IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 5, March 2025

Advanced Computing for Energy Optimization: An Overview

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Abstract: *Efficient energy consumption is crucial in today's technological landscape. This paper presents an energy optimization system using the ESP32 Devkit V1, IoT, machine learning, and edge computing. The system collects real-time data via current, voltage, and temperature sensors, processes it locally for quick optimization, and uses machine learning to predict energy demand. Key features include adaptive control for appliances, cloud-based monitoring, integration with renewable energy, and an Energy Efficiency Index (EEI) for performance evaluation. By combining real-time IoT monitoring with predictive analytics, this system reduces energy waste, enhances efficiency, and supports sustainable energy management.*

Keywords: Energy Optimization, IoT, ESP32, Machine Learning, Edge Computing, Smart Energy Management, Renewable Energy Integration