Department of Electrical and Computer Engineering
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Senior Design Project -CSE499A

Fire and Smoke Detection Using YoloV8

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Related Work:

An Efficient Deep Learning Algorithm for Fire and Smoke Detection with Limited Data

Detecting smoke and fire from visual scenes is a demanding task, due to the high variance of the color and texture. A number of smoke and fire image classification approaches have been proposed to overcome this problem; however, most of them rely on either rule-based methods or on handcrafted features. We propose a novel deep convolutional neural network algorithm to achieve high-accuracy fire and smoke image detection. Instead of using traditional rectified linear units or tangent functions, we use adaptive piecewise linear units in the hidden layers of the network. We also have created a new small dataset of fire and smoke images to train and evaluate our model. To solve the overfitting problem caused by training the network on a limited dataset, we improve the number of available training images using traditional data augmentation techniques and generative adversarial networks. Experimental results show that the proposed approach achieves high accuracy and a high detection rate, as well as a very low rate of false alarms.

2.2

Forest fire and smoke detection using deep learning-based learning without forgetting

In this study, we implement transfer learning on pre-trained models such as VGG16, InceptionV3, and Xception, which allow us to work with a smaller dataset and lessen the computational complexity without degrading accuracy. Of all the models, Xception excelled with 98.72% accuracy. We tested the performance of the proposed models with and without LwF. Without LwF, among all the proposed models, Xception gave an accuracy of 79.23% on a new task (BowFire dataset). While using LwF, Xception gave an accuracy of 91.41% for the BowFire dataset and 96.89% for the original dataset. We find that fine-tuning the new task with LwF performed comparatively well on the original dataset.

2.3 A Study on a Complex Flame and Smoke Detection Method Using Computer Vision Detection and Convolutional Neural Network

The smoke detection results were similar, and in the model presented in this study, the accuracy was 93.0%, precision was 93.9%, and detection rate and F1 score

were 92.0% and 92.9%, respectively. In the case of SSD, the accuracy was 85.0% and Faster R-CNN was 89.0%,