**Early Detection of Fire in Videos using Computer Vision and Deep Learning**

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***ABSTRACT***

Early detection of fire is a must to prevent the dangerous accidents it could cause. Traditional fire detection systems use hardwares like sensors to detect the presence of fire. A more automated approach is provided with the use of Deep learning and Machine learning. This study talks about using Convolutional Neural Networks with a large dataset. This dataset helps in reducing the false positives, false negatives and provides a more accurate classification. Fog, weather, climate, sunrise, sunset, wildfire, and non-fire images are collected and combined. This is done so that fog is not confused with smoke and all orangish-red colored objects are not misinterpreted as fire. Image augmentation is performed to increase the size of the dataset and to make it more versatile. Videos from CCTV footage are split into frames and processed for fire. These frames are fed into the trained CNN model which achieved an accuracy of 0.94. If any of the frames show a slight presence of fire, then the alert of fire is raised. This real-time immediate detection of fire will prevent the fire's spread and help in extinguishing it as soon as possible. The user interface developed has options for processing both videos and images. Once this is done, attributes of sound waves such as airflow, decibels, frequency, and distances are used to predict if fire can be extinguished or not. Machine learning models are trained using a labeled dataset with all these features. The Decision Tree classifier showed the highest accuracy of 0.97 for the above. So by using these techniques, fire detection and prediction of its extinction is made easier, and more efficient.

**Keywords:** Convolutional Neural Networks, Computer Vision,Early Fire Detection, Image Processing, Improved dataset.