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 Robotics

Matthew N. O. Sadiku[1], Samuel A. Ajayi[2], Janet O. Sadiku[3]

[1]Roy G. Perry College of Engineering, Prairie View A&M University, Prairie View, TX, USA
[2]Texas Southern University, Houston, TX, USA
[3]Juliana King University, Houston, TX, USA

ABSTRACT

Image recognition is the process by which a computer system analyzes digital images and identifies objects, people, patterns, or other meaningful features within them. It has become an important technology in modern robotics because it enables robots to perceive, identify, and interpret objects and situations in their surroundings. Traditional robots were largely dependent on predetermined instructions and carefully controlled environments. Modern robots, however, are increasingly expected to operate in dynamic environments such as factories, hospitals, warehouses, farms, homes, and public spaces. To function effectively in these settings, robots need the ability to understand visual information. Image recognition, particularly when combined with artificial intelligence, computer vision, and deep learning, provides robots with this capability. It has evolved from basic edge detection to sophisticated neural networks that let machines interpret visual data with near-human accuracy. The technology enables autonomous vehicles to navigate city streets, industrial robots to sort components at high speed, and collaborative robots to work safely alongside humans. This paper looks into the transformation of robots through image recognition.

KEYWORDS: *Image recognition, image classification, image segmentation, robots, robotics.*

How to cite this paper: Matthew N. O. Sadiku | Samuel A. Ajayi | Janet O. Sadiku "Image Recognition in Robotics" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-10 | Issue-5, October 2026, pp.1298-1310, URL: www.ijtsrd.com/papers/ijtsrd142325.pdf

IJTSRD142325

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 is a crucial technology in robotics, enabling machines to interpret and understand visual data. This capability allows robots to perform tasks such as navigation, object detection, and interaction with their environment. Image recognition improves the ability of robots to perceive their environment, operate autonomously, interact with people, and perform complex tasks. It provides significant benefits to robotics by giving machines an enhanced ability to perceive and interpret the visual world. It supports object recognition, autonomous navigation, robotic manipulation, quality inspection, human-robot interaction, safety, productivity, flexibility, and operation in hazardous environments. A robot equipped with cameras can capture visual information, while image-recognition algorithms analyze that information to determine what the robot is seeing. Advances in artificial intelligence, computer vision, and deep learning have greatly improved this capability, allowing robots to recognize objects, people, obstacles, gestures, and complex scenes. Image recognition is used in industrial robots, autonomous vehicles, healthcare robots, agricultural machines, security systems, warehouse robots, and service robots. Despite these advances, reliable image recognition in robotics remains difficult because robots must operate in complex, changing, and often unpredictable real-world environments [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].

FUNDAMENTALS OF ROBOTICS

The word "robot" was coined by Czechriter Karel Čapek in his play in 1920. Isaac Asimov coined the term "robotics" in 1942 and came up with three rules to guide the behavior of robots and later added the zeroth law [5]:

- Law 0: A robot may not injure humanity or through inaction, allow humanity to come to harm.
- Law 1: Robots must never harm human beings,
- Law 2: Robots must follow instructions from humans without violating rule 1,

- Law3: Robots must protect themselves without violating the other rules.

Robots are becoming increasingly prevalent in almost every industry, from healthcare to manufacturing.

Although there are many types of robots designed for different environments and for different purposes/applications, they all share four basic similarities [6]:

1. All robots have some form of mechanical construction designed to achieve a particular task;
2. They have electrical components which power and control the machinery;
3. All robots must be able to sense its surroundings; a robot may have light sensors (eyes), touch and pressure sensors (hands), chemical sensors (nose), hearing and sonar sensors (ears), etc.
4. All robots contain some level of computer programming code.

Programs are the core essence of a robot since they provide intelligence. There are three different types of robotic programs: remote control, artificial intelligence, and hybrid. Some robots are programmed to faithfully carry out specific actions over and over again (repetitive actions) without variation and with a high degree of accuracy.

Robotics is an interdisciplinary field that involves the design, construction, operation, and use of robots. It is a branch of engineering and computer sciences that includes the design and use of machines that are capable of performing programmed tasks without human involvement. The field develops machines that can efficiently carry out various tasks, can automate tasks, and do various jobs that a human might not be able to do. Robots could someday be our drivers, companions, collaborators, teachers, specialists, and exploration pioneers [7]. Figure 5 shows a cloud word for robots [8], while Figure 6 shows a typical robot [9].

IMAGE RECOGNITION IN ROBOTICS

Image recognition enables robots to perceive, identify, and interact with objects in their environment through computer vision and deep learning techniques. It has greatly expanded the capabilities of robots by enabling machines to perceive and interpret their surroundings. Robots must recognize objects under changing lighting, partial occlusion, unusual viewing angles, cluttered backgrounds, motion, and unfamiliar environmental conditions. They must accomplish these tasks rapidly while operating within limitations of computing power, memory, energy, and hardware [1].

Robots do not just move anymore—they see. Figure 7 shows a robot that is learning to see [10]. That is the magic of computer vision in robotics. A robot must first obtain useful information about its environment before it can make appropriate decisions and perform physical actions. Image recognition provides an important part of this perception. In robotics, cameras and other visual sensors serve somewhat like the eyes of the robot, while computer vision and AI algorithms process the information obtained from these sensors. The robot can then use the resulting information to make decisions and perform appropriate physical actions. Thus, image recognition forms an important connection between robotic perception and robotic action. Image recognition allows robots not merely to detect that something is present but also to determine what it is and, in many systems, where it is located. For example, industrial robots handling high-speed sorting need cameras capturing hundreds of frames per second. Collaborative robots working alongside humans prioritize depth sensing for safety. Mobile autonomous robots might use wide-angle cameras for environmental mapping combined with narrow-field cameras for detailed object inspection. A manufacturing robot may visually inspect a product, detect a defect, and remove the defective item from the production line [11].

APPLICATIONS OF IMAGE RECOGNITION IN ROBOTICS

Image recognition is applied in manufacturing, warehousing, industrial automation, autonomous navigation, healthcare, agriculture, logistics, security, domestic robotics, logistics, scientific exploration, transportation, domestic assistance, and many other fields. The applications of image recognition in robotics are extensive and continue to expand. Common applications of image recognition in robotics include the following [1,12,13]:

- *Robot Navigation*: An important application is robot navigation. Mobile robots must understand their surroundings to move safely from one location to another. Visual information can help a robot recognize obstacles, doors, pathways, landmarks, equipment, and people. When image recognition is combined with technologies such as depth sensing, LiDAR, GPS, and simultaneous localization and mapping (SLAM), robots can develop a richer representation of their environment and determine how to navigate through it.
- *Industrial Robots:* Image recognition plays a significant role in industrial robotics. One of the largest application areas in industrial robots is quality control and inspection through image

recognition. Manufacturing environments increasingly use machine vision to guide robotic arms during assembly, sorting, inspection, packaging, and material handling. A vision-equipped robot can recognize components that may appear in different positions or orientations. After determining the object's location and orientation, the robot can adjust its movements to grasp or manipulate it. This flexibility is particularly valuable in modern manufacturing systems where production requirements frequently change.

- *Mobile Robots*: Mobile robots are expected to navigate successfully in complex environments, locate and track objects, avoid obstacles, determine their own location, and to reconstruct 3D visual scenes of their environment from cameras and other sensors. Additionally, they may be expected to carry out services to aid humans and industrial inspection. Typically, a service robot might be expected to perform search and rescue, act as human assistance in caring for the elderly by monitoring, and providing timely information about their activities.
- *Human-robot Interaction*: Image recognition improves interaction between humans and robots. Robots can use cameras and computer vision to recognize people, body movements, hand gestures, and facial expressions. Robots designed to work alongside people need to recognize human presence, gestures, body positions, objects being handled, and environmental conditions. A collaborative robot in a factory, for example, may need to detect when a worker enters its operating area so that it can modify or stop its movement. Service robots may use visual information to understand gestures or determine whether someone is attempting to interact with them. Such capabilities can make interactions between humans and robots more natural and safer.
- *Healthcare:* Image recognition has important applications in medical and healthcare robotics. Surgical robots can process visual information from cameras to help provide detailed views of anatomical structures during procedures. Robots may use cameras and image-processing technologies to assist with surgery, rehabilitation, hospital logistics, laboratory automation, and patient-support activities. Service robots operating in healthcare facilities can also use visual perception to navigate corridors, recognize objects, and interact more effectively with their surroundings. Figure 8 shows the use of robots in medicine [14].
- *Agriculture*: Robotic image recognition is also transforming agriculture. Vision-enabled agricultural robots can examine crops and identify characteristics such as fruit maturity, weed location, or visible plant abnormalities. Harvesting robots may use cameras to locate individual fruits before directing robotic arms toward them. Weed-control robots can distinguish crops from unwanted vegetation and apply treatment more selectively. Such systems have the potential to improve agricultural efficiency while reducing unnecessary use of labor, chemicals, and other resources.
- *Manufacturing:* Manufacturing is one of the major areas in which image recognition and robotics are combined. The concept of image recognition in industrial robotics is an absolute game-changer for manufacturing. Industrial robots use machine vision for assembly, sorting, inspection, welding, packaging, and material handling. For example, a robot can recognize different components and determine which component should be installed at a particular stage of production. Robots can also inspect manufactured products visually and identify defects such as cracks, scratches, incorrect shapes, missing components, or improper assembly. This application improves manufacturing efficiency because inspection and production can occur rapidly and consistently. Figure 9 shows a typical use of robots in manufacturing [15].
- *Warehousing*: Warehouses and distribution centers provide another major application of image-recognition robotics. Robots can visually recognize packages, shelves, labels, containers, pallets, and products. Image recognition can assist robots in locating goods, sorting packages, performing inventory checks, and preparing orders for shipment. Vision-guided robotic arms can identify objects of different shapes and sizes and determine how they should be picked and placed. These technologies are particularly useful in fulfillment centers where thousands of different products may have to be processed rapidly.
- *Object Recognition*: One of the most fundamental applications of image recognition in robotics is object recognition. Object recognition is the ability of a robot to identify and classify objects within an image or video stream. Robots frequently need to distinguish one object from another before they can interact successfully with their surroundings. Using cameras and trained machine-learning models, a robot can identify

tools, products, packages, household items, machine components, and many other objects. Object recognition is especially important when robots operate in environments containing many different items. For example, a warehouse robot may need to recognize a particular package among hundreds of packages.

- *Face Recognition*: Face recognition is the ability of a robot to identify and verify individuals within an image or video stream. This is typically done using machine learning techniques, such as deep learning, which allow the robot to learn to recognize faces from a training dataset. Figure 10 shows a typical face recognition [15].
- *Search-and-Rescue Robotics*: Robots are increasingly used in environments that may be dangerous for humans, including collapsed buildings, disaster zones, fires, mines, and contaminated areas. Image recognition can help search-and-rescue robots identify people, structural features, hazards, pathways, and important objects. For example, a robot exploring a damaged building could transmit images while an artificial-intelligence system searches those images for indications of trapped individuals. Combining visual recognition with thermal cameras and other sensors can further improve situational awareness.
- *Security Robots:* Security robots can use image recognition to monitor buildings, industrial facilities, airports, warehouses, and other locations. They may recognize objects, detect unusual activities, identify unauthorized entry into restricted areas, or alert human operators to potential hazards. These applications, however, raise important questions concerning privacy, data protection, surveillance, accuracy, and responsible use. Organizations deploying such technologies must therefore establish appropriate safeguards and comply with relevant laws and ethical standards.
- *Service Robots*: Image recognition is also important in household and service robots. A robotic vacuum cleaner, for example, can use computer vision to identify furniture and obstacles. More advanced domestic robots may recognize household objects and assist with cleaning, organization, or other routine activities. In hotels, restaurants, hospitals, airports, and offices, service robots can use visual recognition to navigate their environments, locate objects, interact with customers, and deliver items.
- *Image Restoration:* Image restoration techniques are used to repair or improve the quality of a degraded image. These techniques include removing noise, blur, and distortion, as well as restoring missing or corrupted parts of an image. A typical image restoration is shown in Figure 11 [15].

BENEFITS

One of the major benefits of image recognition in robotics is improved perception of the environment. Image recognition enhances precision and efficiency in tasks like quality control and navigation. Other benefits of image recognition in robotics include the following [1,13]:

- *Reduced Costs*: Although sophisticated robotic vision systems may require considerable initial investment, they can potentially reduce long-term operating costs. Automated inspection, monitoring, sorting, and handling can reduce repetitive labor requirements, production errors, material waste, and downtime. The financial benefit depends on the application, equipment cost, maintenance requirements, accuracy of the system, and scale of deployment.
- *Greater Autonomy*: Image recognition increases robotic autonomy. Traditional robots often operate according to predetermined instructions and perform repetitive movements in highly controlled environments. Vision-enabled robots can respond more dynamically to changing conditions. A warehouse robot, for example, can recognize packages, shelves, obstacles, and pathways while navigating a facility. Greater autonomy reduces the need for constant human supervision and makes robots useful in less structured environments.
- *Accurate Object Detection*: Robots frequently need to determine what objects are present and where they are located. Image recognition makes this possible by allowing robots to detect, classify, and distinguish among objects. For example, in manufacturing, a robotic system can identify different components moving along a production line.
- *Enhanced Navigation:* Autonomous robots must navigate their environments while avoiding obstacles. Visual recognition can help robots identify landmarks, pathways, objects, people, and potential hazards. For example, delivery robots can use visual information to recognize sidewalks and obstacles. Autonomous vehicles employ cameras alongside other sensors to identify road markings, traffic signs, pedestrians, cyclists, and vehicles.
- *Increased Safety*: Safety is another significant benefit. Robots that recognize people and

dangerous conditions can modify their behavior to reduce the possibility of collisions or injuries. Collaborative robots, often called cobots, are designed to operate in environments shared with human workers. Vision systems can help such robots detect human presence and movements. In hazardous environments, image recognition can also help robots identify fires, damaged equipment, structural problems, obstacles, or other potentially dangerous conditions before approaching them.

- *Better Human-Robot Interaction*: As robots become more common in homes, hospitals, schools, businesses, and public spaces, effective interaction with people becomes increasingly important. Image recognition can help robots recognize people, gestures, body movements, and other visual cues. A service robot, for example, may detect that a person is approaching and prepare to interact. Robots can also use gesture recognition to interpret commands such as pointing toward an object or indicating a direction. These capabilities can make human-robot interaction more natural and intuitive.
- *Higher Productivity*: Image recognition can increase productivity by allowing robots to perform tasks faster and with less human intervention. Automated visual inspection, sorting, picking, and monitoring can be performed continuously when systems are appropriately designed. In manufacturing, a robot equipped with visual recognition may identify components and position itself accordingly rather than depending entirely on fixed placement. In logistics, robots can identify and sort packages rapidly. These capabilities can reduce repetitive manual work and improve operational efficiency.
- *Operation in Dangerous Environments:* Robots are often deployed where conditions are unsafe for humans, including disaster areas, mines, industrial facilities, underwater environments, and potentially contaminated locations. Image recognition allows such robots to interpret visual information remotely or autonomously. A disaster-response robot may identify debris, pathways, structural features, or people requiring assistance. Inspection robots can examine infrastructure and equipment while limiting human exposure to hazardous conditions.
- *Greater Flexibility:* Conventional automation works especially well when tasks and environments remain highly predictable. Image recognition can make robotic systems more adaptable by helping them recognize variation. For example, instead of requiring every component to arrive in precisely the same orientation, a vision-guided robot may locate an object and adjust its grasp accordingly. This flexibility is particularly valuable in modern manufacturing and logistics environments where robots may need to handle multiple products or changing production requirements.

CHALLENGES

In spite of the significant benefits, image recognition in robotics is not perfect. Challenges involving reliability, computational requirements, safety, privacy, and changing environments remain to be addressed. Other significant challenges include inadequate training data, poor generalization, three-dimensional spatial understanding, integration with other sensors and control systems, cybersecurity, and ethical concerns. Other challenges of image recognition in robotics include the following [1]:

- *Privacy Concerns*: Privacy becomes especially important when robots continuously capture images in homes, workplaces, hospitals, schools, and public spaces. Robots equipped with cameras may continuously collect images. This raises concerns about privacy, consent, surveillance, data storage, and unauthorized access. For this reason, the future of robotic image recognition will depend not only on improving accuracy but also on developing trustworthy AI systems.
- *Variations in Lighting*: One of the major challenges of image recognition in robotics is variation in lighting. Images captured by robotic cameras can appear very different depending on whether the environment is bright, dark, cloudy, artificially illuminated, or affected by shadows. An object that is easily recognized under laboratory lighting may become difficult to identify in poor or rapidly changing illumination. Outdoor robots face particularly difficult conditions because sunlight changes throughout the day. Shadows, glare, reflections, and nighttime conditions can affect image quality.
- *Object Occlusion*: Objects are frequently partially hidden by other objects. This phenomenon, known as occlusion, presents a serious problem for robotic vision. For example, a warehouse robot may need to recognize a package that is partially covered by another package, while a household robot may need to identify a cup when only part of it is visible. Humans can often recognize objects from incomplete visual information because they use prior knowledge and contextual understanding. Robots may

struggle when important identifying features are hidden.

- *Cluttered Environments*: Robots frequently operate in environments containing many objects simultaneously. Factories, warehouses, hospitals, farms, streets, and homes can be visually complex. The robot must distinguish relevant objects from background information and determine which visual elements require attention. For example, a warehouse robot may encounter shelves containing hundreds of products with similar packaging. A service robot in a home may encounter furniture, toys, appliances, people, pets, and numerous other objects. Separating individual objects from such cluttered scenes can be computationally difficult.
- *Real-Time Processing*: Robots often need to recognize images and make decisions almost immediately. A mobile robot approaching an obstacle cannot wait several seconds for an image-recognition system to determine what is ahead. Similarly, an industrial robot working on a rapidly moving production line must identify objects quickly enough to perform its assigned task. Modern deep-learning models can require substantial computational resources. Running sophisticated models in real time on a robot with limited processing power creates a difficult balance between accuracy, speed, energy consumption, and hardware cost.
- *Limited Resources*: Many robots cannot carry large computing systems. Mobile robots, drones, and small autonomous machines have limitations in processor capacity, memory, battery life, weight, and physical size. Advanced image-recognition algorithms may require powerful graphics processing units or specialized AI processors. These components consume electricity and generate heat. Engineers must therefore develop efficient models capable of operating on resource-constrained robotic platforms without sacrificing too much accuracy.
- *Generalization:* A robot trained in one environment may not perform equally well in another. For example, a warehouse robot trained using images from one facility may encounter different shelves, packaging, lighting, floor markings, and layouts when deployed elsewhere. This problem is related to domain shift, in which the data encountered during actual operation differs from the data used during training. Robots need recognition systems that can generalize beyond their original training environments and adapt to unfamiliar situations.
- *Safety:* Recognition errors can create serious safety problems. A household robot that mistakes a pet for an inanimate object could cause injury. When robots work near humans, vision failures carry safety implications. Collaborative applications rely heavily on vision for safety. An industrial robot that fails to recognize a worker entering its operating area could create a dangerous situation. Autonomous systems that incorrectly identify pedestrians, vehicles, obstacles, or traffic signals may also create significant risks. For this reason, robotic image recognition cannot be evaluated solely by average accuracy. Engineers must also consider the consequences of particular errors, system robustness, uncertainty estimation, redundancy, testing, and fail-safe mechanisms.
- *Integration:* Image recognition does not operate independently. Its output must be integrated with navigation, localization, motion planning, manipulation, language processing, control systems, and decision-making. For example, identifying a chair is useful only if the robot can determine its location and decide whether to approach it, avoid it, move it, or ignore it. Effective robotics therefore requires close integration between visual perception and the robot's broader reasoning and control architecture.

FUTURE OF IMAGE RECOGNITION IN ROBOTICS

The future of image recognition in robotics is closely connected with advances in artificial intelligence. Increasingly, researchers are developing robots that combine vision with language, sound, touch, spatial reasoning, and other forms of sensory information. The combination of robotics, artificial intelligence, deep learning, and computer vision is particularly significant because effective robotic autonomy depends heavily on perception. As these technologies advance, image recognition will play an increasingly important role in enabling robots to move from highly controlled environments into complex real-world settings where they can perceive, reason, and act with greater autonomy.

In the future, image recognition will move beyond simply identifying objects toward providing robots with a richer understanding of their surroundings. This development will contribute to more autonomous, adaptable, collaborative, and intelligent robotic systems. The future will also bring significant improvements in human-robot collaboration. Robots are increasingly expected to work alongside humans rather than remain isolated behind industrial barriers. This capability could make human-robot teamwork

more natural and productive. Applications are likely to expand across manufacturing, healthcare, agriculture, transportation, logistics, domestic assistance, and many other fields. At the same time, accuracy, safety, privacy, security, bias, and accountability must remain central considerations [1].

CONCLUSION

Image recognition is a foundational component of intelligent robotics. It has become one of the most important technologies shaping the development of modern robotics. It enables robots to identify objects, recognize people, interpret scenes, navigate environments, and interact intelligently with the physical world. It gives robots the ability to extract meaningful information from their visual surroundings and use that information to guide their actions.

The broader significance of image recognition is that it helps transform robots from machines that merely execute predetermined movements into systems that can perceive changing environments and adapt their actions accordingly. As computer vision, artificial intelligence, sensors, and robotic hardware continue to advance, image recognition is likely to remain a fundamental technology in the development of increasingly capable and autonomous robotic systems.

Image recognition transforms robots from blind actuators into perceptive machines capable of understanding and responding to their environment. The technology has matured from experimental research to production deployment across manufacturing, logistics, agriculture, and healthcare. The trajectory is clear: vision systems will become more capable, efficient, and ubiquitous. The technology works when implemented thoughtfully [11]. More information about images recognition in robotics can be found in the following related journals:

- *Robotica*
- *Robotics*
- *Robitics and Autonomous*
- *Robotics and Computer-Integrated Manufacturing,*
- *Advanced Robotics*
- *Autonomous Robots*
- *Automation in Construction*
- *Journal of Robotics*
- *Journal of Robotic Systems*
- *Journal of Robotic Surgery*
- *Journal of Robotics and Mechatronics*
- *Journal of Intelligent & Robotic Systems*
- *Journal of Mechanisms and Robotics-Transactions of the ASME*
- *Journal of Automation, Mobile Robotics and Intelligent Systems*
- *Journal of Future Robot Life*
- *IEEE Robotics and Automation Letters*
- *IEEE Transactions on Robotics*
- *International Journal of Robotics Research*
- *International Journal of Social Robotics*
- *International Journal of Humanoid Robotics*
- *International Journal of Advanced Robotic Systems*
- *Science Robotics*
- *Soft Robotics*
- Cognitive Robotics
- *Journalism*
- *Journalism and Media*

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] "Human–robot interaction," *Wikipedia,* the free encyclopedia https://en.wikipedia.org/wiki/Human–robot_interaction

[6] "Robotics," *Wikipedia*, the free encyclopedia https://en.wikipedia.org/wiki/Robotics

[7] M. N. O. Sadiku, U. C. Chukwu, A. Ajayi-Majebi, and S. M. Musa, "A primer on robotics," *International Journal of Trend in Scientific Research and Development,* vol. 6, no. 7, November-December 2022, pp. 614-621.

[8] A. Borchardt, "We can use robots but we still need journalists," September 2018, https://en.ejo.ch/comment/we-can-use-robots-but-we-still-need-journalists

[9] "Tesla's Optimus heads to Capitol Hill," March 2025, https://wallstreetpit.com/125503-teslas-optimus-heads-to-capitol-hill/#google_vignette

[10] "Computer vision in robotics: How robots are learning to see," May 2025, https://thinkrobotics.com/blogs/learn/computer-

vision-in-robotics-how-robots-are-learning-to-see

[11] "Image recognition for robots: 2026 vision tech guide," May 2026, https://aisuperior.com/image-recognition-for-robots/

[12] T. A. Tawiah, "A review of algorithms and techniques for image-based recognition and inference in mobile robotic systems," *International Journal of Advanced Robotic Systems,* vol. 17, no. 6, November 2020,

[13] "Image recognition in industrial robots: The future of manufacturing," August 2024, https://thesiliconreview.com/2024/08/image-recognition-in-industrial-robots-the-future-of-manufacturing

[14] "6 Applications for robotics in medicine," May 2025, https://arteantica.de/6-applications-for-robotics-in-medicine/

[15] Michealomis, "Image processing for robotics: Enabling advanced perception and control," January 2023, https://medium.com/@michealomis99/image-processing-for-robotics-enabling-advanced-perception-and-control-9151133b2dd7



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].

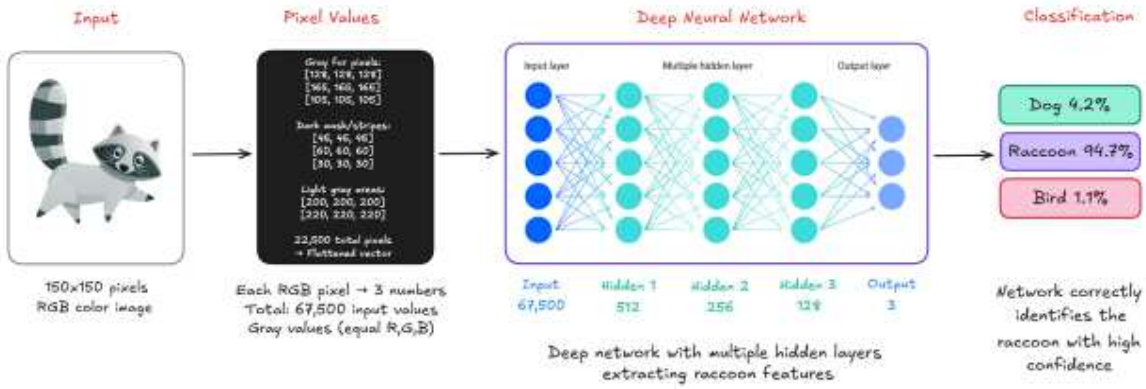


Figure 4 How image recognition works [4].



Figure 5 A cloud word for robots [8].



Figure 6 A typical robot [9].



Figure 7 A robot that is learning to see [10].



Figure 8 Use of robots in medicine [14].



Figure 9 A typical use of robots in manufacturing [15].

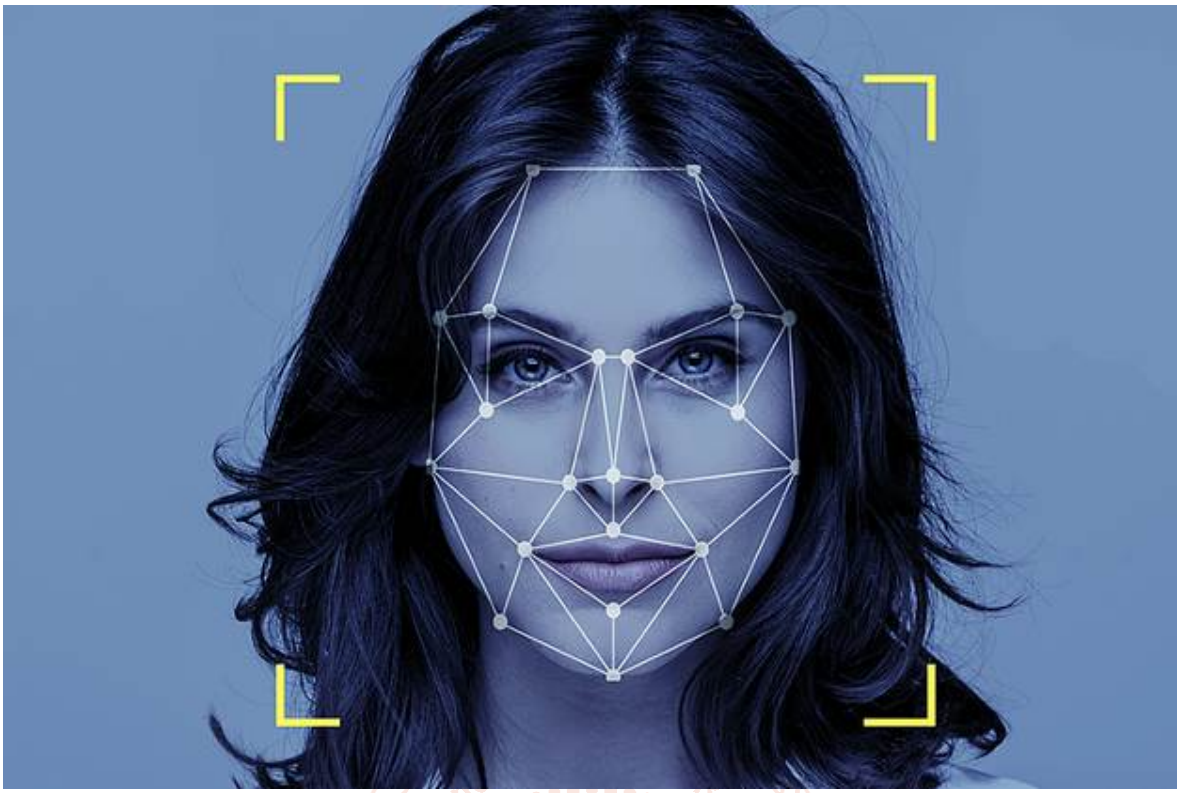


Figure 10 A typical face recognition [15].



Figure 11 A typical image restoration [15].