

A Comprehensive Review of Artificial Intelligence Techniques in Automation and Robotics

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Peer Review Information	Abstract
Type: Article Received: 12 April 2026 Revised: 03 May 2026 Accepted: 10 June 2026 Published: 05 July 2026	Artificial Intelligence (AI) has significantly transformed the domains of automation and robotics, enabling systems to perform complex tasks with minimal human intervention. This review paper presents a comprehensive analysis of recent research contributions in AI-driven automation and robotics, focusing on machine learning, deep learning, human-robot interaction, and industrial applications. The selected studies highlight advancements in autonomous systems, robotic vision, and intelligent decision-making. A comparative analysis is conducted to identify key methodologies, performance metrics, and limitations. Furthermore, this paper identifies critical research gaps such as ethical concerns, adaptability challenges, and workforce implications. The study concludes with insights into future trends, emphasizing the integration of AI technologies for achieving efficient, scalable, and intelligent robotic systems. Keywords: Artificial Intelligence; Automation; Robotics; Machine Learning; Deep Learning; Human-Robot Interaction

How to Cite This Article

Kadam, K., Kale, A., Pande, B., Kale, S., & Fegade, M. (2026). A comprehensive review of artificial intelligence techniques in automation and robotics. *Multidisciplinary Journal of Research in Engineering and Technology*, 13(2s), 289–291.

Introduction

Robots today can see, adapt, learn - intelligence reshapes their role in automation. Not just programmed tasks anymore; they respond on their own now. Machines once limited by fixed routines now handle unpredictable situations. Think smarter actions without constant human input guiding each step. Their growth comes from built-in awareness, picking up new skills over time. Functionality evolves thanks to real-time choices made inside the system itself. What used to be rigid operations now feels more like independent reasoning at work. Robots work fast in factories, hospitals, delivery networks, even farms. Machines now learn by doing, spotting patterns, seeing like humans - thanks to smarter software behind them. Research shows smart machines boost output while mistakes drop along with spending on daily tasks.

Even with progress, problems still pop up - ethics questions linger, jobs shift around, machines sometimes fail. Looking closely at many studies, this work pieces together how artificial intelligence shows up in automated systems and robots, pulling out patterns along the way, spotting what's tough now, where things might go next.

Literature Review

AI in robotics moving from automated to self-operating systems

Robots today act quite differently than they once did. Where fixed rules used to guide every move, now learning shapes behaviour. Learning happens through experience, shaped by interactions with surroundings. Decisions come not from scripts but from patterns found during operation. Intelligence enters via methods like training on data, or trial-and-error adjustment. These approaches let machines adapt without constant human direction. The shift marks a quiet turning point in how tasks are handled. Machines observe, react, adjust - on their own terms.

How People and Robots Connect in Everyday Settings

Communication between people and machines grows smoother when robots understand speech patterns, sometimes even sensing mood shifts. Though built differently, these systems learn through artificial intelligence methods that adjust responses based on how users react over time.

Machine learning in self-driving robots

This study looks at how machines learn to help robots move without human guidance. Because they rely on patterns, these systems adjust routes by spotting barriers ahead. Supervised methods train them using past examples, while rewards shape choices in uncertain spaces. Clustering groups have similar surroundings so decisions fit the context nearby.

Object Detection with Deep Learning for Robots

Robotic systems often rely on deep learning tools including CNNs, YOLO, and R-CNN to spot and identify objects. Accuracy jumps up when these methods handle jobs such as monitoring areas or checking products in factories. Real-time results get sharper too.

Robots and AI Changing How Things Work

This research looks into how artificial intelligence, machines that move, and automated systems affect businesses plus daily life. Productivity often rises when these technologies step in. Efficiency sees a boost too, though some roles may vanish. People must adjust their skills because change moves fast now. Thinking about fairness and right versus wrong becomes more urgent.

AI in robotics and automation enhances efficiency and quality

This study looks into artificial intelligence within factory operations. Robotics step in - lifting product standards while cutting down mistakes. Safety gets a boost too when machines take risky tasks. Workers need new skills though, since old roles shift with tech upgrades. Moving systems forward brings complications that can't be ignored.

Methodology

This review takes a close look using thoughtful examination. Its path moves through careful study built on observing details instead of counting them.

- Selection of relevant research papers related to AI in automation and robotics
- Sorting happens by where things get used - like seeing, talking, moving stuff around, or learning from data
- Comparative evaluation of techniques and outcomes
- Identification of research gaps and future trends

Discussion

It turns out AI is deeply involved in pushing automation and robotics forward. Efficiency grabs the spotlight in many research efforts, though precision and self-operation matter just as much. Robotic eyesight and choices often lean on machine learning, sometimes deep learning too. Progress here doesn't always follow straight paths - yet patterns emerge.

What stands out across the research? A shared focus on how machines taking over tasks can boost output while lightening workloads. Yet where they're used splits paths - one group digs factory-style automation, another explores robots in human-centered settings.

- Some questions still need answers
- Lack of robust ethical frameworks for AI systems
- Limited adaptability in dynamic environments
- High computational requirements for deep learning models
- Insufficient focus on human workforce transition

Few things beat how AI now links up with smart devices and massive datasets, shaping robots that think on their feet. Machines respond faster when learning blends into sensing, especially once patterns emerge from constant streams of real-world info.

Conclusion

This review takes a close look at how artificial intelligence works in automation and robots. Because of AI, machines now handle tough jobs much faster and make fewer mistakes. What stands out is their improved precision during demanding operations. Efficiency jumps when learning algorithms guide movement and decisions. Some methods adapt on the fly while others rely on preset patterns. Progress shows especially in real-world testing environments. One key point lies in how sensors combine with smart software. Results shift noticeably where human oversight fades into the background.

Still, worries about ethics, lost jobs, yet tangled setups need attention. Looking ahead, work ought to center on AI that people can understand, better teamwork between humans and machines, along with steady ways to blend automation into daily life.

Robots might soon think on their feet, thanks to smarter software behind the scenes. One day they could handle complex tasks without constant human oversight. Instead of just following orders, these machines may adapt in real time. Across factories, hospitals, even farms, changes are already creeping in slowly. Intelligence built into hardware opens doors once thought out of reach. Not everything works perfectly yet, but progress keeps moving forward.

References

1. Ravi Teja Yarlagadda, "Future of Robots, AI and Automation in the United States," International Engineering Journal for Research & Development, 2020.
2. Nazim Hussain and Greian April Pangilinan, "Robotics and Automation with Artificial Intelligence: Improving Efficiency and Quality," Aptisi Transactions on Technopreneurship(ATT), 2023.
3. Abu Rayhan , "Research Paper on AI in Robotics: From Automation to Autonomous Systems".
4. David Basin and Jurgen Dosereth Zurich And Torsten Lodderstedt, "Model Driven Security: From UML Models to Access Control Infrastructures
5. Nicola Leone, "The DLV system for knowledge representation and reasoning.