Introduction

(*An automatic fire detection system based on deep convolutional neural networks for low-power, resource-constrained devices*)

Traditional fire detection systems are slow and prone to false alarms, while CNN-based models, though more accurate, are too resource-heavy for low-power devices; thus, there is a need for a real-time, efficient, and lightweight fire detection solution for practical deployment.

Title of the Paper:
An Automatic Fire Detection System Based on Deep Convolutional Neural Networks for Low-Power, Resource-Constrained Devices.

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Summary of the Problem Statement

Traditional fire detection systems, including smoke detectors, temperature sensors, and infrared alarms, struggle to detect fires quickly and accurately in large or outdoor environments due to high false-alarm rates, limited range, and inability to handle complex visual conditions like smoke or varying lighting. While CNN-based deep learning models improve detection accuracy, they typically require significant computational resources, making them unsuitable for low-power, resource-constrained devices such as IoT sensors, embedded boards, and drones. Consequently, there is a need for a real-time, accurate, and energy-efficient fire detection solution capable of operating effectively on lightweight devices in real-world conditions.

Objectives of the Project

1. To develop a deep learning–based fire detection model
2. To optimize the model for low-power, resource-constrained devices
3. To achieve real-time fire detection performance
4. To reduce false alarms in visually complex environments
5. To evaluate the system using real-world fire datasets
6. To create a deployable fire monitoring solution

Research Gap of the Paper

Deep learning fire detection systems are more accurate than traditional methods but are often too resource-intensive for low-power devices and are tested on limited datasets, failing to handle real-world complexities; therefore, a lightweight, real-time, and robust fire detection model for low-power devices is needed.