

AI-Enabled Security, Safety, Smart Infrastructure and Laboratory Automation

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Published Online: 30 September 2026.

Citation

T. Ganokratanaa, AI-enabled security, safety, smart infrastructure and laboratory automation, *Journal of Smart Sensors and Computing*, 2026, 2(3), 26215, <https://doi.org/10.64189/ssc.26215>.

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The *Journal of Smart Sensors and Computing*, Volume 2, Issue 3 (September 2026) presents four scholarly contributions addressing emerging challenges in smart sensing and intelligent computing. The issue brings together research spanning Edge AI and federated learning for smart-city engineering, multimodal biometric authentication, intelligent indoor air-quality and safety management, and AI-enhanced approach to hydrochloric acid detection. Together, these contributions demonstrate how intelligent computational techniques can be integrated with sensing, embedded systems, and data-driven analysis to develop efficient and practical solutions across different application domains.

Mariam Labib Francies presents a cross-domain review of Edge AI and federated learning in smart city engineering, examining their applications across transportation, environmental systems, and building infrastructure. The review synthesizes literature published between 2021 and early 2026 and develops a unified perspective based on computation locality and learning paradigms. It proposes a taxonomy covering cloud, fog, edge, and on-device computing alongside centralized, federated, and hybrid learning approaches. The review further presents a five-layer reference architecture and identifies important deployment challenges, including non-IID urban data, communication efficiency, model drift, privacy, fairness, and explainability. The study highlights the growing importance of distributed and privacy-conscious intelligence for next-generation smart-city systems.^[1] Ahmed Salman Ibraheem investigates multimodal biometric authentication using fingerprint and finger vein recognition through a framework based on frozen pre-trained convolutional neural network backbones and lightweight classifiers. The proposed approach combines features extracted using VGG16, ResNet50, and EfficientNet-B0 without fine-tuning the convolutional backbones. Principal Component Analysis is subsequently employed for dimensionality reduction, while Random Forest and K-Nearest Neighbour classifiers are used for biometric recognition. The multimodal framework achieves 98.88% overall accuracy with an equal error rate of 0.03%, while requiring approximately 156.2 ms per authentication request on CPU-based hardware. The work demonstrates the potential of combining complementary biometric modalities with computationally efficient feature-extraction strategies for resource-constrained authentication environments.^[2]

Khan et al. introduce a hybrid edge-AI framework for proactive indoor air quality management, integrating environmental

sensing, LSTM-based prediction, vision-assisted monitoring, offline voice intelligence, and active hazard mitigation within an embedded architecture. The system employs an on-device LSTM model for air-quality forecasting and incorporates multiple sensors together with visual verification to distinguish potential fire events from non-hazardous conditions. The reported experimental evaluation achieved a MAPE of 5.8% for IAQ prediction, with an inference latency of 32 ms, while the hardware safety mechanism demonstrated an 87 ms response for relay deactivation and intervention. The study illustrates how Edge AI can combine predictive environmental monitoring with real-time safety-oriented control in smart residential systems.^[3] Shanti Vunguturi explores the application of artificial intelligence to classical analytical chemistry through an AI-enhanced approach to hydrochloric acid detection. The study integrates automated data acquisition, preprocessing, curve fitting, regression, and anomaly detection to improve the identification of equivalence points during potentiometric titration. Using standard sodium hydroxide titrants, the proposed Python-based framework is designed to reduce subjectivity in manual endpoint determination while providing visualization and real-time analytical feedback. The work demonstrates how AI and computational automation can extend the capabilities of established laboratory techniques and support more reproducible analytical workflows.^[4]

In conclusion, Volume 2, Issue 3 reflects the increasingly interdisciplinary nature of smart sensing and intelligent computing research. From distributed intelligence in smart cities and multimodal biometric security to Edge-AI-enabled environmental safety and automated chemical analysis, the contributions demonstrate diverse ways in which computational intelligence can be integrated with sensing and real-world systems. Collectively, these studies emphasize the importance of developing intelligent, efficient, and application-oriented technologies capable of addressing emerging challenges across urban infrastructure, security, environmental monitoring, and scientific research.

Conflict of Interest

There is no conflict of interest.

Artificial Intelligence (AI) Use Disclosure

The author declare that artificial intelligence (AI)-assisted tools were used only for language refinement, grammar improvement. All technical content, experimental implementation, results, and interpretations were independently developed and verified by the author.

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