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HARDWARE AND SOFTWARE IMPLEMENTATION OF IMAGE SECURITY ALGORITHMS WITH AI–ML INTEGRATION: A COMPREHENSIVE SURVEY

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In the modern digital age, the transmission and storage of secure digital images are essential for digital communication networks, cloud computing, healthcare information systems, and the Internet of Things (IoT). Software-based encryption methods securely protect images with high computational efficiency and flexibility. Still, it can be slow due to operating system overhead, consume more power, and offer limited real-time performance. Hardware implementation with a software-developed algorithm provides FPGA acceleration to achieve higher throughput, lower latency, and improved resource efficiency in power consumption, area utilization, and processing speed, with AI-ML integrated security to better protect images, including automated Adaptive Encryption, smart authentication, and anomaly detection. In this paper, an extensive overview of recent developments in image security is made. The survey highlighting the convergence of FPGA acceleration with software intelligence and AI-driven security mechanisms represents a promising direction for next-generation image protection applications.