CSCE 5222: Feature Engineering

Project Proposal

Title : WildFire Detection System

Team Members :

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Project Proposal :

[3] This project is an attempt to detect the presence or initiation of a forest fire in an image using convolutional neural networks (CNN). The concept is that this model might be used to detect a ‘fire’ or ‘no fire’ in a forest using (aerial) surveillance data. We will make the CNN model similar to inceptionV3 from scratch. The model might be applied in real-time to low-framerate surveillance video and provide fire alerts. [3]

Idea Description :

Our network will be trained on the dataset that will contain roughly 1000 photos divided into three categories: 'fire,'and ‘no fire’.The majority of the images depict forest or forest-like landscapes. Images will be labeled as 'fire' that have visible flames. Finally, we will label the images "no fire" taken in the woods. We used Keras' data augmentation routines to conduct a series of random changes on photos before feeding them to the network in order to train a network that generalizes well to new images.

Motivation :

[4] The two massive devastating fire years of 2019 and 2020 have captivated the world's attention. The Amazon rainforest was also destroyed by fire in 2019, resulting in acres of burned land. Similarly, a blaze in Australia caused one of the most devastating fires in history. Wildfires generate a tremendous amount of CO2 and greenhouse gases, which raises global temperatures. The particles from the fires go a long way and pollute the air. This endeavour will be undertaken in order to safeguard the world from such a tragedy. [4]

Significance :

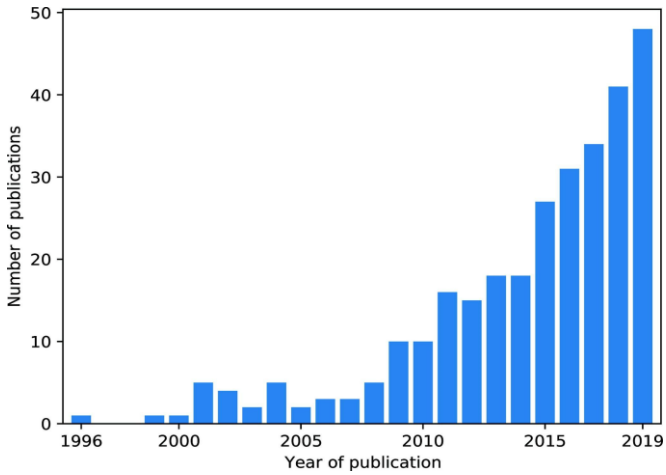
[2] Completing the project will benefit wildlife animals and species. Also, scientists that are conducting research on connected topics. It also aids forest security authorities in their efforts to protect the environment. According to numerous United Nations reports, wildfires have had an impact on climate change. Wildfires are expected to become more common as global temperatures rise, and they have a significant impact on climate change. Perhaps such a Wildfire detection system will assist them in reducing the risk associated with such a strategy. [2]

Literature Survey :

[1] We used the key words "wildfire" or "wildland fire" or "forest fire" or "bushfire" in combination with "machine learning" or "random forest" or "decision trees" or "regression trees" or "support vector machine" or "maximum entropy" or "neural network" or "deep learning" or "reinforcement learning" in the Google Scholar and Scopus databases to conduct a literature search.We also got papers from references noted within publications retrieved using the above mentioned literature databases. [1]

[1] We found few publications relevant to the issue of machine learning applications in wildfire science and management after conducting our literature search. After identifying papers for examination, we used the following criteria to eliminate publications that were irrelevant or inappropriate: [1]

- Conference submissions where a journal publication covering the same work was available and conference posters
- Articles where the technique and findings were not adequately described to undertake a study assessment.
- Research that did not present novel methodology or results
- Articles that were not available to us via open access or subscription.



Objectives :

Our goal is to build a CNN model with numerous layers and then try to train it on our dataset. We want to experiment with different layers and see how they turn out. Our main goal is to raise deep Learning knowledge among wildfire researchers and managers, as well as to demonstrate the wide spectrum of challenges in wildfire science that ML data scientists can tackle.

Features :

We'll try to identify the optimal filters for recognizing specific objects and patterns, such as fire edges, colors, and smoke in video feeds. To begin, we'll separate each of our VIDEO frames into images, which we'll then input to our custom model, which will recognize those image patterns.

Expected Outcome :

We want to build a machine learning model that is able to detect "fire" and "no-fire". Our outcomes are “fire” and “no-fire”.

References :

[1] A review of machine learning applications in wildfire science and management by Piyush Jain, Sean C.P. Coogan, Sriram Ganapathi Subramanian, Mark Crowley, Steve Taylor, and Mike D. Flannigan

[2] A Survey of Machine Learning Algorithms Based Forest Fires Prediction and Detection Systems by Faroudja Abid

[3] Automatic Wildfire Smoke Detection Using Deep Learning by Aristana Scourtas

[4] Role of Machine Learning Algorithms in Forest Fire Management by Muhammad Arif, Khloud K Alghamdi, Salma A Sahel, Samar O Alosaimi, Mashael E Alsahaft, Maram A Alharthi and Maryam Arif