A PROJECT REPORT ON

EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRE

Domain: ARITIFICIAL INTELLIGENCE

Team ID: PNT2022TMID22350

Team Members:

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1. INTRODUCTION

1.1 PROJECT OVERVIEW

Forest fires are a major environmental issue, creating economic and ecological damage while endangering human lives. There are typically about 100,000 wildfires in the United States every year. Over 9 million acres of land have been destroyed due to treacherous wildfires. It is difficult to predict and detect Forest Fire in a sparsely populated forest area and it is more difficult if the prediction is done using ground-based methods like Camera or Video-Based approach. Satellites can be an important source of data prior to and also during the Fire due to its reliability and efficiency. The various real-time forest fire detection and prediction approaches, with the goal of informing the local fire authorities

1.2 PURPOSE

Forest fires have become a major threat around the world, causing many negative impacts on human habitats and forest ecosystems. Climatic changes and the greenhouse effect are some of the consequences of such destruction. A higher percentage of forest fires occur due to human activities .The goal of the project is to develop a forest fire detection system that can identify forest fires in their early phases.

The main goal of the project

1. We can find forest fire early to avoid vulnerability and upcoming disaster.
2. Early Warning system to alert the officers and people to save lot of lives.
3. It is real time detection of forest fire.
4. To get most value accuracy.

2. LITERATURE SURVEY

2.1 Existing Problem

Every year, there are an estimated340,000 premature deaths from respiratory and cardiovascular issues attributed to wildfire smoke. The increasing frequency and severity of wildfires pose a growing threat to biodiversity globally. Individuals, companies and public authorities bear great economic costs due to fires. In order to reduce all these, we need to detect the forest fire at an early stage and prevent it

2.2 References

- Torquay Celik , Huseyin Ozkaramanl, and Hassan Demirel (2007). Fire and Smoke detection without Sensors: Image Processing based approach.15th European signal processing conference (eusipco 2007), Poznan, Poland, September 3-7.
- S. A. Christopher, M. Wang, T. A. Berendes, and R. M. Welch (1998). The 1985 biomass burning season in South America: Satellite remote sensing of fires, smoke, and regional radiative energy budgets, vol. 37, 661– 678

- Paulo Vinicius Koerich Borges (2010). A Probabilistic Approach for VisionBased Fire Detection in Videos, IEEE transactions on circuits and systems for video technology, vol. 20, no. 5.
- Jiawei Han, Micheline Kamber, Jian Pei (2012). Data Mining Concepts and Techniques, Third edition, 248-253, 350-351.
- Official webpage of the European Forest Fire Information System at: http://effis.jrc.ec.europa.eu/
- Jesús San-Miguel-Ayanz, Tracy Durrant, Roberto Boca, Giorgio Libertà, Alfredo Branco, Daniele de Rigo, Davide Ferrari, Pieralberto Maianti, Tomàs Artés Vivancos, Hugo Costa, Fabio Lana, Peter Löffler, Daniel Nuijten, Anders Christofer Ahlgren, Thaïs Leray; Forest Fires in Europe, Middle East and North Africa 2017.

EUR 29318 EN, ISBN 978-92-79-92831-4, doi: 10.2760/663443

- Chen, Thou-Ho, et al. "The smoke detection for early fire- alarming system base on video processing." Intelligent

Information Hiding and Multimedia Signal Processing, 2006. IIH- MSP'06.

International Conference on. IEEE, 2006.

Noda, S., and K. Ueda. "Fire detection in tunnels using an image processing

method." Vehicle Navigation and Inform

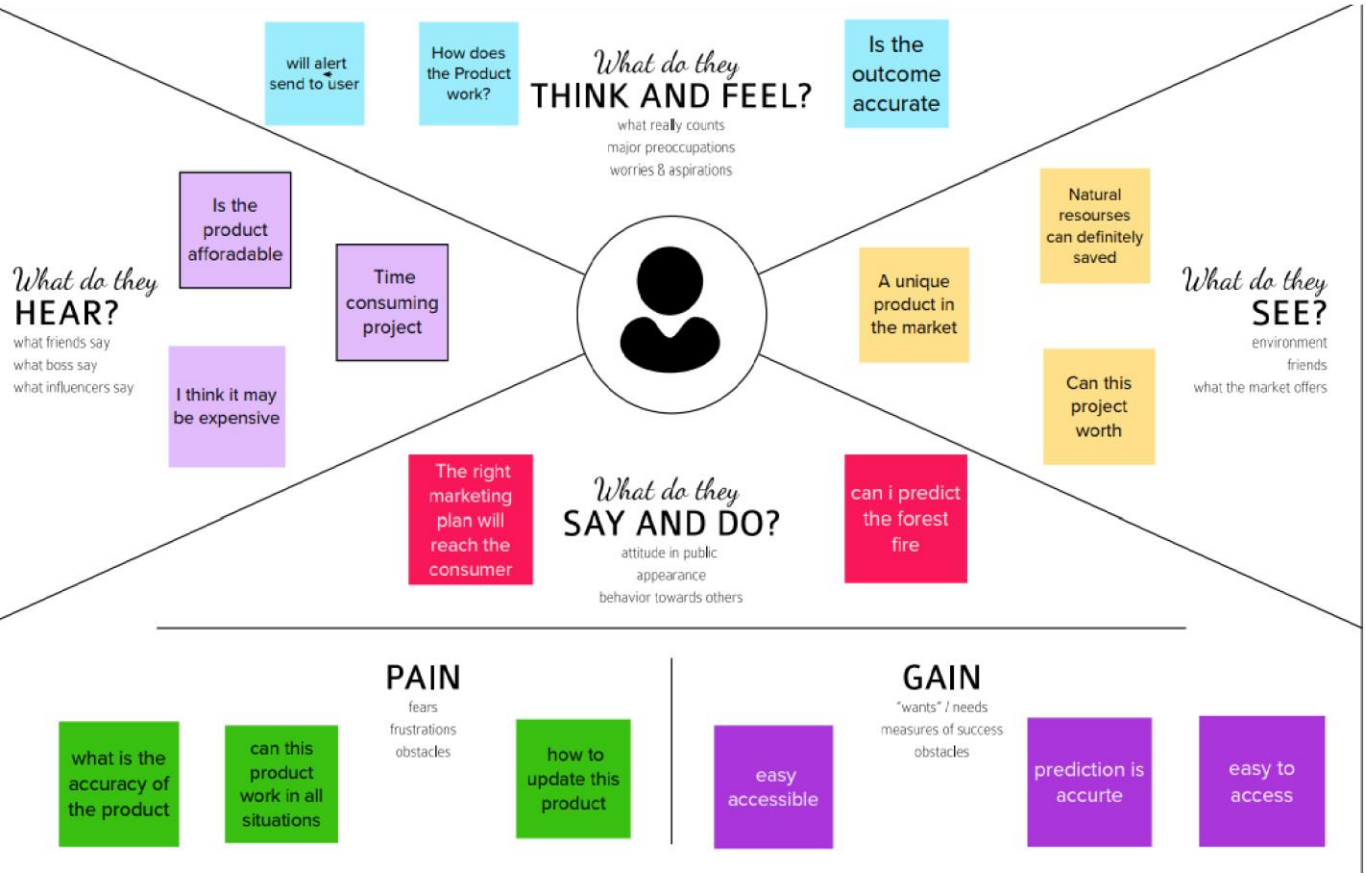
2.3 Problem Statement Definition

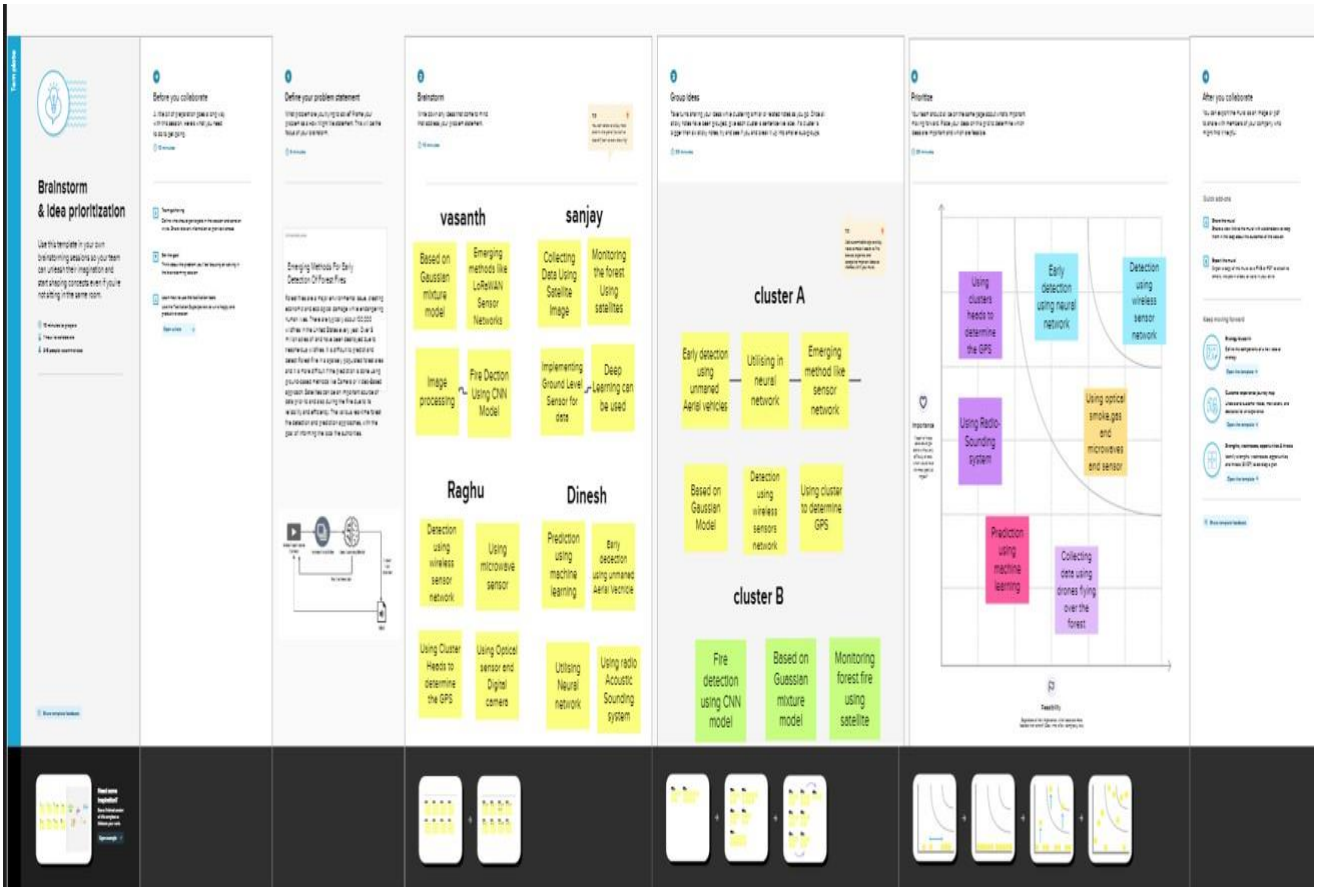
- In the past, fires were detected by watching towers or using satellite images.
- Satellites collect images of fires and send them to a monitoring authority for review. If the images 6 appear to show a fire, the authority will determine whether The fire is burning or not.
- But this approach was slow because the fire may have spread in the large areas and caused a lot of damage before the rescue team arrived.
- Since it's impossible to place a man in every part of a forest, it's important to have monitoring devices in certain areas so we can keep an eye on the forest.
- Both watching towers and satellite images failed to detect the presence of a fire early on, which resulted in more damage being done by the fire.
- Predictive analytics based on these insights are becoming increasingly effective in detecting mitigating and preventing fires.

3. IDEATION AND PROPOSED SOLUTION 3.1

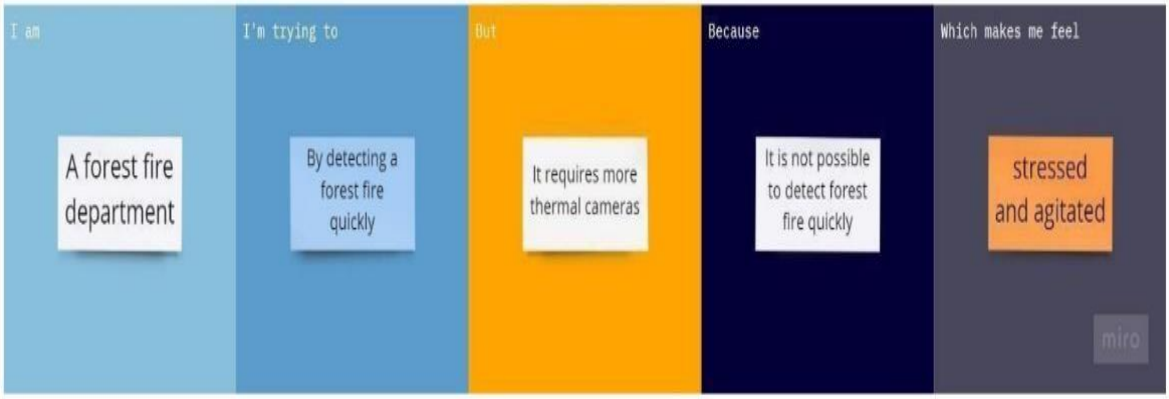
Empathy Map Canvas

3.2 Ideation and Brainstorming





3.3 Proposed Solution



S/no	Parameter	Description
O	Problem Statement (Problem to be solved)	A forest fire risk prediction algorithm, based on support vector machines, is presented. The algorithm depends on previous weather conditions in order to predict the fire hazard level of a day
O	Idea / Solution description	Use computer vision methods for recognition and detection of smoke or fire, based on the still images or the video input from the drone camera

O	Novelty / Uniqueness	Real time computer program detect forest fire in earliest before it spread to larger area.
O	Impact on society	Blocked roads and railway lines, electricity, mobile and land telephone lines cut, destruction of homes and industry
O	Business Model (Revenue Model)	The proposed method was implemented using the Python programming language on a Core i3 or greater (CPU and 4GB RAM.)
O	Scalability of the Solution	Changes in the use or occupancy of a building can result in compliance issues and a fire alarm system that no longer provides sufficient protection. If future changes are anticipated, fire safety engineers can design a fire alarm system with this in mind, providing a flexible infrastructure that includes the proper wire size and additional circuits distributed in a way that accommodates future growth and change can trigger potentially very expensive alterations in a fire alarm system.

3.4 Problem Solution Fit

Define CS, fit into CC

1. CUSTOMER SEGMENT(S)

CS

Forest guard

6. CUSTOMER CONSTRAINTS

Spending more money for the equipments, network connection for the devices, power supply interruptions, occurrence of damages sometimes these limitations the customers choices of solutions .

5. AVAILABLE SOLUTIONS

Alarm system for indication of five, remote sensing based methods such as satellites, high -resolution static cameras fixed on the ground, unmanned aerial vehicles.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS

J&P

Always clear the area around the workspace.

The area should be even larger if it is windy and dry.

Making sure that to never operate equipment that produces sparks near dry vegetation.

9. PROBLEM ROOT CAUSE

RC

The fire is mainly caused by lightning, increased temperature, human activities and other reasons .

Human caused fires result from campfires, equipment use and malfunction, negligently discarded cigarettes, etc..

7. BEHAVIOUR

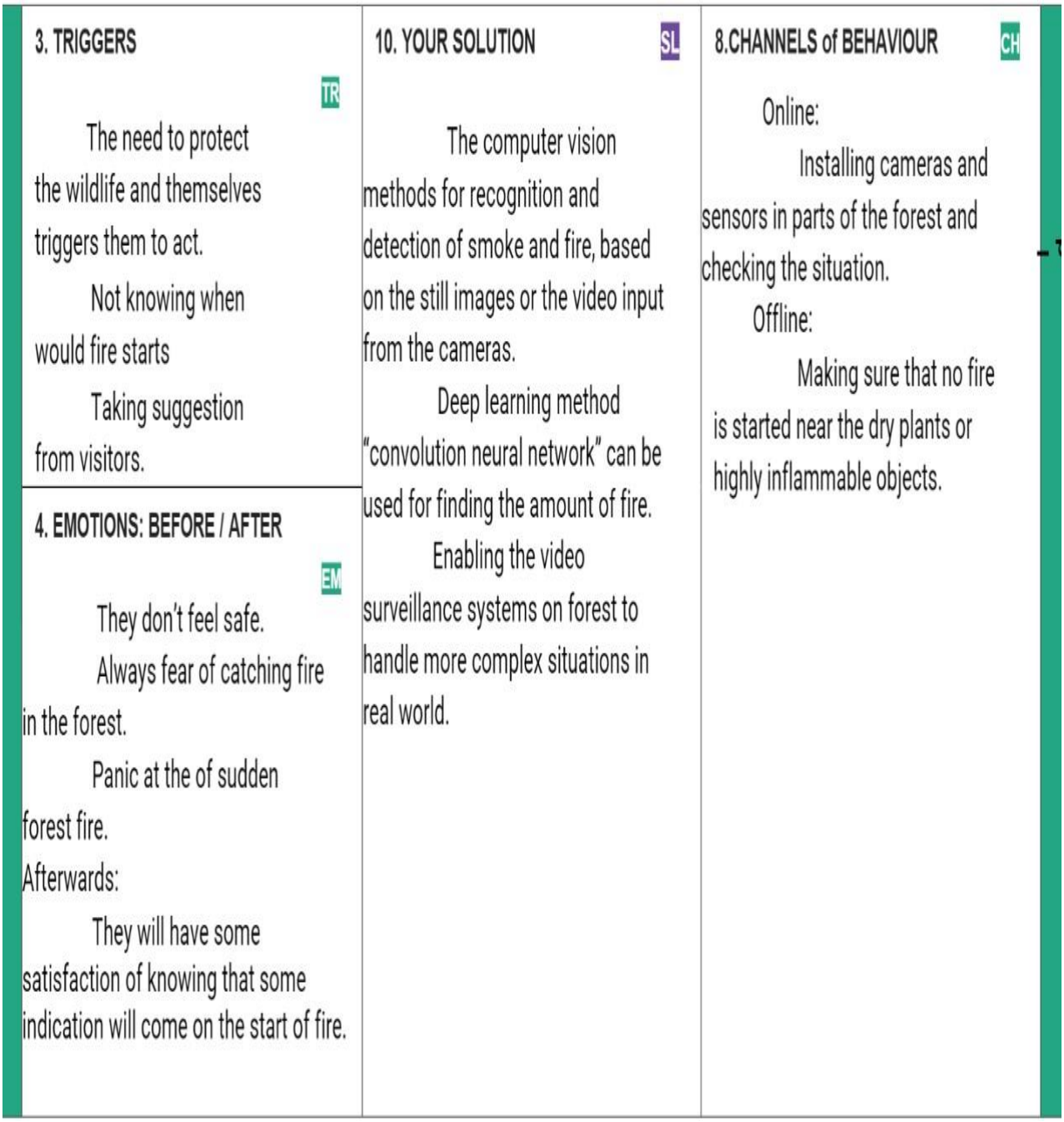
BE

They to monitor the forest areas themselves, often checking whether the camp fire are put off properly.

Always having fire fighting tools always ready.

Monitoring the temperature in the forest.

Focus on J&P, tap into BE, understand RC



4. REQUIREMENT ANALYSIS

4.1 Functional Requirements

Following are the functional requirements of the proposed solution

FR NO	FUCTION REQUIREMENT(EPIC)	SUB REQUIRMENT
✞	Video surveillance start	Start surveillance through remote control
✞	Forest monitoring	Continuous monitoring through camera
✞	Detect fire	Fire is detected through CNN ,odel
✞	Alert	Alert the forest officials through message

4.2 NON- FUNCTIONAL REQUIREMENTS

Following are the non-functional requirement of the proposed solution.

FR no	FUCTION REQUIREMENT(EPIC)	SUB REQUIRMENT
✞	Reliability	Model is safe to install
✞	Security	more secure environment
✞	Availability	Build model is available all the time
✞	performance	Model will achieve high accuracy

4.3 SYSTEM REQUIREMENTS:

The hardware requirements may serve as the basis for contract for the implementation of the system and should therefore be a complete engineer a the starting point for thE system design.

Ram : 8GB Ram or more

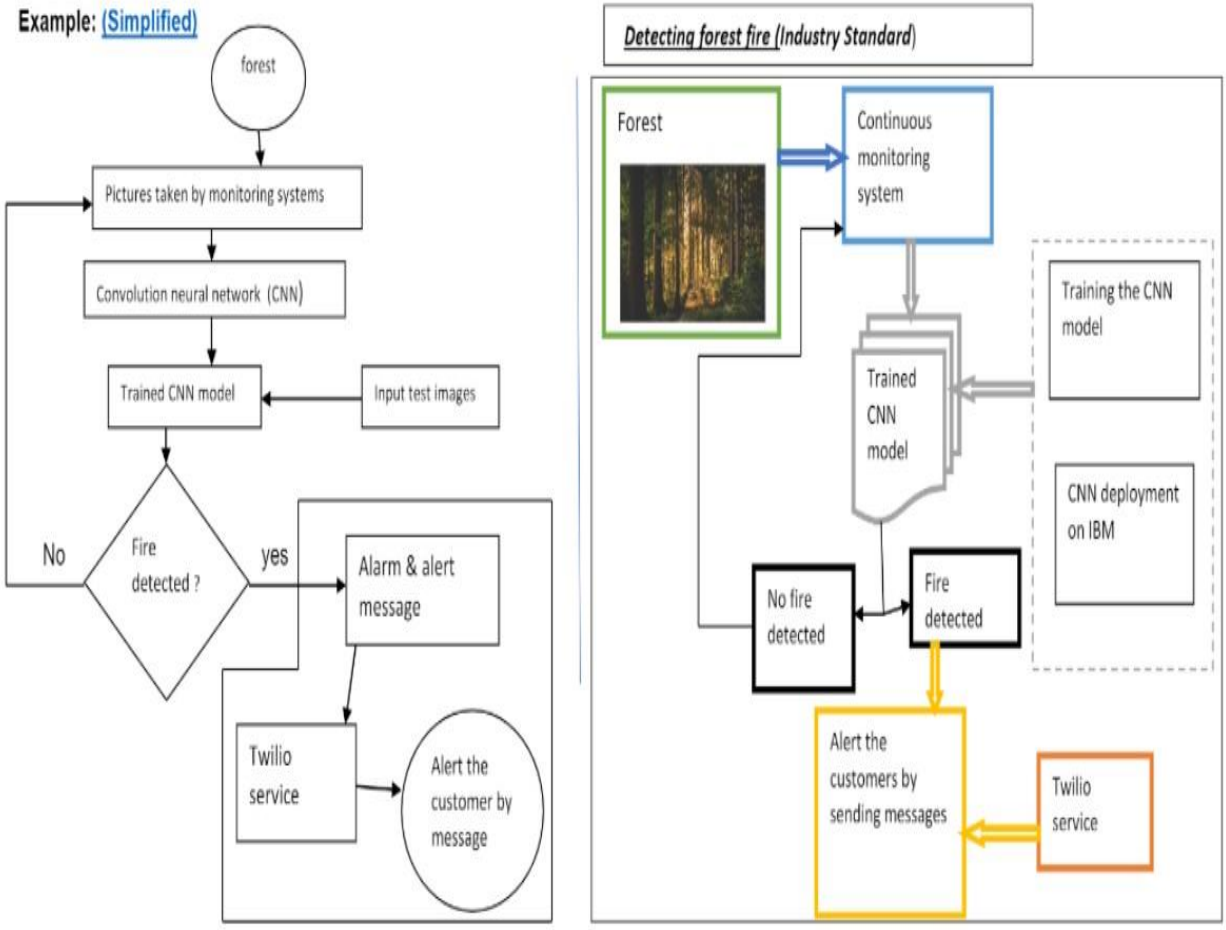
Processor : Any Processor

GPU : 8GB or more

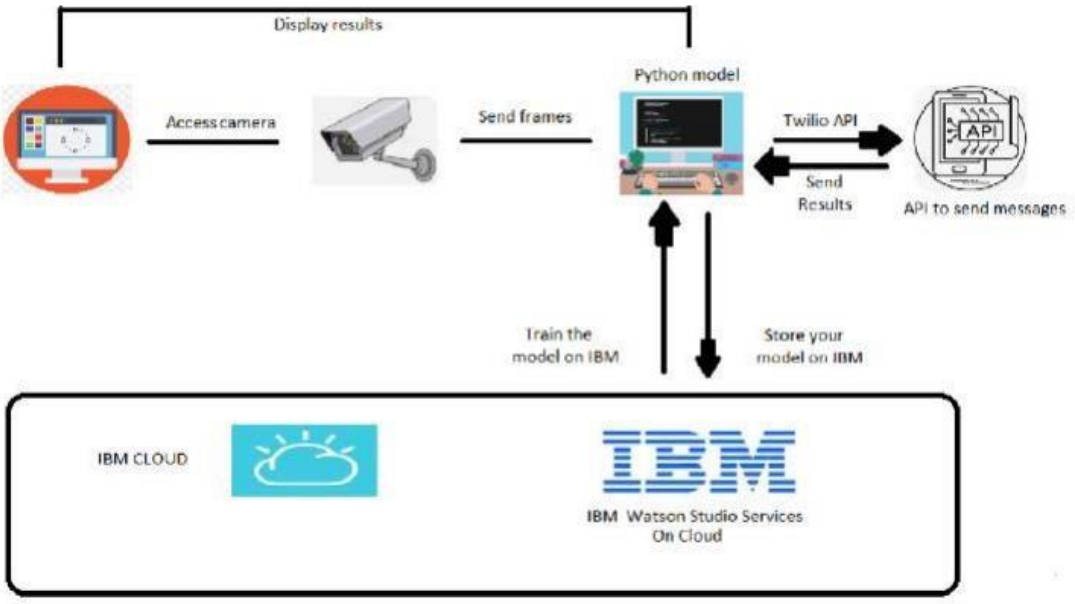
Hard Disk : 10GB or more

Speed : 1.4GHZ or more

5. PROJECT DESIGN 5.1Data Flow Diagrams



5.2 Solution & Technical Architecture:



:

5.3 User Stories:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Developer	Registration	USN-1	As a user, I can sign up and register respective sites to access the required details and data. And import the required libraries for the processes.	I can access the account / dashboard	High	Sprint-1
Assistant developer	Login	USN-2	As a user, I will access the page and test and train the CNN model to predict or detect the forest fire.	I can test and confirm the error free detections	High	Sprint-2
Customer Care Executive	Worker	USN-3	As a customer care executive ,i am available to the customers .so if the customers have any issues or in need of any assistance they will get help and solve them.	I can be in contact with the customers.	medium	Sprint 3
Customer (Web user)	Login	USN-4	As a user , i will have the access to know about the activities in the forest.	I can get messages when there is fire in the forest	High	Sprint-4

6.PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members

Sprint1	registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	10	high	Dinesh kumar c
Sprint2		USN-2	As a user, I can register for the application through g mail , linked in	10	high	Vasanth s
Sprint3	login	USN-2	As a user ,I can login by using valid user name and password.	20	high	Sanjaykumar s
			As a user ,I can view the garbage storage level.	20	high	Raghu rajagopal k
			Blynk Server is responsible for all the communications between the smart phone and hardware.	20	high	Raghu rajagopal k

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint).

Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

7. CODING AND SOLUTION

7.1 Feature 1

- Language used: Python
- Tools/IDE: Google Co lab

In [107…

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

Data Collection

In [108…

```
!unzip '/content/drive/MyDrive/archive.zip'
```

```
Archive:  /content/drive/MyDrive/archive.zip
replace Dataset/Dataset/test_set/forest/0.48007200_1530881924_final_forest.jpg? [y]es, [n]o, [A]ll, [N]one, [r]ename:
```

Image Pre-processing

In [109…

```
from keras.preprocessing.image import ImageDataGenerator
train_datagen = ImageDataGenerator(rescale=1./255,
                                   shear_range=0.2,
                                   rotation_range=180,
                                   zoom_range=0.2,
                                   horizontal_flip=True)
test_datagen = ImageDataGenerator(rescale=1./255)
train = train_datagen.flow_from_directory('/content/Dataset/Dataset/test_set',
                                          target_size=(128,128),
                                          batch_size=32,
                                          class_mode='binary')
test = train_datagen.flow_from_directory('/content/Dataset/Dataset/train_set',
                                          target_size=(128,128),
                                          batch_size=32,
                                          class_mode='binary')
```

```
Found 121 images belonging to 2 classes.
Found 436 images belonging to 2 classes.
```

Sprint 2

In [110…

```
#Model Building
from keras.models import Sequential
from keras.layers import Convolution2D,MaxPooling2D,Dense,Flatten
import warnings
warnings.filterwarnings('ignore')
```

In [111...

```
#Initializing the model and adding CNN and Dense layers
model = Sequential()
model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())
model.add(Dense(units=256,activation='relu'))
model.add(Dense(units=1,activation='sigmoid'))
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d (Conv2D)              (None, 126, 126, 32)      896

max_pooling2d (MaxPooling2D  (None, 63, 63, 32)        0
)

flatten (Flatten)            (None, 127008)            0

dense (Dense)                (None, 256)               32514304

dense_1 (Dense)              (None, 1)                 257

=================================================================
Total params: 32,515,457
Trainable params: 32,515,457
Non-trainable params: 0
_________________________________________________________________
```

In [112...

```
# Compiling the Model
model.compile(optimizer='adam',loss='binary_crossentropy',metrics=['accuracy','mse'])
```

In [113...

```
#Training the model
y = model.fit_generator(train,steps_per_epoch=14,epochs=15,validation_data=test,validation_steps=4)
```

```
Epoch 1/15
```

```
14/14 [==============================] - 27s 1s/step - loss: 4.0799 - accuracy: 0.5537 - mse: 0.3706 - val_loss: 6.6469 - val_accuracy: 0.6562 - val_ms
e: 0.3400
```

In [114...

```
#Saving the model
model.save('ffd_model.h5')
```

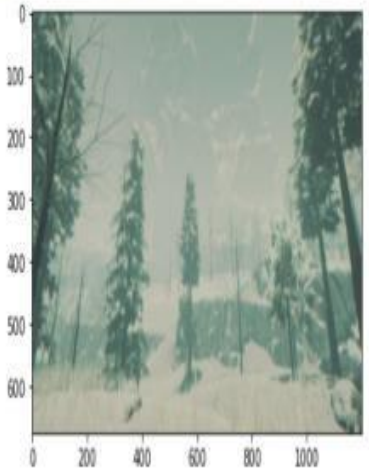
In [116...

```
#Testing the model
from keras.models import load_model
import cv2
import numpy as np
from PIL import Image
from keras.utils import img_to_array
model = load_model('/content/ffd_model.h5')
def prediction(img_path):
    i = cv2.imread(img_path)
    i = cv2.cvtColor(i, cv2.COLOR_BGR2RGB)
    img = Image.open(img_path)
    img = img.resize((128,128))
    x = img_to_array(img)
    x = np.expand_dims(x,axis=0)
    pred = model.predict(x)
    plt.imshow(i)
    print("%s"%("FOREST FIRE DETECTED! SMS SENT!" if pred==[[1.]] else "NO FOREST FIRE DETECTED"))
```

In [117...

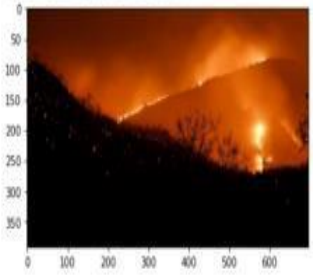
```
prediction(r'/content/Dataset/Dataset/test_set/forest/1200px_Mountainarea.jpg')
```

```
1/1 [==============================] - 0s 182ms/step
NO FOREST FIRE DETECTED
```



In [118...
```
prediction(r'/content/Dataset/Dataset/test_set/with fire/Fire_2_696x392.jpg')
```

```
1/1 [==============================] - 0s 61ms/step
FOREST FIRE DETECTED! SMS SENT!
```



Model Deployment in IBM Cloud

In [119...
```
#Converting .h5 to tar format
!tar -zcvf forest_fire_detection.tgz ffd_model.h5
```

```
ffd_model.h5
```

In [ ]:
```
!pip install watson-machine-learning-client
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: watson-machine-learning-client in /usr/local/lib/python3.7/dist-packages (1.0.391)
Requirement already satisfied: lomond in /usr/local/lib/python3.7/dist-packages (from watson-machine-learning-client) (0.3.3)
Requirement already satisfied: urllib3 in /usr/local/lib/python3.7/dist-packages (from watson-machine-learning-client) (1.26.12)
Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-packages (from watson-machine-learning-client) (2.28.1)
Requirement already satisfied: tqdm in /usr/local/lib/python3.7/dist-packages (from watson-machine-learning-client) (4.64.1)
```

7.2 Feature 2

Model Deployment in IBM Cloud

In [119...
```
#Converting .h5 to tar format
!tar -zcvf forest_fire_detection.tgz ffd_model.h5
```

```
ffd_model.h5
```

In [ ]:
```
!pip install watson-machine-learning-client
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: watson-machine-learning-client in /usr/local/lib/python3.7/dist-packages (1.0.391)
Requirement already satisfied: lomond in /usr/local/lib/python3.7/dist-packages (from watson-machine-learning-client) (0.3.3)
Requirement already satisfied: urllib3 in /usr/local/lib/python3.7/dist-packages (from watson-machine-learning-client) (1.26.12)
Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-packages (from watson-machine-learning-client) (2.28.1)
```

```
Successfully installed docutils-0.15.2 ibm-cos-sdk-2.7.0 ibm-cos-sdk-core-2.7.0 ibm-cos-sdk-s3transfer-2.7.0 ibm-watson-machine-learning-1.0.257
```

In [ ]:
```
#Connecting to IBM Cloud from Notebook
from ibm_watson_machine_learning import APIClient
credentials = {
    'url':'https://us-south.ml.cloud.ibm.com',
    'apikey':"hwPqBMWeHLVUWozQrsfBOwqAZUlLPITGwY4gNKcMBpVF"
}
Client = APIClient(credentials)
```

```
Python 3.7 and 3.8 frameworks are deprecated and will be removed in a future release. Use Python 3.9 framework instead.
```

In [ ]:
```
Client
```

Out[ ]:

In [ ]:
```
Client.spaces.get_details()
```

Out[ ]:
```
{'resources': [{'entity': {'description': '',
    'name': 'forest fires',
    'scope': {'bss_account_id': '29b20e18cb82499ca758899f43447824'},
    'stage': {'production': False},
    'status': {'state': 'active'},
    'storage': {'properties': {'bucket_name': '0bc342a6-1621-4eeb-ba26-b44087ff24d6',
      'bucket_region': 'us-south',
      'credentials': {'admin': {'access key id': 'e6abbbbf7099406aa52ed55a4701c60f',
```

In [ ]:
```
Client.spaces.list()
```

```
Note: 'limit' is not provided. Only first 50 records will be displayed if the number of records exceed 50
------------------------------------  --------------------  ------------------------
ID                                    NAME                  CREATED
33e29996-acf0-40b6-8882-c6a1506201c7  forest fires project  2022-11-30T14:58:43.819Z
1efdc4c1-392d-4714-89f6-6db05f965f7a  forest fires          2022-11-30T14:56:08.672Z
------------------------------------  --------------------  ------------------------
```

In [ ]:
```
space_uid = '33e29996-acf0-40b6-8882-c6a1506201c7' #Space User ID
space_uid
```

Out[ ]:
```
'33e29996-acf0-40b6-8882-c6a1506201c7'
```

In [ ]:
```
#Setting created deployment space as default
Client.set.default_space(space_uid)
```

Out[ ]:
```
'SUCCESS'
```

In [ ]:
```
#Seeing tensorflow asset_id
Client.software_specifications.list()
```

```
In [ ]: software_space_uid = Client.software_specifications.get_uid_by_name('tensorflow_rt22.1-py3.9')
        software_space_uid

Out[ ]: 'acd9c798-6974-5d2f-a657-ce06e986df4d'

In [ ]: model_details = Client.repository.store_model(model="/content/forest_fire_detection.tgz",meta_props={
            Client.repository.ModelMetaNames.NAME:"forest fires project",
            Client.repository.ModelMetaNames.TYPE:"tensorflow_2.7",
            Client.repository.ModelMetaNames.SOFTWARE_SPEC_UID:software_space_uid
        })

In [ ]: model_details

Out[ ]: {'entity': {'hybrid_pipeline_software_specs': [],
          'software_spec': {'id': 'acd9c798-6974-5d2f-a657-ce06e986df4d',
           'name': 'tensorflow_rt22.1-py3.9'},
          'type': 'tensorflow_2.7'},
         'metadata': {'created_at': '2022-11-11T07:11:08.554Z',
          'id': 'cd777ca7-c414-4c5d-9fe2-6c9828275c1b',
          'modified_at': '2022-11-11T07:11:30.184Z',
          'name': 'forest fires project',
          'owner': 'IBMid-665002KXQR',
          'resource_key': '2bea2454-f5f8-49d9-b224-07068c1dd165',
          'space_id': '33e29996-acf0-4066-8882-c6a1506201c7'},
         'system': {'warnings': []}}

In [ ]: model_id = Client.repository.get_model_uid(model_details)
        model_id

Out[ ]: 'cd777ca7-c414-4c5d-9fe2-6c9828275c1b'

In [ ]: #Downloading the model from IBM Cloud
        Client.repository.download(model_id,'ffd_model.tgz')

        Successfully saved model content to file: 'ffd_model.tgz'
Out[ ]: '/content/ffd_model.tgz'

In [ ]: !pip install twilio

        Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
        Collecting twilio
          Downloading twilio-7.15.2-py2.py3-none-any.whl (1.4 MB)
             |████████████████████████████████| 1.4 MB 8.8 MB/s
        Requirement already satisfied: pytz in /usr/local/lib/python3.7/dist-packages (from twilio) (2022.6)
        Collecting PyJWT<3.0.0,>=2.0.0
          Downloading PyJWT-2.6.0-py3-none-any.whl (20 kB)
        Requirement already satisfied: requests>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from twilio) (2.28.1)
        Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (2.10)
        Requirement already satisfied: urllib3<1.27,>=1.21.1 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (1.26.12)
        Requirement already satisfied: charset-normalizer<3,>=2 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (2.1.1)
        Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (2022.9.24)
        Installing collected packages: PyJWT, twilio
        Successfully installed PyJWT-2.6.0 twilio-7.15.2

        Video Analysis

In [86]: pip install twilio

        Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
        Requirement already satisfied: twilio in /usr/local/lib/python3.7/dist-packages (7.15.2)
        Requirement already satisfied: requests>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from twilio) (2.28.1)
        Requirement already satisfied: pytz in /usr/local/lib/python3.7/dist-packages (from twilio) (2022.6)
        Requirement already satisfied: PyJWT<3.0.0,>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from twilio) (2.6.0)
        Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (2022.9.24)
        Requirement already satisfied: charset-normalizer<3,>=2 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (2.1.1)
        Requirement already satisfied: urllib3<1.27,>=1.21.1 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (1.26.12)
        Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (2.10)
```

8. TESTING

8.1 Test Cases

A test case might be created as an automated script to verify the functionality per the original acceptance criteria. After doing manual exploratory testing, QA testers might suggest other

functionality be added to the application as well as updated test cases be incorporated in the automated test suit

TEST CASE ED	FEATURE TYPE	COMPONENT	TEST SCENARIO
SMS NOTIFICATION	Twilio SMS Notification	Python	Verify if user is able to receive SMS when forest fire is detected in the video processed by the model
DEPLOYMENT TC	Website Deloyment	Azure	Website built using HTML and designed using CSS is deployed using Microsoft Azure
FRONT END AND BACKEND TC	Website Functionality	Home page (client)	Verify if front-end and backend are well connected and the results are as expected

Table.8.2. Test Report

STEPS TO EXECUTE	TEST DATA	RESULT	EXECUTED BY
1. Execute script with intended video file to check. 2. Check if the results are expected. 3. Note the results	User should receive SMS Notification	PASS	SANJAYKUMAR S
1. Deploy repository on Azure 2. Check if the website is live. 3. Note the result	Website should be live in the given URL	PASS	SANJAYKUMAR S. RAGHU RAJAGOPAL.K
1. Upload an image to the website to check the model's working 2. Check if the results are as expected. 3. Note the results.	We should get expected detection results for the uploaded image	PASS	RAGHU RAJAGOPAL.K

8.2 User Acceptance Testing Test Scenario

Predict the Output.

Description: To predict the output for the given input video or image.

Test Step: Model: 1. Choose Video file or use default video or use webcam input.

2. Execute the program.

3. If fire detected user receives SMS alert and console also displays and sounds an alert.

Website: 1. Choose Image file as input.

2. Click upload .

3. Website shows the result – ‘Positive’ or ‘Negative’ . Expected Result :

Should display the exact prediction.

Actual Result: As Expected.

Status: PASS.

9.RESULTS

Performance Metrics The Depicting Accuracy graph shows the Training and Validation Accuracy along the Epochs (x-axis) and Accuracy (y-axis)

the Epochs (x-axis) and Accuracy (y-axis).

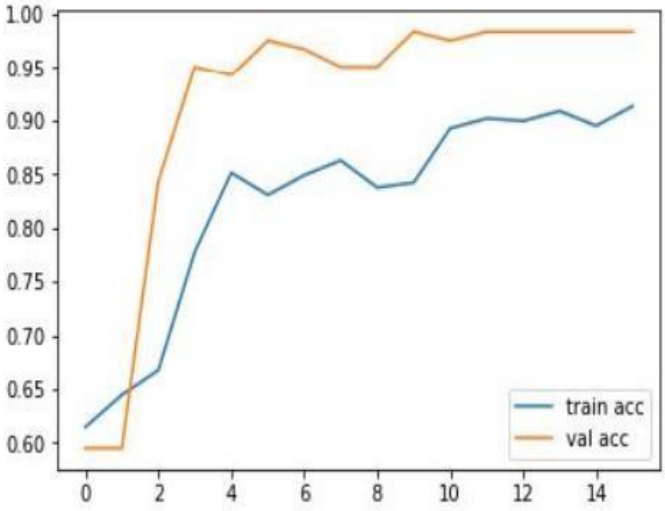


Figure - 9.1.1: Plot Depicting Accuracy

The Depicting Loss graph shows the Training and Validation Loss along the Epochs (x-axis) and Loss (y-axis).

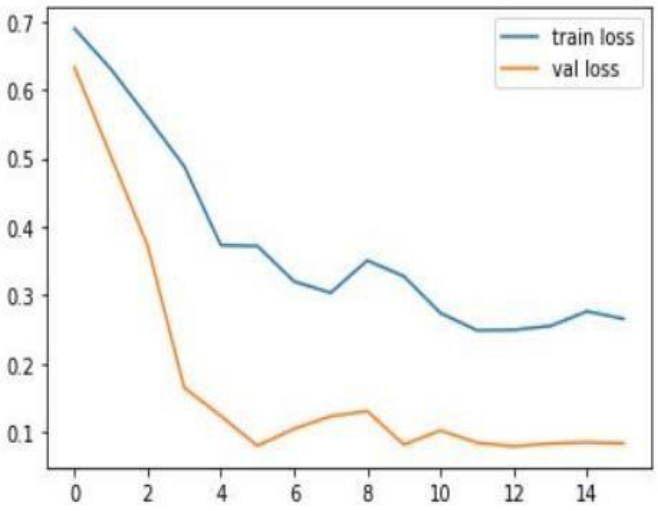


Figure - 9.1.2: Plot Depicting Loss

ADVANTAGES AND DISADVANTAGES ADVANTAGES

- This project helps forest officers and fire fighters to respond quickly to the forest fire so that they can handle it in its earlier phases.

- This project can be scaled to a large area easily given that there are a few basic requirements fulfilled. - The detection accuracy obtained in this project is much better as compared to the existing methodologies used. It can produce significant results and with even more live data available to train, the model can be improved much more decreasing false results

. DISADVANTAGES

- The current version of the project cannot handle large amount of data for processing i.e., detecting the forest fire.
- There is no clear graphical user interface to handle and organize all video input efficiently.

CONCLUSION

The project mainly helps forest officers and fire fighters to prevent forest fires and stop the forest fires from spreading. It also helps police officers and environmentalists to support in the rescue process. Forest fires pose a great threat to the environment, they decrease the quality of forests, endanger many species of flora and fauna resulting in depletion of natural resources and loss of human lives.

The current response time for handling the forest fires is too long. The delay in response can cause a fatal accident and it also increases the probability of the fire spreading wider. So, this project detects forest fire using Deep Learning and immediately alerts responsible people with SMS alert. It aims to decrease the response time to limit the damage by fighting the fire in its weak beginning phase.

FUTURE SCOPE

The current version of this project sends SMS alert to a single registered number using Twilio API. It also has a lower video processing capacity – to both capture and to detect forest fires. Some other additional features that are planned to be incorporated with this existing product are listed below:

- User can fetch multiple live cam input using a more powerful and robust processing system.
- User can use a latitude and longitude-based camera system to survey the forest area completely while scanning for animal movement to make sure of their presence in the region. - User can also use UAV or drones in our response team to assist the fire fighters while also capturing real-time data.
- User can also create a more enhanced dashboard with more than binary response, we can include live temperature and natural gas levels (caused by decomposing material) and a quick response system to improve efficiency and decrease response time.

```
from google.colab import drive
drive.mount('/gdrive')
```

```
Mounted at /gdrive
```

```
!wget https://github.com/DeepQuestAI/Fire-Smoke-Dataset/releases/download/v1/FIRE-SMOKE-DA
!unzip FIRE-SMOKE-DATASET.zip
```

```
--2022-11-18 15:04:09-- https://github.com/DeepQuestAI/Fire-Smoke-Dataset/releas
Resolving github.com (github.com)... 20.27.177.113
Connecting to github.com (github.com)|20.27.177.113|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://objects.githubusercontent.com/github-production-release-asset-2
--2022-11-18 15:04:09-- https://objects.githubusercontent.com/github-
productionResolving objects.githubusercontent.com
(objects.githubusercontent.com)... 185.19
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.1
HTTP request sent, awaiting response... 200 OK
Length: 320963592 (306M) [application/octet-stream] SavinSga..v. ing to: 'FIRE-
SMOKE-DATASET.zip'

FIRE-SMOKE-DATASET. 100%[===================>] 306.09M 5.95MB/s     in 76s

2022-11-18 15:05:26 (4.00 MB/s) - 'FIRE-SMOKE-DATASET.zip' saved [320963592/32096

Archive: FIRE-SMOKE-DATASET.zip creating: FIRE-SMOKE-DATASET/Test/ creating: FIRE-
  SMOKE-DATASET/Test/Fire/   inflating:   FIRE-SMOKE-DATASET/Test/Fire/image_0.jpg
  inflating:   FIRE-SMOKE-DATASET/Test/Fire/image_1.jpg   inflating:   FIRE-SMOKE-
  DATASET/Test/Fire/image_10.jpg              inflating:              FIRE-SMOKE-
  DATASET/Test/Fire/image_11.jpg              inflating:              FIRE-SMOKE-
  DATASET/Test/Fire/image_12.jpg              inflating:              FIRE-SMOKE-
  DATASET/Test/Fire/image_13.jpg              inflating:              FIRE-SMOKE-
  DATASET/Test/Fire/image_14.jpg              inflating:              FIRE-SMOKE-
  DATASET/Test/Fire/image_15.jpg              inflating:              FIRE-SMOKE-
  DATASET/Test/Fire/image_16.jpg              inflating:              FIRE-SMOKE-
  DATASET/Test/Fire/image_17.jpg              inflating:              FIRE-SMOKE-
  DATASET/Test/Fire/image_18.jpg              inflating:              FIRE-SMOKE-
  DATASET/Test/Fire/image_19.jpg              inflating:              FIRE-SMOKE-
  DATASET/Test/Fire/image_2.jpg              inflating:              FIRE-SMOKE-
  DATASET/Test/Fire/image_20.jpg              inflating:              FIRE-SMOKE-
  DATASET/Test/Fire/image_21.jpg              inflating:              FIRE-SMOKE-
  DATASET/Test/Fire/image_22.jpg
  inflating: FIRE-SMOKE-DATASET/Test/Fire/image_23.jpg
: FIRE-SMOKE-DATASET/Test/Fire/image_24.jpg inflating: FIRE-SMOKE-
DATASET/Test/Fire/image_25.jpg inflating: FIRE-SMOKE-
DATASET/Test/Fire/image_26.jpg inflating: FIRE-SMOKE-
DATASET/Test/Fire/image_27.jpg inflating: FIRE-SMOKE-
DATASET/Test/Fire/image_28.jpg inflating: FIRE-SMOKE-
DATASET/Test/Fire/image_29.jpg inflating: FIRE-SMOKE-
DATASET/Test/Fire/image_3.jpg  inflating:  FIRE-SMOKEDATASET/Test/Fire/image_30.jpg
inflating: FIRE-SMOKE-
DATASET/Test/Fire/image_31.jpg inflating: FIRE-SMOKE-
DATASET/Test/Fire/image_32.jpg inflating: FIRE-SMOKE-
DATASET/Test/Fire/image_33.jpg inflating: FIRE-SMOKE-
DATASET/Test/Fire/image_34.jpg inflating: FIRE-SMOKE-
```

```
  DATASET/Test/Fire/image_35.jpg inflating: FIRE-SMOKE-
  DATASET/Test/Fire/image_36.jpg inflating: FIRE-SMOKE-
  DATASET/Test/Fire/image_37.jpg inflating: FIRE-SMOKE-
  DATASET/Test/Fire/image_38.jpg inflating: FIRE-SMOKE-
  DATASET/Test/Fire/image_39.jpg inflating: FIRE-SMOKE-
  DATASET/Test/Fire/image_4.jpg      inflating:      FIRE-
  SMOKEDATASET/Test/Fire/image_40.jpg inflating: FIRE-
  SMOKEDATASET/Test/Fire/image_41.jpg
```

```
   import shutil shutil.rmtree('/content/FIRE-SMOKE-
   DATASET/Test/Smoke') shutil.rmtree('/content/FIRE-SMOKE-
   DATASET/Train/Smoke')
```

```
import tensorflow as tf import keras_preprocessing from
   keras_preprocessing import image from
   keras_preprocessing.image import ImageDataGenerator
   import shutil
   TRAINING_DIR="/content/FIRE-SMOKE-DATASET/Train"
   training_datagen = ImageDataGenerator(rescale=1./255,
   zoom_range=0.15, horizontal_flip=True, fill_mode='nearest')
   VALIDATION_DIR="/content/FIRE-SMOKE-DATASET/Test"
   validation_datagen = ImageDataGenerator(rescale =1./255)

   train_generator =
       training_datagen.flow_from_directory(
       TRAINING_DIR, target_size=(224,224), shuffle =
       True, class_mode='categorical', batch_size = 128
   )

   validation_generator =
       validation_datagen.flow_from_directory( VALIDATION_DIR,
       target_size=(224,224), class_mode='categorical', shuffle
       = True, batch_size=14
   )
```



```
        Found 1800 images belonging to 2 classes. Found
        200 images belonging to 2 classes.
```

```
from tensorflow.keras.applications.inception_v3 import InceptionV3
   from tensorflow.keras.preprocessing import image from
   tensorflow.keras.models import Model
   from tensorflow.keras.layers import Dense, GlobalAveragePooling2D, Input, Dropout

   input_tensor = Input(shape=(224,224,3))
   base_model = InceptionV3(input_tensor=input_tensor,weights='imagenet',include_top=False)

   #adding a global spatial average pooling layer x =
   base_model.output x = GlobalAveragePooling2D()(x) x =
   Dense(2048,activation='relu')(x) x = Dropout(0.2)(x)
   predictions = Dense(2, activation='softmax')(x) model =
   Model(inputs=base_model.input, outputs=predictions)
```

```
  for layer in base_model.layers:
    layer.trainable = False

  model.compile(optimizer='rmsprop', loss='categorical_crossentropy',metrics=["acc"])
```

```
Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/i
87916544/87910968 [==============================] - 4s 0us/step
```

```
  for layer in model.layers[:249]:
    layer.trainable = False
  for layer in model.layers[249:]:
    layer.trainable = True
from tensorflow.keras.optimizers import SGD
  model.compile(optimizer=SGD(lr=0.0001, momentum=0.9), loss='categorical_crossentropy',metr

  class myCallback(tf.keras.callbacks.Callback):
    def on_epoch_end(self,epoch,logs={}):
      if(logs.get('val_loss')<=0.1099 and logs.get('loss')<=0.1099):
        print('\n\n Reached the Destination!')
        self.model.stop_training = True
  callbacks = myCallback()
history =model.fit(
  train_generator,
  steps_per_epoch =
  3, epochs= 30,
  validation_data =
  validation_generato
  r, validation_steps
  = 1,
  callbacks=[callback
  s]
  )
print(len(base_model.layers))
```

```
      /usr/local/lib/python3.7/dist-
        packages/keras/optimizers/optimizer_v2/gradient_descen super(SGD, self)._init
        (name, **kwargs)
      Epoch 1/30
      3/3 [==============================] - 72s 22s/step - loss: 0.2371 - acc: 0.9089 -
      v Epoch 2/30
      3/3 [==============================] - 65s 21s/step - loss: 0.1964 - acc: 0.9193 -
      v Epoch 3/30
      3/3 [==============================] - 62s 20s/step - loss: 0.1813 - acc: 0.9141 -
      v Epoch 4/30
      3/3 [==============================] - 68s 23s/step - loss: 0.2045 - acc: 0.9089 -
      v Epoch 5/30
      3/3 [==============================] - 65s 22s/step - loss: 0.1895 - acc: 0.9036 -
      v Epoch 6/30
      3/3 [==============================] - 65s 22s/step - loss: 0.1743 - acc: 0.9271 -
      v
      Epoch 7/30
      3/3 [==============================] - 65s 21s/step - loss: 0.1461 - acc: 0.9427 -
      v Epoch 8/30
```

```
3/3 [==============================] - 46s 13s/step - loss: 0.1794 - acc: 0.9318 -
v Epoch 9/30
3/3 [==============================] - 65s 21s/step - loss: 0.1270 - acc: 0.9531 -
v Epoch 10/30
3/3 [==============================] - 67s 21s/step - loss: 0.1712 - acc: 0.9479 -
v
Epoch 11/30
3/3 [==============================] - 63s 21s/step - loss: 0.1357 - acc: 0.9505 -
v
 Epoch 12/30
3/3 [==============================] - 65s 22s/step - loss: 0.1483 - acc: 0.9505 -
v Epoch 13/30
3/3 [==============================] - 67s 23s/step - loss: 0.1355 - acc: 0.9375 -
v Epoch 14/30
3/3 [==============================] - 47s 22s/step - loss: 0.0927 - acc: 0.9659 -
v Epoch 15/30
3/3 [==============================] - ETA: 0s - loss: 0.1027 - acc: 0.9609

 Reached the Destination!
3/3 [==============================] - 65s 22s/step - loss: 0.1027 - acc: 0.9609 -
v
311
```

```
model.save("model.h5")
```

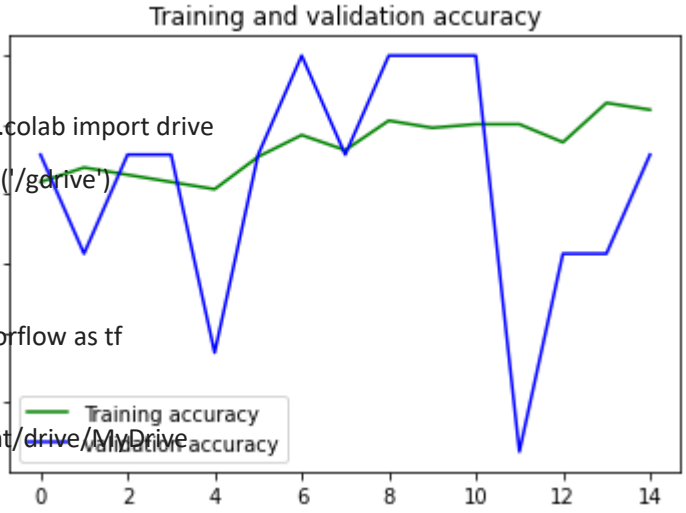
```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-9-a3439455f9ca> in <module>
----> 1 model.save("model.h5")

NameError: name 'model' is not defined
```

```
   %matplotlib inline import
   matplotlib.pyplot as plt acc =
   history.history['acc'] val_acc=
   history.history['val_acc'] loss =
   history.history['loss'] val_loss =
   history.history['val_loss'] epochs =
   range(len(acc))

   plt.plot(epochs,acc,'g',label='Training accuracy')
   plt.plot(epochs, val_acc,'b', label='validation accuracy')
   plt.title('Training and validation accuracy')
plt.legend(loc=0)
   plt.figure()
   plt.show()

   plt.plot(epochs, loss, 'r', label = 'Training loss')
   plt.plot(epochs,val_loss,'orange',label='Validation loss')
   plt.title('Training and Validation loss')
plt.legend(loc=0)
   plt.figure()
   plt.show()
```

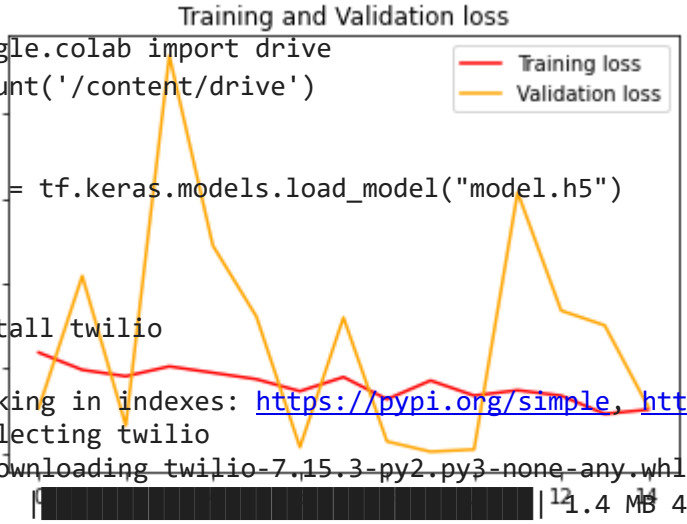



```
from google.colab import drive
drive.mount('/gdrive')
```

```
import tensorflow as tf
```

```
%cd /content/drive/MyDrive
```

```
<Figure size 432x288 with 0 Axes>
```




```
from google.colab import drive
drive.mount('/content/drive')
```

```
newModel = tf.keras.models.load_model("model.h5")
```

```
!pip install twilio
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/
Collecting twilio
  Downloading twilio-7.15.3-py2.py3-none-any.whl (1.4 MB)
     |████████████████████████████████| 1.4 MB 4.7 MB/s
Requirement already satisfied: requests>=2.0.0 in /usr/local/lib/python3.7/dist-pack
Collecting PyJWT<3.0.0,>=2.0.0
```

Saving.. .

```
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-pa
  Downloading PyJWT-2.6.0-py3-none-any.whl (20 kB)
Requirement already satisfied: pytz in /usr/local/lib/python3.7/dist-packages (from

Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-
package
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-
p
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in
/usr/local
Installing collected packages: PyJWT, twilio
Successfully installed PyJWT-2.6.0 twilio-7.15.3
```

```
import os
   from twilio.rest import Client
from traitlets.traitlets import ClassTypes
   import keras.utils as image #predicting
   any random images

   import numpy as np from
   google.colab import files
   tf.keras.utils.load_img
```

```
   #from keras.preprocessing import image
uploaded = files.upload() for fn in uploaded.keys():
   # path= '/content/'+fn path = fn img =
   image.load_img(path, target_size=(224,224)) x =
   image.img_to_array(img) x=np.expand_dims(x,
   axis=0)/255 classes = newModel.predict(x) if
   np.argmax(classes[0])==0:
       print(np.argmax(classes[0])==0, max(classes[0]),end=" ")
       print("Forest Fire is detected !!!,Message sended")

       # Sending Message to authority

       account_sid = 'ACb65b5505be868c24bd20543207a856a1'
       auth_token = '0e306096c14f4fb7cce1d6536c09b3b2'
       client = Client(account_sid, auth_token)

       message = client.messages.create( body='Forest Fire Detected !! Be Aware, precaustion
            needed move to safe place---- from_='+19182624326', to='+919361092334'
        )

     else:
       print(np.argmax(classes[0])==0, max(classes[0]),end=" ")
       print("No forest fire is detected!!!")
```

Choose Files th (2).jfif **th (2).jfif**(image/jpeg) - 25071 bytes, last modified:

8/15/2022 - 100% done

Saving th (2).jfif to th (2) (10).jfif

```
       1/1 [==============================] - 0s 345ms/step
       True 0.9402907 Forest Fire is detected !!!,Message sended
```

```
   !pip install watson-machine-learning-client

       Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-
       whee
       Collecting watson-machine-learning-client
         Downloading watson_machine_learning_client-1.0.391-py3-none-any.whl (538 kB)
            |████████████████████████████████| 538 kB 4.8 MB/s
       Requirement already satisfied: urllib3 in /usr/local/lib/python3.7/dist-
       packages
       Requirement already satisfied: pandas in /usr/local/lib/python3.7/dist-packages
       (
       Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-
       packages Requirement already satisfied: tqdm in /usr/local/lib/python3.7/dist-
       packages (fr Collecting ibm-cos-sdk
         Downloading ibm-cos-sdk-2.12.0.tar.gz (55 kB)
            |████████████████████████████████| 55 kB 3.7 MB/s Collecting lomond
         Downloading lomond-0.3.3-py2.py3-none-any.whl (35 kB)
       Collecting boto3
         Downloading boto3-1.26.13-py3-none-any.whl (132 kB)
            |████████████████████████████████| 132 kB 56.0 MB/s
       Requirement already satisfied: certifi in /usr/local/lib/python3.7/dist-
       packages
       Requirement already satisfied: tabulate in /usr/local/lib/python3.7/dist-packages
       Collecting jmespath<2.0.0,>=0.7.1
```

```
  Downloading jmespath-1.0.1-py3-none-any.whl (20 kB)
Collecting botocore<1.30.0,>=1.29.13
  Downloading botocore-1.29.13-py3-none-any.whl (9.9 MB)
     |████████████████████████████████| 9.9 MB 61.1 MB/s Collecting
s3transfer<0.7.0,>=0.6.0
  Downloading s3transfer-0.6.0-py3-none-any.whl (79 kB)
     |████████████████████████████████| 79 kB 8.1 MB/s
Collecting urllib3
  Downloading urllib3-1.26.12-py2.py3-none-any.whl (140 kB)
     |████████████████████████████████| 140 kB 67.5 MB/s
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /usr/local/lib/pyth
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/dist-packages
Collecting ibm-cos-sdk-core==2.12.0
  Downloading ibm-cos-sdk-core-2.12.0.tar.gz (956 kB)
     |████████████████████████████████| 956 kB 56.7 MB/s Collecting ibm-cos-sdk-
s3transfer==2.12.0
  Downloading ibm-cos-sdk-s3transfer-2.12.0.tar.gz (135 kB)
     |████████████████████████████████| 135 kB 47.9 MB/s Collecting
jmespath<2.0.0,>=0.7.1
  Downloading jmespath-0.10.0-py2.py3-none-any.whl (24 kB)
Collecting requests
  Downloading requests-2.28.1-py3-none-any.whl (62 kB)
     |████████████████████████████████| 62 kB 1.4 MB/s
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.7/dist-pack
Requirement already satisfied: charset-normalizer<3,>=2 in /usr/local/lib/python3
Requirement already satisfied: numpy>=1.17.3 in /usr/local/lib/python3.7/dist-pac
Requirement already satisfied: pytz>=2017.3 in /usr/local/lib/python3.7/dist-pack
  Building wheels for collected packages: ibm-cos-sdk, ibm-cos-sdk-core, ibm-cos-sd
    Building wheel for ibm-cos-sdk (setup.py) ... done
    Created wheel for ibm-cos-sdk: filename=ibm_cos_sdk-2.12.0-py3-none-any.whl siz
    Stored in directory: /root/.cache/pip/wheels/ec/94/29/2b57327cf00664b6614304f79
    Building wheel for ibm-cos-sdk-core (setup.py) ... done
    Created wheel for ibm-cos-sdk-core: filename=ibm_cos_sdk_core-2.12.0-py3-none-a
    Stored in directory: /root/.cache/pip/wheels/64/56/fb/5cd6f4f40406c828a5289b95b
    Building wheel for ibm-cos-sdk-s3transfer (setup.py) ... done
    Created wheel for ibm-cos-sdk-s3transfer: filename=ibm_cos_sdk_s3transfer-2.12.
    Stored in directory: /root/.cache/pip/wheels/57/79/6a/ffe3370ed7ebc00604f9f7676
Successfully built ibm-cos-sdk ibm-cos-sdk-core ibm-cos-sdk-s3transfer
```

Saving..

```
!pip install ibm_watson-machine-learning
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-
whee
Collecting ibm_watson-machine-learning
  Downloading ibm_watson_machine_learning-1.0.257-py3-none-any.whl (1.8 MB)
     |████████████████████████████████| 1.8 MB 4.9 MB/s
Requirement already satisfied: tabulate in /usr/local/lib/python3.7/dist-
packages
Requirement already satisfied: lomond in /usr/local/lib/python3.7/dist-packages
(
Requirement already satisfied: urllib3 in /usr/local/lib/python3.7/dist-
packages
Collecting ibm-cos-sdk==2.7.*
  Downloading ibm-cos-sdk-2.7.0.tar.gz (51 kB)
     |████████████████████████████████| 51 kB 674 kB/s
Requirement already satisfied: packaging in /usr/local/lib/python3.7/dist-
package
Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-
packages
```

```
  Requirement already satisfied: certifi in /usr/local/lib/python3.7/dist-packages
  Requirement already satisfied: importlib-metadata in /usr/local/lib/python3.7/dis
  Requirement already satisfied: pandas<1.5.0,>=0.24.2 in /usr/local/lib/python3.7/
  Collecting ibm-cos-sdk-core==2.7.0
    Downloading ibm-cos-sdk-core-2.7.0.tar.gz (824 kB)
       |████████████████████████████████| 824 kB 53.1 MB/s
  Collecting ibm-cos-sdk-s3transfer==2.7.0
    Downloading ibm-cos-sdk-s3transfer-2.7.0.tar.gz (133 kB)
       |████████████████████████████████| 133 kB 58.3 MB/s
  Requirement already satisfied: jmespath<1.0.0,>=0.7.1 in /usr/local/lib/python3.7
  Collecting docutils<0.16,>=0.10
    Downloading docutils-0.15.2-py3-none-any.whl (547 kB)
       |████████████████████████████████| 547 kB 57.4 MB/s
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /usr/local/lib/pyth
Requirement already satisfied: pytz>=2017.3 in /usr/local/lib/python3.7/dist-pack
Requirement already satisfied: numpy>=1.17.3 in /usr/local/lib/python3.7/dist-pac
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.7/dist-pack
Requirement already satisfied: charset-normalizer<3,>=2 in /usr/local/lib/python3
Requirement already satisfied: typing-extensions>=3.6.4 in /usr/local/lib/python3
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-package
  Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in /usr/local/lib/python3
  Building wheels for collected packages: ibm-cos-sdk, ibm-cos-sdk-core, ibm-cos-sd
    Building wheel for ibm-cos-sdk (setup.py) ... done
    Created wheel for ibm-cos-sdk: filename=ibm_cos_sdk-2.7.0-py2.py3-none-any.whl
    Stored in directory: /root/.cache/pip/wheels/47/22/bf/e1154ff0f5de93cc477acd0ca
    Building wheel for ibm-cos-sdk-core (setup.py) ... done
    Created wheel for ibm-cos-sdk-core: filename=ibm_cos_sdk_core-2.7.0-py2.py3-non
    Stored in directory: /root/.cache/pip/wheels/6c/a2/e4/c16d02f809a3ea998e17cfd02
    Building wheel for ibm-cos-sdk-s3transfer (setup.py) ... done
    Created wheel for ibm-cos-sdk-s3transfer: filename=ibm_cos_sdk_s3transfer-2.7.0
    Stored in directory: /root/.cache/pip/wheels/5f/b7/14/fbe02bc1ef1af890650c7e517
  Successfully built ibm-cos-sdk ibm-cos-sdk-core ibm-cos-sdk-s3transfer
  Installing collected packages: docutils, ibm-cos-sdk-core, ibm-cos-sdk-s3transfer
    Attempting uninstall: docutils
      Found existing installation: docutils 0.17.1
      Uninstalling docutils-0.17.1:
        Successfully uninstalled docutils-0.17.1
    Attempting uninstall: ibm-cos-sdk-core
      Found existing installation: ibm-cos-sdk-core 2.12.0 Saving... Uninstalling ibm-
cos-sdk-core-2.12.0:
```

```
    Successfully uninstalled ibm-cos-sdk-core-2.12.0
  Attempting uninstall: ibm-cos-sdk-s3transfer
    Found existing installation: ibm-cos-
    sdks3transfer 2.12.0 Uninstalling ibm-cos-
    sdks3transfer-2.12.0:
```

```
#connecting to IBM cloud from
ibm_watson_machine_learning
import APIClient credentials =
{
    "url":'https://us-south.ml.cloud.ibm.com',
    "apikey": "xdlFwJU-rH3GFLdU6SvxYsJgRqsXlWur2-Y840Qes57R"
}
Client = APIClient(credentials)
```

```
Python 3.7 and 3.8 frameworks are deprecated and will be removed in a
future release
```

```
Client
```

```
<ibm_watson_machine_learning.client.APIClient at 0x7fe327fdcd10>
```

Github link :https://github.com/IBM-EPBL/IBM-Project-21862-1659793415

Demo link :