Ideation Phase
Define the Problem Statements

Date	19 September 2022
Team ID	PNT2022TMID13815
Project Name	Emerging Methods for Early Detection of Forest Fire
Maximum Marks	2 Marks

PROBLEM STATEMENT AND PROJECT FLOW

COMPUTER VISION:

Computer vision is a process by which we can understand the images and videos how they are stored and how we can manipulate and retrieve data from them. Computer Vision is the base or mostly used for Artificial Intelligence. Computer-Vision is playing a major role in self-driving cars, robotics as well as in photo correction apps.

INPUT:

We need to get a video based input by using Open CV then we need to identify and Estimate the forest fire in the video uploaded.

An User interface is created using flask either web application or Android application are applicable.

Techniques used:

- Computational photography (photo, video, superres)
- Machine learning & clustering (ml, flann)
- CUDA acceleration (gpu)

DATA COLLECTION:

Data collection is the procedure of collecting, measuring and analyzing accurate insights for research using standard validated techniques.

A researcher can evaluate their hypothesis on the basis of collected data. In most cases, data collection is the primary and most important step for research, irrespective of the field of research. The approach of data collection is different for different fields of study, depending on the required information.

Dataset link: https://www.kaggle.com/arbethi/forest-fire?select=Dataset

This dataset is taken from the Kaggle where it has train and test image modules on both Fire and no Fire classes to make a perfectly balanced data package for both training and testing purpose.

IMAGE PREPROCESSING:

Pre-processing is a common name for operations with images at the lowest level of abstraction — both input and output are intensity images. These iconic images are of the same kind as the original data captured by the sensor, with an intensity image usually represented by a matrix of image function values (brightnesses). The aim of pre-processing is an improvement of the image data that suppresses unwilling distortions or enhances some image features important for further processing, although geometric transformations of images (e.g. rotation, scaling, translation) are classified among pre-processing methods here since similar techniques are used.

Applying ImageDataGenerator on trainset and test set:

- Image data augmentation is used to expand the training dataset in order to improve the performance and ability of the model to generalize.
- Image data augmentation is supported in the Keras deep learning library via the *ImageDataGenerator* class.
- How to use shift, flip, brightness, and zoom image data augmentation.

MODEL CREATION:

Deep learning is an increasingly popular subset of machine learning. Deep learning models are built using neural networks. A neural network takes in inputs, which are then processed in hidden layers using weights that are adjusted during training. Then the model spits out a prediction. The weights are adjusted to find patterns in order to make better predictions. The user does not need to specify what patterns to look for — the neural network learns on its own.

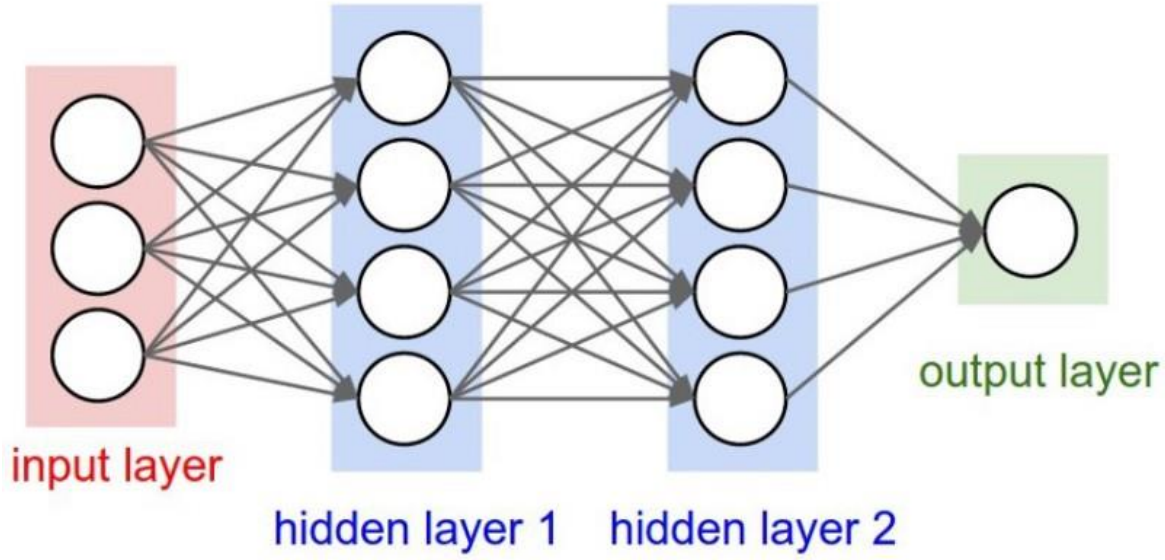

Figure:1 Deep learning Model

CNN LAYERS:

There are three types of layers that make up the CNN which are the convolutional layers, pooling layers, and fully-connected (FC) layers. When these layers are stacked, a CNN architecture will be formed. In addition to these three layers, there are two more important parameters which are the dropout layer and the activation function

- Convolutional Layer
- Pooling Layer
- Fully Connected Layer
- DropOut
- Activation Fuctions

HIDDEN LAYERS:

Hidden layer(s) are the secret sauce of your network. They allow you to model complex data thanks to their nodes/neurons. They are “hidden” because the true values of their nodes are unknown in the training dataset. In fact, we only know the input and output.

SAVING THE MODEL:

Then we need to save the moden in binary .h5 File format so that it can be called while developing the web application using flask or through Computer Vision.

VIDEO STREAMING AND ALERTING:

OPENCV:

OpenCV is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human. When it integrated with various libraries, such as NumPy, python is capable of processing the OpenCV array structure for analysis. To Identify image pattern and its various features we use vector space and perform mathematical operations on these features.

Creating Twilio Account:

Login to your account at www.twilio.com/console. Click the Account drop-down menu to the right of your account name. Select View all accounts, or click on the Twilio logo to access the Accounts Summary. Click the Create New Account button to start the account creation flow.

Twilio API to send alert messages:

Twilio's Programmable SMS API helps you add robust messaging capabilities to your applications. Using this REST API, you can send and receive SMS messages, track the delivery of sent messages, Schedule SMS messages to send at a later time, and retrieve and modify message history.