers, passengers, and the transportation industry. As artificial intelligence and computer vision continue to advance, image recognition is likely to play an increasingly important role in the evolution of automobiles. Its greatest contribution will be its ability to help vehicles perceive and interpret the world around them, providing the foundation for safer, smarter, and more efficient transportation [1].

WHAT IS IMAGE RECOGNITION?

Image recognition is a computer vision task that enables machines to identify objects, people, and actions in images by analyzing pixel patterns through neural networks trained on labeled data. It is a technology that enables machines to interpret and understand visual data, similar to human perception. It is a subset of computer vision and employs various algorithms to identify objects, scenes, and patterns within images. It enables machines to interpret visual data and perform tasks that traditionally require human vision and understanding. For example, an image recognition system can identify a person in a photograph, recognize a traffic sign, detect a tumor in a medical image, or distinguish between different species of animals. Image recognition systems allow computers to learn complex visual patterns from large datasets rather than relying entirely on manually designed features. The main model types include classifiers, object detectors, segmentation models, keypoint estimators, face recognition systems, and vision-language models, each suited to different problems. Figure 1 shows a representation of image

recognition [2], while Figure 2 shows some professionals working on image recognition [3].

Although image recognition is closely related to image classification, object detection, and image segmentation, these concepts have different functions. Image classification assigns one or more labels to an entire image, such as identifying an image as containing a cat. Object detection identifies objects within an image and determines their locations, usually using bounding boxes. Image segmentation divides an image into meaningful regions or identifies the pixels belonging to particular objects. For example, an autonomous vehicle may use image classification to recognize a road scene, object detection to locate pedestrians, and image segmentation to distinguish roads from sidewalks. Figure 3 shows image recognition using bounding boxes to classify vehicles [3].

To humans, seeing an image means instantly recognizing familiar shapes, colors, or people. But for a computer, seeing is completely different; images are just numbers. How does image recognition work? At its core, image recognition works by analyzing the pixels of an image and identifying patterns. This is achieved through complex algorithms, most notably a type of computational model called neural network. Image recognition involves the following stages [1]:

- *Image acquisition*: The first stage (or the input layer) involves obtaining digital images from cameras, smartphones, scanners, satellites, medical imaging equipment, or other visual sensors. The images may be photographs, X-rays, satellite images, or video frames.
- *Image preprocessing*: After acquisition, images may undergo preprocessing to improve their quality and prepare them for analysis. Common preprocessing operations include resizing, normalization, noise reduction, and color adjustments. Preprocessing helps ensure that images are presented in a consistent format suitable for the recognition model. Engineers prepare images for analysis by normalizing the image, which means scaling pixel values to a standard range, typically between 0–1 or -1–1, so data is consistent and more manageable for machine learning models to process. Preprocessing also includes resizing images, converting them to grayscale to reduce computational complexity.
- *Feature extraction*: This involves identifying visual characteristics that distinguish one object or image category from another. Engineers must select the features that provide the most meaningful information. Traditional image recognition systems relied on manually designed features, such as edges, corners, textures, shapes, and color distributions. By annotating objects of interest within images, the models can more easily recognize and classify specific objects such as "cat" or "dog." Precisely annotated data allows machine learning algorithms to learn the visual features of each category accurately.
- *Encoding for machine learning*: Engineers extract these features and format them into numerical vectors, making it easier for machine learning models to process and compare images. Engineers translate each image into a fixed-length feature vector, a list of numbers summarizing its importance. Deep learning methods, particularly convolutional neural networks (CNNs), have revolutionized image recognition due to their ability to learn and extract features automatically from large datasets. Modern deep learning systems automatically learn relevant features from training data.
- *Output layer:* Finally, the data reaches the output layer, which consolidates the extracted features and produces a final prediction. This prediction is compared to the annotated training dataset to calculate errors and adjust the network's weights for improved accuracy.

When a new image is shown, the computer analyzes the pixels, detects features, compares them with what it has learned and outputs a label (e.g., "raccoon") with a confidence score (e.g., 94.7%). Figure 4 shows how image recognition works [4].

IMAGE RECOGNITION IN AUTOMOTIVE INDUSTRY

Image recognition enables vehicles to interpret their surroundings, identifying obstacles, lane markings, and traffic signs. It offers enormous potential for improving automotive safety, driver assistance, autonomous navigation, vehicle inspection, and transportation efficiency. By enabling machines to interpret visual information, image recognition provides vehicles and automotive organizations with capabilities that were previously dependent largely on human observation. Using cameras, computer vision, artificial intelligence, and deep learning, vehicles can recognize pedestrians, traffic signs, road markings, other vehicles, and obstacles. Image recognition for cars uses convolutional neural networks (CNNs) to automatically identify vehicle make, model, type, and other characteristics from photos. Figure 5 is a representation of image recognition in automotive industry [5].

APPLICATIONS OF IMAGE RECOGNITION IN AUTOMOTIVE INDUSTRY

Image recognition is transforming the automotive industry by enabling vehicles and transportation systems to interpret their surroundings visually. Its applications include advanced driver assistance, autonomous driving, pedestrian detection, traffic sign recognition, lane detection, driver monitoring, parking assistance, vehicle security, manufacturing inspection, vehicle maintenance, smart transportation, and intelligent traffic management. Common applications of image recognition in automotive industry include the following [1,6]:

- *Advanced Driver Assistance Systems (ADAS):* One of the most significant uses of image recognition in the automotive industry is in advanced driver assistance systems (ADAS). Modern vehicles are increasingly equipped with cameras that continuously observe the road and surrounding environment. Image recognition software analyzes the images obtained from these cameras and identifies objects that may affect driving. For example, the system can recognize pedestrians crossing a road, cyclists traveling alongside a vehicle, cars suddenly stopping ahead, and objects blocking the roadway. Once an object has been identified, the vehicle can warn the driver or, in some systems, automatically take appropriate action. Figure 6 shows how ADAS works [7].
- *Traffic Sign Recognition*: Image recognition is also widely used for traffic sign recognition. Drivers may occasionally overlook a speed-limit sign, stop sign, warning sign, or other important road information. A camera-equipped vehicle can capture these signs and use image recognition algorithms to identify them. The recognized information can then be displayed on the dashboard or incorporated into the vehicle's driver-assistance functions. This technology can help drivers remain aware of changing road regulations and conditions.
- *Lane Detection:* Another important application is lane detection and lane-keeping assistance. Cameras mounted on a vehicle can recognize lane markings and determine the vehicle's position within a lane. If the vehicle begins drifting from its lane without the driver signaling an intentional lane change, the system can issue a warning. More advanced systems can provide steering assistance to help keep the vehicle within the appropriate lane. This capability is particularly valuable during long-distance driving, when driver fatigue or distraction may increase the risk of unintended lane departure.
- *Autonomous Vehicles*: Image recognition is especially important in the development of automated and autonomous vehicles. An automated vehicle must understand its environment before it can make appropriate driving decisions. Cameras provide rich visual information, while image recognition systems help distinguish between different objects and situations. For example, the system must differentiate between a pedestrian, traffic light, parked vehicle, moving vehicle, road barrier, animal, and ordinary roadside object. The vehicle's automated driving system can combine this visual information with information from other sensors, such as radar and lidar, to build a more comprehensive understanding of its surroundings. Figure 7 shows some autonomous vehicles [8].
- *Pedestrian Detection*: Pedestrian and cyclist detection is another major safety application. People and bicycles can sometimes be difficult for drivers to notice, particularly at intersections, in congested urban areas, or under poor visibility conditions. Image recognition systems can be trained to identify human shapes, bicycles, and movement patterns. When a pedestrian or cyclist is detected in a potentially dangerous position, the vehicle may warn the driver or activate emergency braking where the vehicle is equipped to do so.
- *Parking Assistance*: Parking assistance represents another practical application. Cameras positioned around a vehicle can provide images of the surrounding area, while computer vision algorithms identify parking spaces, nearby vehicles, pedestrians, curbs, and other obstacles. In combination with ultrasonic sensors and other technologies, image recognition can support automated parking systems that assist with steering and maneuvering into parking spaces. Surround-view camera systems can also combine images from several cameras to give drivers a more complete view around their vehicles.
- *Automotive Manufacturing*: Beyond driving, image recognition has important applications in automotive manufacturing. Automobile factories produce thousands of components that must satisfy precise quality requirements. Computer vision systems can examine vehicle bodies, engines, electronic components, tires, paint surfaces, welds, and other parts for visible defects. Artificial intelligence can help identify scratches, cracks, incorrect assembly, missing components, or manufacturing abnormalities.

Automated visual inspection can operate rapidly and consistently, helping manufacturers improve quality control and reduce waste. Figure 8 shows a typical automotive manufacturing [9].

- *Damage Assessment*: Image recognition is also useful for vehicle maintenance and damage assessment. Photographs of damaged vehicles can be analyzed by AI systems to identify visible damage such as dents, broken lights, cracked windshields, or damaged body panels. This capability can assist repair shops, insurers, fleet operators, and vehicle owners in documenting damage and supporting inspection processes. Nevertheless, automated image assessments still require appropriate validation because some internal or structural damage cannot be determined reliably from photographs alone.
- *Personalization:* Another developing application involves vehicle security and personalization. Facial recognition or other forms of visual identification can potentially be used to identify authorized drivers and customize vehicle settings. Once a driver is recognized, the vehicle could adjust seat position, mirrors, climate preferences, entertainment settings, and other personalized features. However, these applications raise significant privacy and data-protection concerns because biometric information is sensitive and requires strong safeguards.
- *License Plate Recognition*: Image recognition can identify vehicles according to characteristics such as type, model, shape, or license plate. Automatic license plate recognition systems capture images of license plates and convert the visible characters into machine-readable information. Such technology has applications in parking facilities, toll collection, traffic management, access control, and law enforcement. A parking facility, for example, may automatically recognize an authorized vehicle and open an entrance gate without requiring a physical ticket. Figure 9 shows number plate recognition camera [10].
- *Recognition Cameras:* Automotive image recognition cameras are sophisticated vision systems designed to capture, process, and interpret visual data from a vehicle's surroundings or interior. These cameras serve as the "eyes" of modern vehicles, enabling a wide range of safety, automation, and convenience features. By leveraging advanced image sensors, embedded processors, and machine learning algorithms, these systems can identify objects, lane markings, traffic signs, pedestrians, and even monitor driver behavior in real time. The strategic importance of automotive image recognition cameras lies in their ability to enhance vehicle safety, reduce human error, and pave the way for higher levels of driving automation. The integration of image recognition cameras has become a cornerstone of Advanced Driver Assistance Systems (ADAS) and autonomous driving platforms. These cameras are deployed in various configurations, including front view, rear view, surround view, blind spot detection, and driver monitoring. Their primary functions range from collision avoidance and lane keeping to parking assistance and driver fatigue detection.

BENEFITS

Image recognition offers numerous benefits to the automotive industry. It can improve road safety, strengthen advanced driver-assistance systems, support autonomous driving, detect pedestrians and traffic signs, simplify parking, monitor driver attention, improve manufacturing quality, assist vehicle maintenance, and enhance security. Other benefits of image recognition in automotive industry include the following [1,11]:

- *Reduced Costs*: Automation through image recognition can reduce operational costs throughout the automotive industry. Manufacturers can automate repetitive inspection activities, identify defects earlier, and improve production efficiency. Transportation and fleet companies can use visual information to assist with vehicle inspection and damage documentation. Although implementing sophisticated image-recognition systems requires investment in cameras, computing hardware, software, data, cybersecurity, and maintenance, the technology can generate long-term efficiencies when deployed effectively. As the automotive industry scales up production of image recognition cameras, manufacturing costs decrease due to economies of scale and technological maturation.
- *Improved Road Safety*: One of the most important benefits of image recognition in the automotive industry is improved road safety. Cameras installed around a vehicle can continuously observe the road and identify pedestrians, cyclists, other vehicles, traffic signs, lane markings, and obstacles. When a dangerous situation is detected, the system can warn the driver or, in appropriately equipped vehicles, initiate an automatic response. For example, image recognition contributes to forward-collision warning and automatic emergency braking systems. If a camera detects a pedestrian crossing the road or a vehicle suddenly stopping ahead, the

system can recognize the danger and assist in braking. This capability can reduce the likelihood or severity of certain collisions.

- *Autonomous Driving*: Image recognition is also important in the development of autonomous vehicles. A self-driving vehicle must be able to understand its environment before it can safely navigate through it. Cameras provide large amounts of visual information, while image-recognition algorithms help identify and classify the objects appearing in those images. For example, an autonomous vehicle may need to distinguish between a pedestrian, bicycle, motorcycle, car, traffic light, road sign, construction barrier, and other objects. It must also recognize road boundaries and determine how objects are moving. Image recognition therefore contributes to the perception systems that allow autonomous vehicles to understand complex road environments.
- *Better Traffic-Sign Recognition:* Drivers sometimes fail to notice important road signs because of distraction, poor visibility, fatigue, or unfamiliar surroundings. Image-recognition systems can detect and interpret signs such as speed limits, stop signs, warning signs, and other traffic-control information. The recognized information can then be displayed to the driver or used by compatible vehicle systems. For example, a vehicle may display the detected speed limit on the dashboard. This helps increase driver awareness and can encourage compliance with traffic regulations.
- *Improved Pedestrian Detection*: Pedestrians and cyclists are particularly vulnerable road users. Image recognition can help vehicles identify people and bicycles in their surroundings and estimate their location and movement. When combined with other vehicle sensors and safety systems, pedestrian and cyclist recognition can provide warnings or contribute to emergency-braking decisions. This capability is particularly valuable in urban areas where vehicles frequently interact with pedestrians, cyclists, scooters, and other road users.
- *More Convenient Parking*: Image recognition can make parking easier and safer. Cameras positioned around a vehicle can identify parking spaces, nearby vehicles, curbs, pedestrians, and other obstacles. The information can be used in parking-assistance and automated-parking systems. Modern vehicles may provide rear-view cameras, surround-view displays, and automatic parking assistance. These systems can improve the driver's awareness of areas that are difficult to see directly and can reduce the likelihood of low-speed collisions while parking.
- *Improved Manufacturing:* The benefits of image recognition extend beyond driving. Automobile manufacturers can use computer-vision systems throughout production lines to inspect components and finished vehicles. Cameras can examine components for defects such as scratches, cracks, incorrect positioning, missing parts, or assembly errors. Automated visual inspection can perform repetitive inspection tasks rapidly and consistently. This can improve quality control, reduce waste, identify manufacturing problems earlier, and lower the cost associated with defective products.
- *Faster Quality Inspection*: Traditional vehicle inspection can require substantial manual labor. Image-recognition technology can automate parts of the inspection process by comparing captured images with established quality standards. For example, systems can inspect paint surfaces, body panels, welds, tires, electronic components, and other vehicle parts. When an abnormality is identified, the system can flag the component for further examination. This allows manufacturers to combine automated inspection with human expertise where additional judgment is required.
- *Greater Vehicle Security*: Image recognition can also improve automotive security. Some vehicles use cameras and biometric technologies to identify authorized users or monitor the vehicle's surroundings. Facial recognition, for example, can potentially be used as one component of driver authentication. External cameras can also record suspicious activity around vehicles. When integrated with other security technologies, image recognition can contribute to theft prevention, access control, and vehicle monitoring.
- *Improved Driving Experience*: Image recognition can make driving more convenient as well as safer. Traffic-sign recognition, parking assistance, lane guidance, surround-view cameras, and other vision-based technologies reduce some of the mental and physical demands placed on drivers. As these technologies improve, vehicles may become increasingly capable of understanding their surroundings and providing useful assistance at appropriate moments. This can create a more comfortable and informed driving experience.

CHALLENGES

In spite of its many benefits, image recognition in the automotive industry faces several challenges. Rain, snow, fog, darkness, glare, shadows, dirty camera

lenses, damaged road signs, faded lane markings, and unusual objects can reduce the reliability of visual recognition. Challenges involving weather and lighting, occlusion, diverse road environments, training data, bias, real-time computation, recognition errors, sensor reliability, cybersecurity, privacy, explainability, regulation, unpredictable edge cases, ethical concerns, and safety must be carefully addressed. Other challenges of image recognition in automotive industry include the following [1,12]:

- *Privacy Concerns*: There are significant privacy concerns. Vehicle cameras may capture pedestrians, license plates, homes, businesses, and other information while traveling through public areas. When images are stored, transmitted, or used to improve artificial intelligence systems, questions arise about data collection, retention, security, consent, and compliance with privacy regulations. Manufacturers must therefore develop responsible policies governing how visual information is collected and used.
- *Bias:* Another concern is bias and poor generalization. If an image recognition model is trained primarily using data from certain cities, climates, roads, vehicles, or populations, its performance may decline when it encounters environments that differ significantly from its training data. Automotive systems therefore need diverse datasets and extensive testing across geographical regions, weather conditions, lighting situations, and road types.
- *Real-time Processing*: Real-time processing requirements present another major challenge. A moving vehicle cannot afford long delays while analyzing an image. The system must capture visual information, recognize relevant objects, determine their locations, and provide information to other vehicle systems within fractions of a second. At highway speeds, even a small delay can affect how much distance is available for braking or maneuvering. Manufacturers must therefore balance recognition accuracy with computational speed, energy consumption, hardware cost, and system complexity.
- *Object Occlusion*: Another challenge is object occlusion. Objects on the road are not always completely visible. A pedestrian may be partially hidden behind a parked vehicle, a motorcycle may be obscured by a truck, or a traffic sign may be covered by vegetation. Image recognition systems must often identify objects from incomplete visual information. Failure to recognize a partially hidden pedestrian or cyclist can have serious safety consequences.
- *Training Data*: A related challenge is the quality and availability of training data. Effective car recognition models require substantial training datasets. Data must be collected across multiple viewpoints, lighting conditions, and real-world scenarios to train robust classification systems. Modern image recognition systems, particularly those based on deep learning, require large collections of accurately labeled images. Collecting and labeling millions of automotive images can be expensive and time-consuming. More importantly, datasets must contain sufficient examples of unusual or dangerous situations. Rare events, such as an animal suddenly entering a highway or an unusual object falling from a truck, may not occur frequently enough in training datasets. Yet these uncommon situations can be among the most important for a vehicle to recognize correctly.
- *False Positives/Negatives*: Image recognition systems must also deal with false positives and false negatives. A false positive occurs when the system incorrectly identifies something as a hazard, while a false negative occurs when it fails to recognize a genuine hazard. For example, unnecessarily identifying a harmless shadow as an obstacle could result in inappropriate braking. More seriously, failing to identify a pedestrian could contribute to a collision. Achieving extremely high reliability while minimizing both types of errors remains a major engineering challenge.
- *Cybersecurity*: Cybersecurity is another concern. Modern vehicles contain interconnected electronic systems, and perception systems may potentially be affected by malicious interference. Researchers have also demonstrated that carefully designed visual patterns can sometimes confuse machine-learning classifiers. Automotive developers therefore need to consider both conventional cybersecurity and the robustness of AI systems against attempts to manipulate their perception.
- *Explainability*: Another challenge involves explainability and accountability. Deep-learning systems can make highly complex decisions that may not always be easy for humans to interpret. After an accident, investigators, manufacturers, regulators, insurers, and vehicle owners may need to understand why a system failed to recognize an object or classified it incorrectly. Improving the transparency and traceability of AI-assisted decisions is therefore important for safety assessment and accountability.

- *Regulation:* Regulation and safety validation further complicate automotive image recognition. A consumer application that occasionally misidentifies an image may cause inconvenience, but a vehicle perception error can contribute to injury or death. Automotive image recognition systems therefore require rigorous testing, validation, monitoring, and safety engineering. Regulators and industry organizations must also adapt standards as artificial intelligence and automated-driving technologies continue to evolve. North America and Europe remain key markets due to stringent safety regulations and high consumer awareness. Global safety regulations, including those from the National Highway Traffic Safety Administration (NHTSA) and European Union directives, are mandating advanced safety features in new vehicles. These standards are encouraging automakers to adopt comprehensive sensor suites.
- *Trust*: Building trust with customers and regulators will be a key differentiator in the evolving market landscape. Companies that proactively engage with regulators, invest in compliance, and prioritize data security will be better positioned to navigate the evolving regulatory landscape and build trust with customers.

FUTURE OF IMAGE RECOGNITION IN AUTOMOTIVE INDUSTRY

The future of image recognition in the automotive industry is promising and far-reaching. It is closely connected with continuing developments in artificial intelligence. Advances in deep learning, computer vision, edge computing, specialized automotive processors, and sensor technologies are expected to improve the speed and accuracy with which vehicles interpret their surroundings. In the future, improvements in deep learning and computer vision should enable vehicles to recognize increasingly complex situations and respond more effectively to changing road environments. The image recognition technology is expected to contribute to autonomous driving, advanced driver assistance, pedestrian detection, driver monitoring, personalized vehicles, manufacturing quality control, vehicle maintenance, traffic management, and connected transportation.

One of the most significant areas for the future of image recognition is autonomous driving. Self-driving and highly automated vehicles must continuously understand their surroundings to operate safely. Cameras positioned around a vehicle can capture images of roads, pedestrians, cyclists, traffic signs, lane markings, other vehicles, and obstacles. Image recognition may further support the development of personalized vehicles. Facial recognition and related biometric technologies could allow a vehicle to identify authorized users and automatically apply preferred settings. Seats, mirrors, climate controls, entertainment systems, navigation preferences, and other features could be adjusted according to the recognized driver. However, greater use of biometric information will also increase the importance of privacy, cybersecurity, informed consent, and responsible data management. In the longer term, image recognition is likely to become part of a broader transformation toward intelligent, connected, and increasingly automated transportation [1].

CONCLUSION

Image recognition is transforming many aspects of the automotive industry. Advances in deep learning, multimodal artificial intelligence, sensor fusion, and vehicle connectivity will further expand what automotive vision systems can accomplish. Automotive image recognition is most effective when combined with robust engineering, appropriate human oversight, and, where necessary, other sensing technologies. Technological progress must be accompanied by careful attention to safety, reliability, privacy, cybersecurity, regulation, and ethical use. Image recognition alone will not solve every challenge associated with intelligent vehicles, but it is likely to remain a fundamental component of the automotive industry's technological evolution. Ultimately, its greatest contribution may be the development of vehicles that can understand their surroundings more effectively and use that understanding to support safer, more efficient, and increasingly intelligent transportation.

REFERENCES

[1] https://chatgpt.com

[2] R. Golemanova, "What is image recognition? Technology, applications, and benefits," March 2025, https://imagga.com/blog/what-is-image-recognition-technology-applications-and-benefits/

[3] T. Mucci, "What is image recognition?" November 2024, https://www.ibm.com/think/topics/image-recognition

[4] M. Timothy, "What is image recognition AI? Algorithms and applications," June 2025, https://blog.roboflow.com/image-recognition/

[5] T. Zia, "How google cloud's automotive AI agent is transforming in-car experience with

mercedes-benz," January 2025, https://www.unite.ai/how-google-clouds-automotive-ai-agent-is-transforming-in-car-experience-with-mercedes-benz/

[6] A, Bachav, "Automotive image recognition camera industry market (2026 - 2035)," https://www.marketresearchintellect.com/product/automotive-image-recognition-camera-industry-market/

[7] "Advanced Driver Assistance Systems (ADAS)," https://alphacarhire.com.au/glossary/advanced-driver-assistance-systems-adas/

[8] "Autonomous vehicles: The road ahead," March 2025, https://hyperxpedia.blogspot.com/2025/03/autonomous-vehicles-road-ahead.html

[9] "Increased efficiency in quality inspections through AI-supported image recognition in the automotive industry," https://ums-gmbh.com/en/cases/increased-efficiency-in-quality-inspections-through-ai-supported-image-recognition-in-the-automotive-industry/

[10] "Number plate recognition camera," https://www.indiamart.com/proddetail/number-plate-recognition-camera-2855061580233.html

[11] "Global automotive image recognition camera market size, industry trends & forecast 2026-2034," https://www.verifiedmarketreports.com/product/automotive-image-recognition-camera-market/

[12] "Automotive image recognition camera industry market: Key drivers shaping future innovation," September 2026, https://www.linkedin.com/pulse/automotive-image-recognition-camera-industry-market-limnf



Figure 1 A representation of image recognition [2].



Figure 2 Some professionals working on image recognition [3].



Figure 3 Image recognition using bounding boxes to classify vehicles [3].

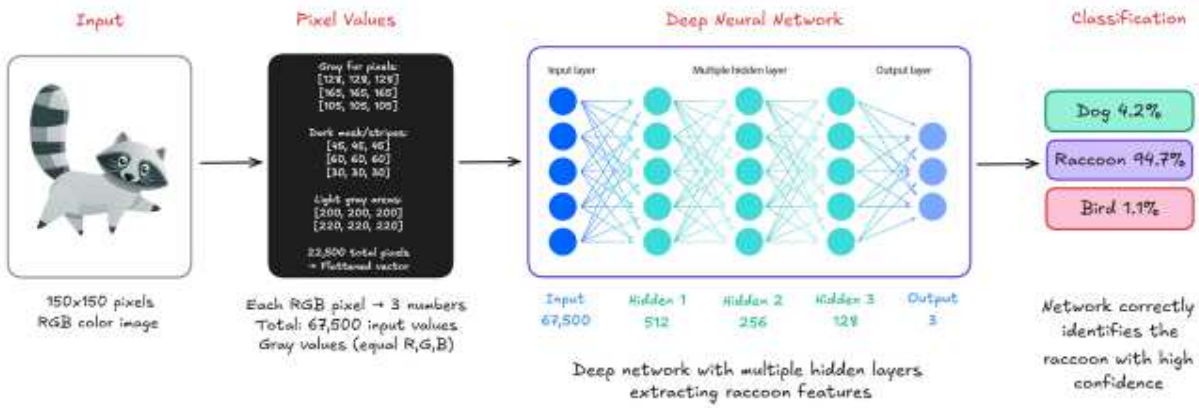


Figure 4 How image recognition works [4].



Figure 5 A representation of image recognition in automotive industry [5].

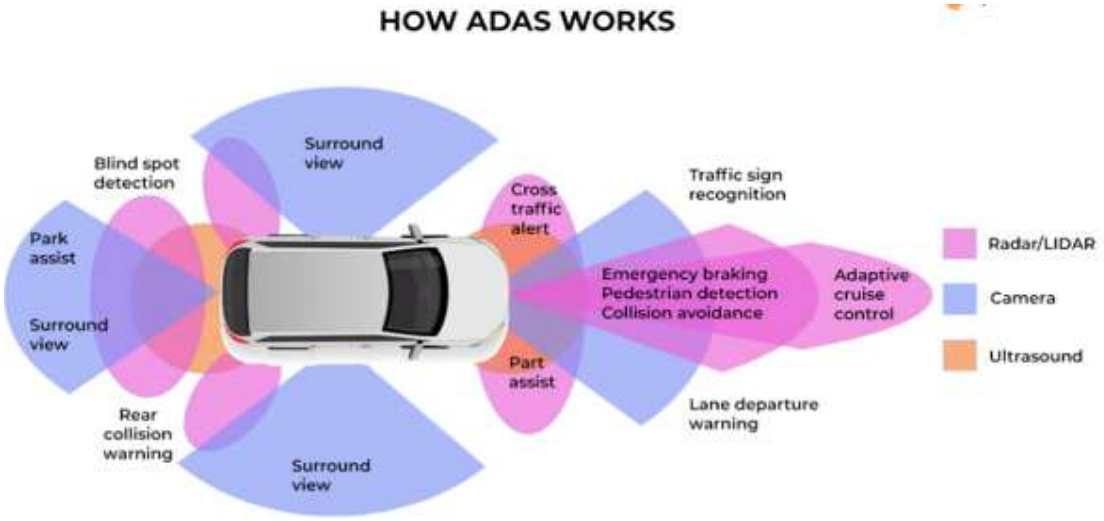


Figure 6 How ADAS works [7].

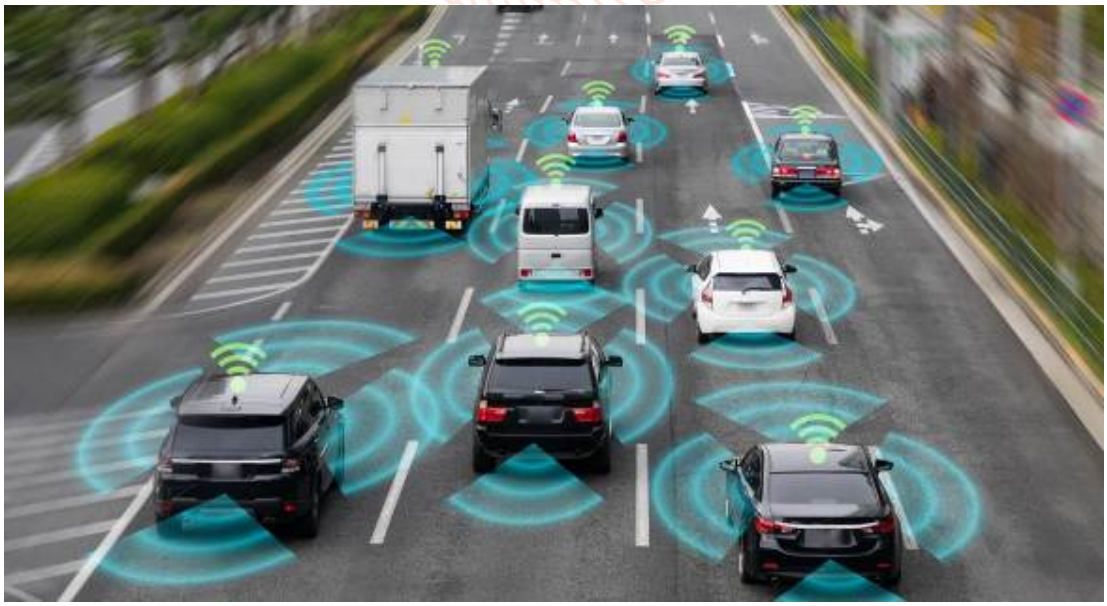


Figure 7 Some autonomous vehicles [8].



Figure 8 A typical automotive manufacturing [9].



Figure 9 Number plate recognition camera [10].