AISaksham

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FIRE DETECTION SYSTEM

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Abstract

- This abstract proposes an AI-based fire detection system designed to detect the presence of fire in images. The system utilizes YOLO model for image analysis tasks.
- Data collection involves gathering a comprehensive dataset of fire-related images, while model training entails training a YOLO using this dataset to learn the characteristics of fire. Once trained, the model can be deployed for inference, where it analyzes incoming images frames in real-time to detect the presence of fire.
- the proposed AI-based fire detection system represents a promising approach to enhancing fire safety measures With further research and development, such systems have the potential to make significant contributions to fire prevention and mitigation efforts.

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Problem Statement

- Develop an AI-based fire detection system using Python to enhance fire safety measures in various environments, including buildings, forests, and industrial sites.
- The system should leverage computer vision techniques to accurately identify and localize fires in images or video streams in real-time or near real-time scenarios.
- The aim is to create a proactive solution that enables early detection of fires, facilitating prompt response and mitigation efforts to minimize damage and save lives.

Aim and Objective

- Therefore, the primary objective of the AI fire detection project is to pioneer the development of advanced technologies that improve the effectiveness and efficiency of fire detection and suppression processes in environments where traditional methods may be inadequate or impractical.
- This entails designing and implementing intelligent systems capable of early detection of fires, swift and accurate identification of their location to facilitate safe evacuation and firefighting operations.
- By addressing these challenges, the project aims to enhance overall fire safety and reduce the potential impact of fire incidents on life, property, and the environment.

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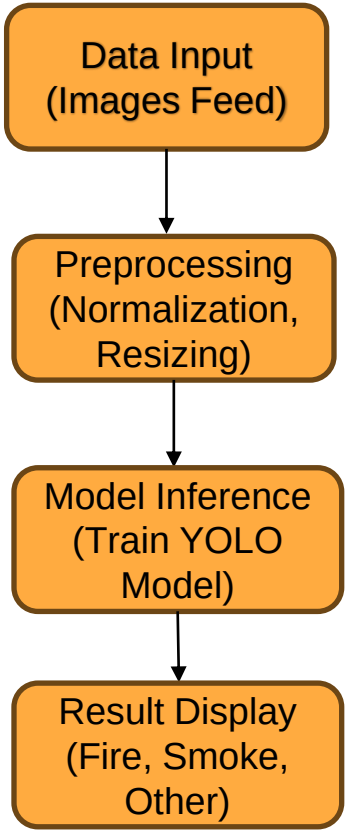
Proposed Solution

- **Gather Dataset**: Collect a diverse set of images containing fires in various environments and conditions
- **Annotation**: Annotate the collected dataset with bounding boxes around the fire regions.
- **Model Configuration**: Configure the model parameters such as input size, anchor boxes, and the number of classes
- **Environment Setup**: Set up the training environment with necessary libraries (e.g., PyTorch, OpenCV, YOLO implementation).
- **Training Process**: Train the YOLO model on the annotated fire dataset. Splitting the dataset into training and validation sets. Monitoring the training process for overfitting or underfitting.
- **Implementation**: Implement the trained YOLO model for inference on new images or video feeds.
- **Visualization**: Visualize the detected fire regions using bounding boxes on the input images or frames from the video.
- **Performance Optimization**: Optimize the model for real-time performance, ensuring low latency and high throughput.

System Architecture



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System Deployment Approach

- In model training **PYTORCH** and **TENSORFLOW** will be use.
- **OPENCV** is use in image processing whereas ,
- **YOLO** is use in image detection and last but not least .
- **GRADIO** is use in web interface.

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Algorithm & Deployment

Data Collection
Gather a comprehensive dataset of fire and non-fire images/videos for model training.

Model Training
Train deep learning models to accurately classify fire-related visual signatures.

Real-time Inference
Deploy the trained models to the camera network for continuous fire detection and alert generation.

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Conclusion

- The AI fire detection project represent a crucial step forward in addressing the limitations of traditional fire detection and suppression methods.

- By leveraging cutting-edge AI technologies, the project aims to enhance the effectiveness and efficiency of fire safety measures in various environments, including large industrial facilities, public buildings, and remote locations.

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Future Scope

- The future of AI fire detection looks bright, with lots of exciting possibilities to make fire safety even better.
- We can work on making fire detection systems more accurate and reliable by improving the technology they use.
- Also, we can make these systems work better in different places, like big buildings or remote areas.
- All these ideas show that there's a lot of potential for making fire safety better with AI in the future.

Project Title

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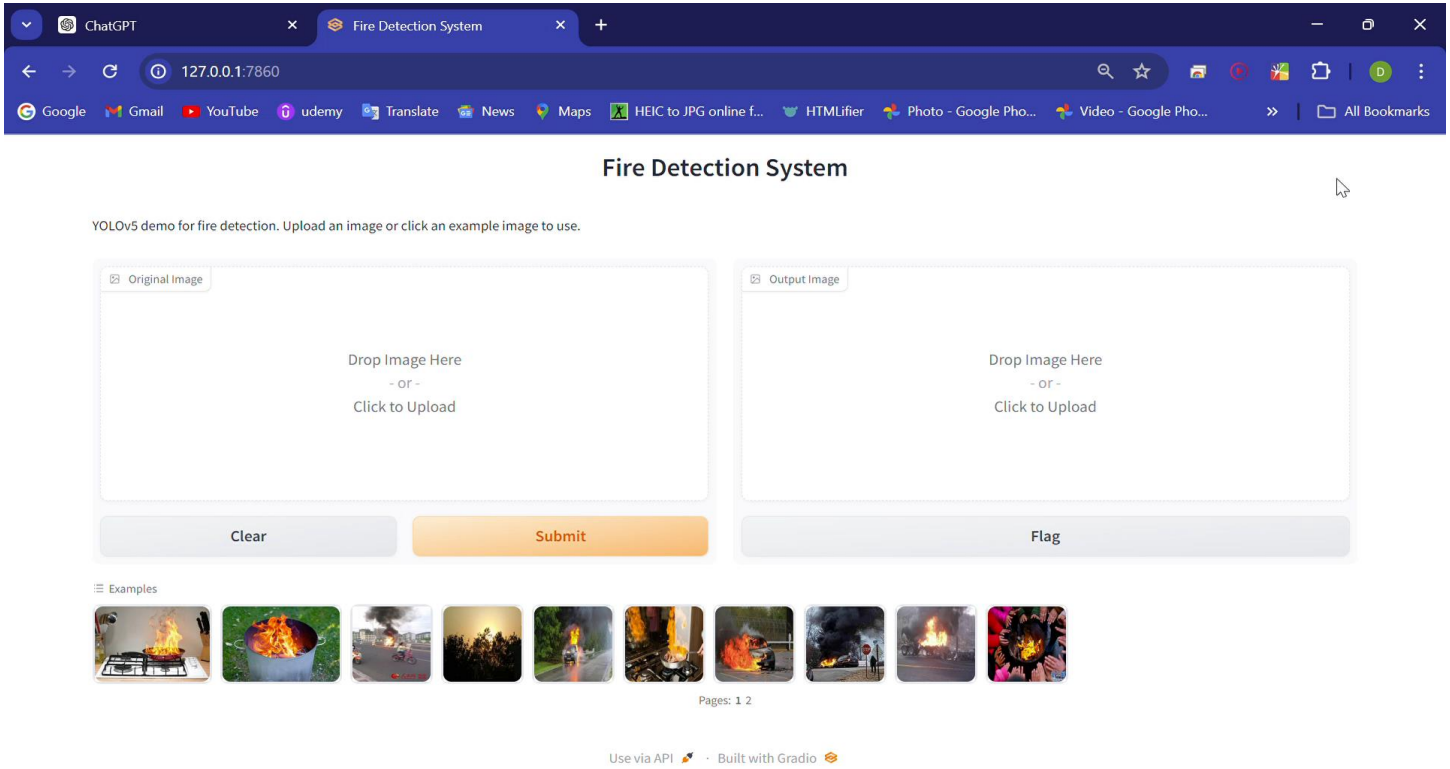

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Reference

https://medium.com/@KaziMushfiq1234/fire-detection-with-python-computer-vision-e55c8fc6fa54

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Thank you!