Deep Learning-Driven Systems for Gunshot Detection and Fire Alarm

AI system fuses microphones and air-quality sensors for edge-based gunshot/fire detection with high accuracy, low false alarms, and privacy protection.

Researchers at Purdue University developed a system that combines gunshot detection and fire alarm solutions into one by leveraging AI-driven technology. This system leverages the sensors disclosed as PRF # 2025-DAI-70843. This system identifies gunshots with high accuracy through new deep learning models trained with microphone and air quality data and running on edge computers and server-based algorithms. Unlike existing solutions, the invention uses both air quality sensors and microphone sensors, equipped within edge computers, to identify gunshots and does not require line-of-sight distance or supplementary lighting. This improves sensor accuracy by detecting gunshots in occluded spaces and reduces privacy risks, as it does not rely on additional cameras. Edge computers have the potential to expand this system to other compatible devices in schools through an IoT system. The server-based programs monitor the gunshot and air quality databases to detect gunshot events and fire alarms with high accuracy and low false alarms.

Technology Validation:

The training datasets of DL-2, a LSTM model that the researchers used to detect gunshots, are gunshot datasets, engine backfires, and false alarm datasets.

Advantages:

-Cost-effective

-Privacy-protecting

-Low false alarm

-High accuracy

Technology ID

2025-DAI-70881

Category

Artificial Intelligence & Machine Learning/Computer Vision & Image Recognition

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View online

-Multifunctional

Applications:

-School safety

-Fire department response time

-Firearm safety

TRL: 2

Intellectual Property:

Utility Patent, N/A, United States

Provisional-Patent, 2024-09-26, United States

Keywords: air quality sensors, Chemistry and Chemical Analysis, cloud servers, Deep Learning Models, edge computers, fire alarm, gunshot detection, Medical/Health, microphone sensors

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