



SCHOLARLY PUBLICATIONS

Centres of Innovation and Research (COIR)

KIIT Deemed to be University

Journal Name: IEEE Transactions on Consumer Electronics

IF: 9.9

Title: Federated Learning-Enabled Digital Twins for Privacy-Preserving Cardiovascular Disease Detection in Consumer Electronics

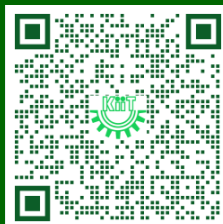
Author: Othman S.B.; Chakraborty C.; Singh S.; Frikha M.A.

Details: Volume 72, Issue2, May 2026

Abstract: Digital Twins (DTs) hold transformative potential for precision cardiology by enabling patient-specific modeling of coronary hemodynamics, electrophysiological dynamics, and myocardial mechanics through multi-modal data fusion. However, their clinical deployment is impeded by critical challenges: privacy vulnerabilities in centralized data aggregation, computational inefficiency of high-fidelity simulations, algorithmic bias across demographic cohorts, and lack of robustness in distributed environments. To address these limitations, we propose QuantumFedDT-CVD, a quantum-enhanced, federated learning-enabled digital twin framework for privacy-preserving cardiovascular disease detection using consumer-grade electronics. The framework enables decentralized training across edge and clinical systems, integrating real-time physiological signals with electronic health records, genomic profiles, and medical imaging, without exchanging raw patient data. At its core, QuantumFedDT-CVD employs physics-informed quantum-variational neural operators to model non-Markovian cardiovascular dynamics with $O(n \log n)$ spectral efficiency. Evaluated on the UK Biobank cohort augmented with real-world data from 500 CVD patients, QuantumFedDT-CVD achieves an AUC-ROC of 0.94 for early adverse event prediction and a Dice score of 0.92 for cardiac segmentation. It operates at 4.2×10^8 FLOPs/round, 0.8 MB/round communication overhead, and 550 J/round energy consumption under-differential privacy. The system scales to 200 institutions, tolerates up to 40% Byzantine clients, and demonstrates a measured quantum advantage factor of 3.8, paving the way for efficient, secure, and equitable remote cardiovascular monitoring.



URL: <https://ieeexplore.ieee.org/document/11259495>





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Journal Name: IEEE Transactions on Consumer Electronics

IF: 9.9

Title: A Lightweight Large-Model Security Framework for Consumer Electronics Based on Sentiment Analysis in Online Consumer Platforms

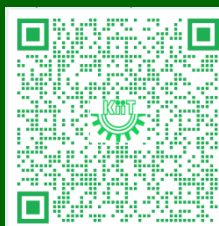
Author: Othman Xu P.; Zhao H.; Chakraborty C.; Guduri M.; Guo Z.; Tolba A.

Details: June, 2026

Abstract: With the widespread deployment of consumer electronics and online consumer platforms, user-generated reviews have become a key source of emotional information for consumer-facing intelligent services. Although large language models achieve strong sentiment analysis performance, their high computational cost limits practical deployment in resource-constrained consumer electronics environments requiring real-time responses and efficient resource utilization. To address this issue, this paper proposes a lightweight large-model security framework for consumer electronics based on sentiment analysis in online consumer platforms. The framework integrates the Low-Rank Adaptation (LoRA) technique into RoBERTa to construct a RoBERTa-LoRA model, enabling efficient fine-tuning with minimal additional parameters while preserving semantic representation capability. Based on this model, a lightweight framework, RoBERTaL, is developed to support real-time sentiment-aware security analysis in consumer-facing applications. Experimental results on a real-world product review dataset show that RoBERTa-LoRA achieves an accuracy of 81.2% with only 0.3M additional parameters, demonstrating improved computational efficiency, deployment feasibility, and effectiveness in mitigating AI-driven opinion manipulation in consumer electronics systems.



URL: <https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=30>





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Journal Name: IEEE Consumer Electronics Magazine

IF: 5.0

Title: Software Defined Network–Internet of Consumer Electronics for Intelligent Self-Powered Gas Sensor Monitoring

Author: Maity S.P.; Banerjee A.; Chakraborty C.; Singh S.

Details: Volume 15, Issue 4, July 2026

Abstract: Detection of harmful gases and their real-time monitoring in closed and open environments find applications such as safety in industrial settings, health monitoring, air quality tracking, etc. This article discusses the issue in the framework of an Internet of Consumer Electronics (IoCE). The model integrates Internet of Things (IoT)-based low-cost self-powered sensor deployment for gas sensing and software-defined network (SDN)-driven control, leading to SDN-IoCE. Reliable transmission of gas sensing data is essential and done through a reconfigurable intelligent surface-aided underlay cognitive radio network. Radio frequency energy harvesting is done for self-powering of sensor nodes. Two deep Q-networks are used, where the first one ensures seamless connectivity on gas sensing data transmission, while the other one performs its time-critical analysis. The proposed SDN-IoT architecture achieves 33-s- and 46-watt-lower values in delay/latency and energy consumption, respectively, over existing work.



URL: <https://ieeexplore.ieee.org/document/11229933>

