Narasaraopeta Engineering College (Autonomous)
Department Of Computer Science And Engineering
2025 - 2026

Batch Number	BB - 2
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Guide	M. Sampath Kumar (Assistant Professor)
Title	**YOLO-HF: A Compact System for Fire Detection and Alerting**
Domain / Technology	Deep Learning
Base Paper Link	https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=10985749
Dataset Link	https://github.com/PengBo0/Home-fire-dataset
Software Requirements	**Browser:** Any Latest Browser Like Chrome **Operating System:** Windows 7 Server Or Later **Python Environment:** Google Colab / Jupyter Notebook / VS Code **Libraries/Packages:** Ultralytics, Opencv, Numpy, Pandas, Matplotlib, Scikit-Learn, Requests.
Hardware Requirements	**System Type:** Intel Core I5 Or Above **RAM:** 8 GB **Number Of Cores:** 4 **Number Of Threads:** 4 **Storage:** 100 GB Free Disk Space **Internet:** Stable High-Speed Connection
Abstract	Early detection of fire and smoke is essential to reduce damage and save lives. Traditional sensor systems can be slow or produce false alarms in complex environments. We present **YOLO-HF**, a practical real-time detector built on the **YOLOv5s backbone** and enhanced with four modules — **Parametric Boosted Channel Attention (PBCA)**, **Space-toDepth (SPD)**, **CBPS (Conv+BN+PBCA+SiLU)**, and **RepNCSPELAN4** — to improve feature extraction and localization. The model was trained on a carefully curated set of 3,900 labeled images covering diverse real-world fire and smoke scenarios, with preprocessing steps including label verification, bounding-box density checks, corrupted-image removal, and format standardization. YOLO-HF attains mAP@0.5 = 92.3%, precision = 93.7%, and recall = 91.4% on held-out test data, outperforming the baseline YOLOv5s in both accuracy and robustness. We deployed the model in a lightweight pipeline using a mobile camera feed; when a fire is detected, the system captures a frame, sends it by **email**, and triggers an **automated phone call** via the Twilio API to alert responders. This responsive hybrid solution is suitable for smart homes, industrial sites, and forest monitoring where fast, reliable alerts can improve emergency response and reduce risk.

Signature of the student(s) **Signature of the Guide** **Signature of the project coordinator**