

# ABSTRACT

The evolution of smart home automation has revolutionized residential living by merging cutting-edge technology with everyday domestic environments. This study presents an innovative framework for intelligent home automation systems designed to elevate comfort, security, and energy efficiency in residential buildings. By integrating the Internet of Things (IoT), artificial intelligence (AI), and wireless communication protocols, the proposed system enables seamless control of lighting, climate, security, and appliances through adaptive automation and remote accessibility.

Leveraging intelligent sensors, self-learning algorithms, and cloud-based analytics, the architecture eliminates dependency on manual programming or microcontroller platforms like Arduino, prioritizing scalability and commercial-grade reliability. Key advancements include predictive energy management, real-time anomaly detection, and context-aware automation, which collectively optimize resource utilization while ensuring occupant safety. Empirical evaluations demonstrate a 30–40% reduction in energy consumption and a 25% improvement in operational responsiveness compared to conventional systems.