

TASK 4: Mini Project – Role of AI in Autonomous Robots

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Abstract

Artificial Intelligence (AI) is the driving force behind modern autonomous robots. This mini project explores how AI enables robots to perceive their surroundings, learn from data, make intelligent decisions, and operate independently without continuous human supervision.

Introduction

Autonomous robots are machines capable of performing tasks independently in dynamic environments. The integration of Artificial Intelligence has transformed traditional programmable robots into intelligent systems that can analyze situations, adapt to changes, and improve performance over time.

Role of AI in Robotics

AI provides robots with cognitive abilities such as perception, reasoning, learning, and decision-making. Machine learning algorithms allow robots to learn from experience. Computer vision enables robots to interpret visual data from cameras. Natural Language Processing supports human-robot communication, while SLAM helps robots navigate unknown environments.

Architecture of an AI-Based Autonomous Robot

The typical architecture includes sensors (cameras, LIDAR, GPS), data acquisition systems, processing units, AI algorithms, decision-making modules, and actuators. The workflow follows:

Environment → Sensors → Data Processing → AI Decision → Actuator Response.

Applications

AI-driven autonomous robots are used in self-driving vehicles, drones for surveillance and delivery, warehouse automation systems, smart manufacturing units, and healthcare service robots. These applications demonstrate how AI enhances efficiency, accuracy, and safety.

Advantages

AI enables adaptability, predictive maintenance, improved accuracy, real-time response, and reduced dependency on human operators. Autonomous systems can operate continuously and optimize performance based on data.

Challenges

Challenges include high computational requirements, complex algorithm training, safety assurance, ethical concerns, and regulatory compliance. Ensuring reliability in real-world environments remains a critical research area.

Future Scope

The future of AI in robotics includes edge AI for faster decision-making, collaborative robots working alongside humans, swarm robotics systems, and advanced humanoid robots capable of complex interactions. AI will continue to be the backbone of next-generation intelligent automation systems.

Conclusion

Artificial Intelligence has revolutionized autonomous robotics by enabling machines to think, learn, and act independently. As research progresses, AI-powered robots will become more efficient, intelligent, and integrated into everyday life, reshaping industries and redefining human-machine collaboration.