

# Edge-AI Machine Learning System for Intelligent Customer Face Monitoring Using Raspberry Pi

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**Abstract**— This study presents a novel embedded artificial intelligence (Edge-AI) framework designed for resource-constrained environments, enabling intelligent customer interaction and real-time content adaptation through personalized digital signage. Leveraging the computational capabilities of the Raspberry Pi and lightweight convolutional neural networks (TinyML), the system performs real-time demographic inference (e.g., gender, age group) entirely on-device. By integrating a dynamic QR-code-based feedback mechanism, the platform facilitates participatory user engagement and refinement of content delivery strategies. Through comprehensive evaluations—including latency benchmarks, classification accuracy, power efficiency, user response time, and QR feedback participation—the proposed system demonstrates feasibility for scalable deployment in retail environments, public facilities, educational campuses, and healthcare kiosks. The study advances the design principles of privacy-preserving, responsive, and autonomous digital signage platforms for next-generation human-AI interfaces.

**Keyword**— Blockchain, Metaverse, Cryptocurrency, Testing, Evaluation



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