

## Smart Disassembly of Waste Printed Circuit Boards: The Role of IoT and Edge Computing

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**Abstract :** The integration of the Internet of Things (IoT) and edge computing devices offers a transformative approach to electronic waste management, particularly in the dismantling of printed circuit boards (PCBs). This paper explores how these technologies optimize operational efficiency and improve environmental sustainability by addressing challenges such as data security, interoperability, scalability, and real-time data processing. Proposed solutions include advanced machine learning algorithms for predictive maintenance, robust encryption protocols, and scalable architectures that incorporate edge computing. Case studies from leading e-waste management facilities illustrate benefits such as improved material recovery efficiency, reduced environmental impact, improved worker safety, and optimized resource utilization. The findings highlight the potential of IoT and edge computing to revolutionize e-waste dismantling and make the case for a collaborative approach between policymakers, waste management professionals, and technology developers. This research provides important insights into the use of IoT and edge computing to make significant progress in the sustainable management of electronic waste

**Keywords :** internet of Things, edge computing, waste PCB disassembly, electronic waste management, data security, interoperability, machine learning, predictive maintenance, sustainable development

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