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edureka!



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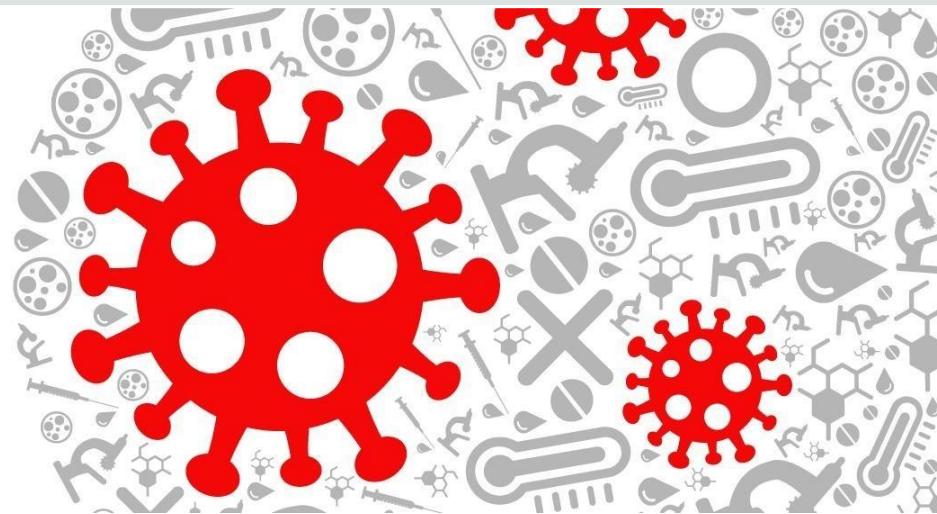


Face Mask Detection Workshop

Face Mask Detection Using Computer Vision

COVID-19

Pandemic in India!



COVID19 is the greatest humanitarian challenge facing the world ever since **World War II**. The pandemic has spread widely, bringing the world to halt, and the number of cases continues to rise. The government is working to slow down its spread.

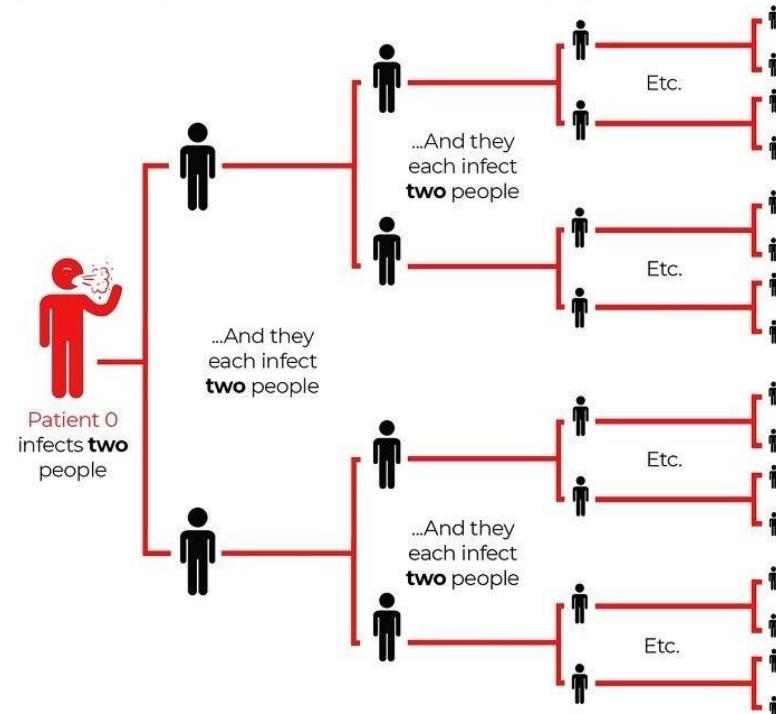
COVID-19: LIVE Update

- With over **45,000** fresh cases, the COVID-19 in India rose to **90 lakhs** with **1,32,162** fatalities
- India registered its biggest single-day increase in COVID-19 cases earlier in September, recording **over 90,000** infections in the **24 hours** with **1065** Deaths
- India is the **second worst-hit nation** in terms of COVID-19 cases
- Maharashtra** is the most-affected state in the country with over **17.6 lakh** cases. **Karnataka** and **Andhra Pradesh** occupy the next two spots.



COVID-19: Explained in Simple Terms

- Let's say Raghav got infected yesterday, but he won't know it until next 14 days
- Raghav thinks he is healthy, but he is infecting 10 persons per day
- Now, these 10 persons go out and infect 100 others, assuming they are completely healthy
- These 100 persons think they are healthy, but they have already infected 1000 others
- No one knows who is healthy or who can infect you
- All you can do is be responsible and stay in quarantine

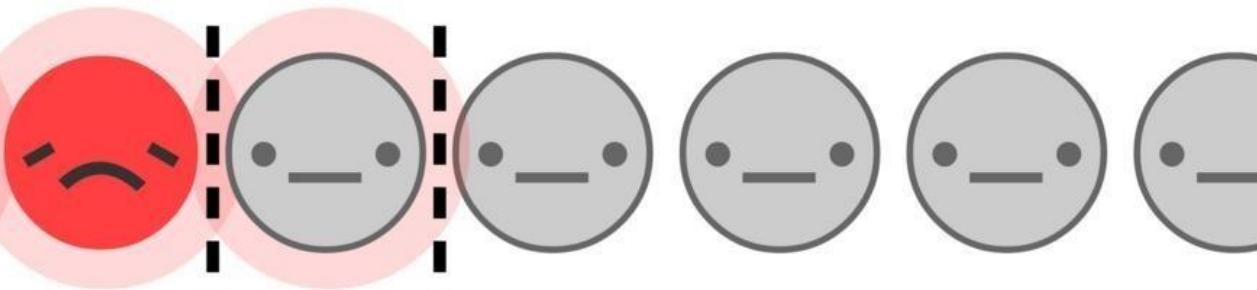


COVID-19: Spreads This Way

Contagious with
symptoms



Contagious with
no symptoms yet



Not
infected

ONE STEP BEHIND
if you self-isolate only when
you know you're infected



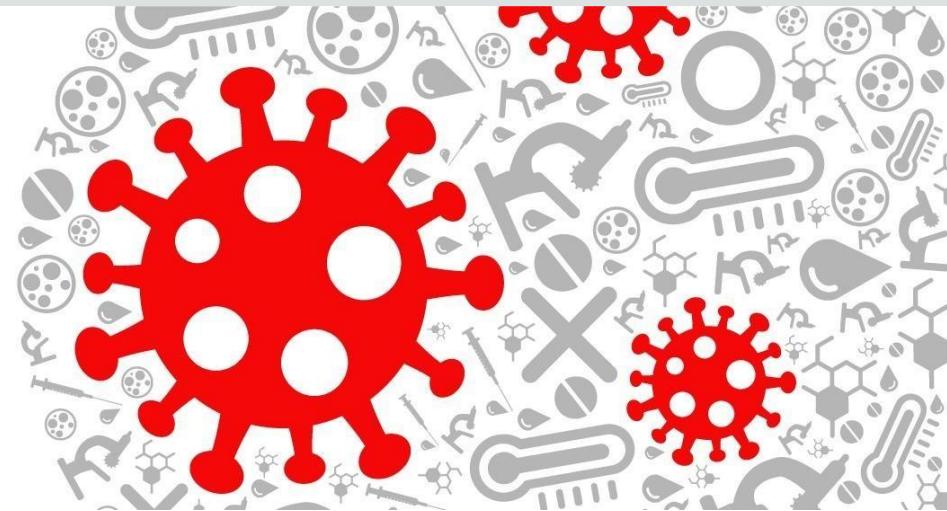
ONE STEP AHEAD
if you self-isolate if you *or a close contact* knows they're infected

COVID-19

Pandemic in India!

Problem Statement:

India has been fighting the pandemic with great spirit, with the unlocking phases being in motion. The need to be proactive now is more than ever. Governments all around the world recognized the power of **AI and ML** in order to fight the pandemic. Since **wearing a mask** and avoiding crowded places is the only alternative until the vaccine is introduced, **Computer vision in the form of mask detection** can be a reviving factor to get the life back to normal. Real time mask detection can solve the monitoring issues in countries with large populations.



Face Mask Detection Workshop: Objective

DAY 1

- Learn about Computer Vision
- Explore Computer Vision Applications
- Understand How Computer Vision Works
- Learn About OpenCV Python
- Get started with OpenCV Python
 - Loading images Using OpenCV
 - Displaying Images Using OpenCV
 - Capturing Video Using OpenCV
 - Face Detection Using OpenCV



- Train a Mask Detector Model
 - Importing libraries
 - Image Preprocessing
 - Training the Network
 - Evaluation
- Detect Mask Using Computer Vision
 - Image Preprocessing Using OpenCV
 - Load the Mask Detector Model
 - Initialize Video Stream
 - Loop Over Frames from the Stream

2 DAY

COVID-19 Impacting the Industries

At least 100 million people lost their jobs in India

More than 30 million fresh graduates out of campus unemployed

Global lockdowns and quarantine took a toll on mental health

Employers struggling to provide infrastructure for smooth transition



The New Normal?



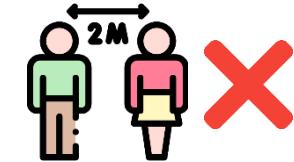
- In order to revive the economies, the businesses and workplaces must open with proper functioning
- Safety measures must be enforced to ensure safety of general public
- The two most important measures are social distancing and mask culture



Challenges to Revive the Normal



It is quite difficult to monitor **social distancing in public places**, especially in countries with large population



There is no way to completely ensure that **masses wear their masks properly** at all times when they go out in public



Even if a single business or workplace ignore these norms, the situation might get back to where it started



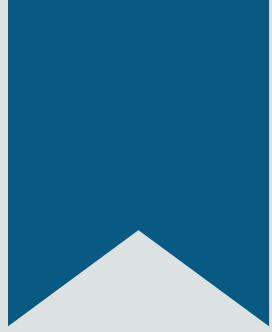
Challenges to Revive the Normal - Solution



Technology powered with **AI and ML** to ensure social distancing at public places

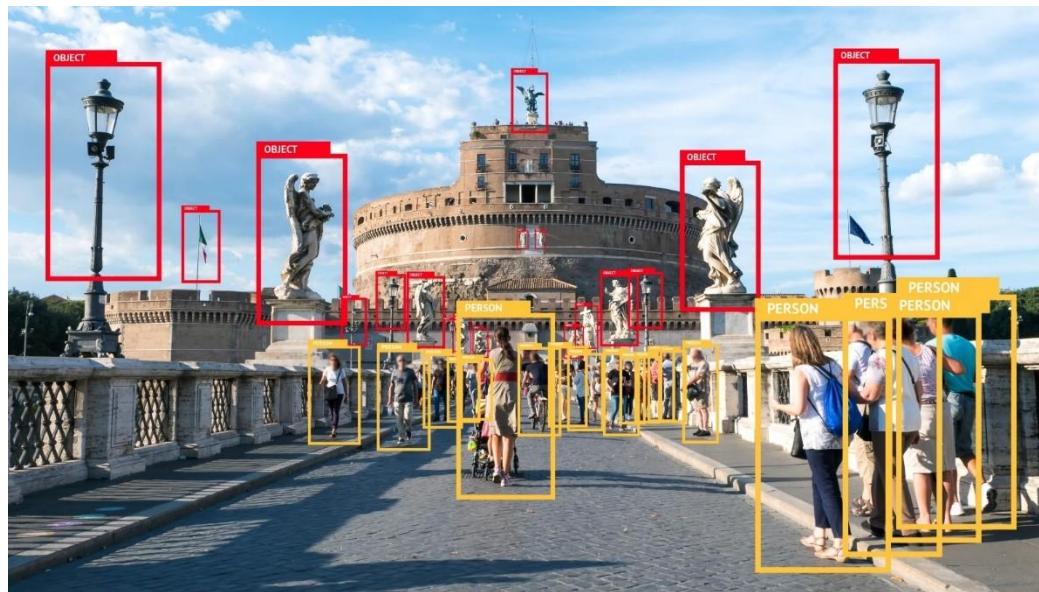
Mask Detection models ensuring the efficient use of the masks at workplaces and public areas

Contactless Thermal screening at public places to identify potential patients to avoid further spread



Computer Vision to the Rescue

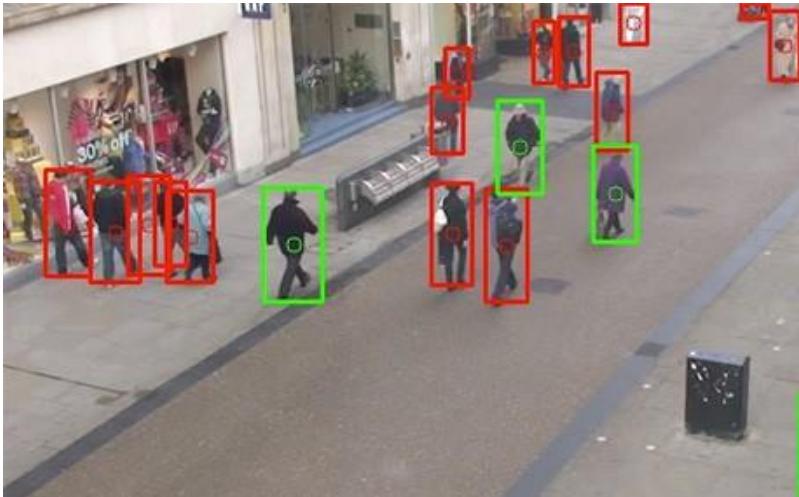
What is Computer Vision?



If We Stick to the Definition

Computer vision is an interdisciplinary scientific field that is inclined towards making a computer get a high-level understanding from digital images or video.

Computer Vision to Monitor Social Distancing



Source: pyimagesearch.com

Social Distancing Violation Detection

- Using computer vision at public places to monitor crowding
- The camera captures images in real time
- Depending upon the distance, each object in the frame is classified
- The idea is to avoid crowd gatherings at public places

Computer Vision for Thermal Scanning



Source: cbronline.com

Thermal Scanning

- IR cameras and computer vision for monitoring temperatures at public places without any contact
 - The camera captures the image, then the processed image is fed to the model
 - The exact temperature of individuals is then displayed in real time and helps in finding the potential patients

Crowd Monitoring Using Computer Vision



Source: Business insider



Crowd Monitoring

- Draganfly came up with pandemic drones teamed up with computer vision
- The product is a monitoring device that captures images in real time
- The computer vision model remotely analyzes any crowd gatherings in the area
- The whole idea is to keep in check the social distancing norms

Computer Vision in Medical Diagnosis



Source: Indianexpress.com



Medical Research

- X-rays are being used by researchers around the world including students at Cranfield University
- The X-rays of infected people are being used to find patterns and similarities using computer vision
- The idea is to diagnose COVID-19 using X-rays of previous patients of similar lung related illnesses

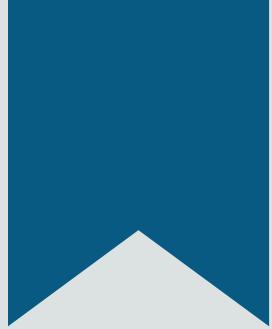
Face Mask Detection Using Computer Vision



Source: BIOMETRIC
UPDATE.COM

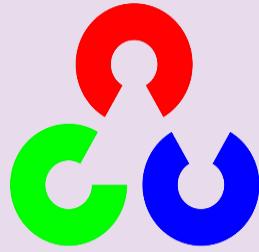
Face Mask Detection

- Integration Wizards Solutions came up with a computer vision based tool called IRIS to fight the COVID-19 crisis
- IRIS can detect face masks in real time
- IRIS is just one of the tools that most companies are developing for Face Mask Detection



Computer Vision Using Python

Python Libraries for Computer Vision



OpenCV



SimpleCV



SimpleITK



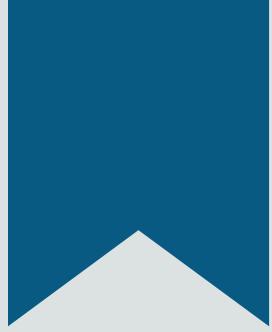
Scikit-Image



Albumentations



Ilastik



Why OpenCV for Computer Vision?

Why OpenCV?



OpenCV, as the name suggests, is an open-source computer vision library that consists of various computer vision and machine learning algorithms

01

Exclusively for computer vision

02

Faster than the rest of the computer vision libraries

03

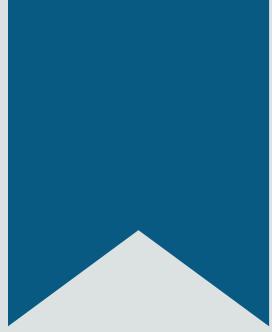
Supports multiple programming languages

04

Works on various OS – Windows, Linux, MacOS, etc

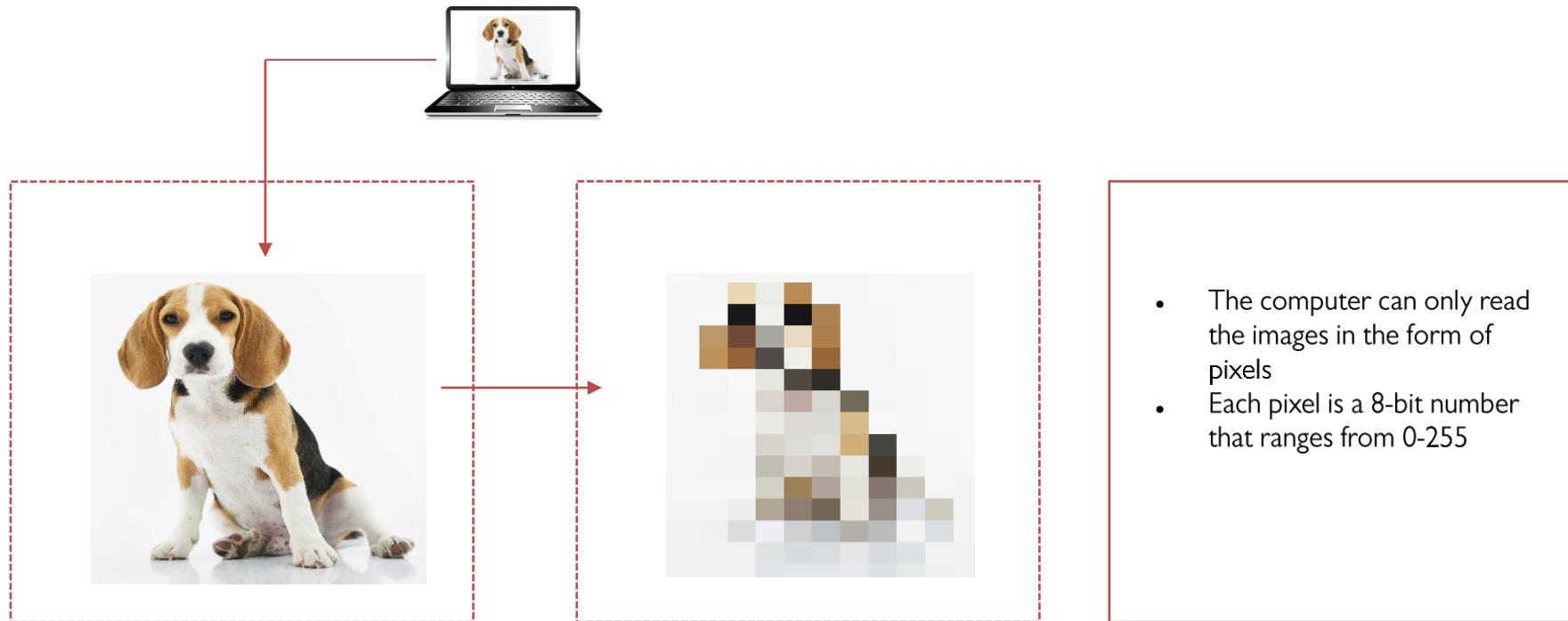
05

Efficient even with minimal system requirements



How OpenCV Works?

Let Us Start from the Very Beginning

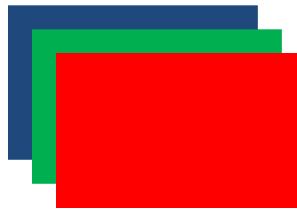
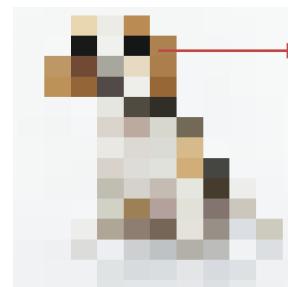


Let Us Start from the Very Beginning (Cont.)

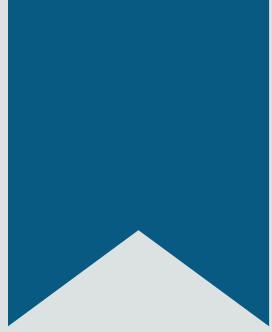
A grayscale image contains only black and white pixel values ranging from 0-255

A coloured image will have 3 separate RGB values for each pixel in the image ranging from 0-255

These pixels are converted into one dimensional arrays before sending it to the computer



Pixel values of R, G, B



Let's Begin the Fun Stuff

OpenCV Demo

Loading Images Using OpenCV

```
import cv2
```

Import the OpenCV Module

Colored Image

```
img = cv2.imread ("Penguins.jpg", 1)
```

Read the image in RGB
/ Colored format

Black and White (Gray Scale)

```
img_1 = cv2.imread ("Penguins.jpg", 0)
```

Read the image as a gray scale
image or black and white image

Loading Images Using OpenCV

```
import cv2  
  
# Black and White (Gray Scale)  
img = cv2.imread ("Penguins.jpg", 0)
```

It is a black and white image, therefore it will have only two channels/dimensions

```
print(type(img))  
print(img)  
  
ic Operations  
C:\Users\Saurabh\AppData\Local\Programs\  
<class 'numpy.ndarray'>  
[[161 161 161 ..., 144 144 144]  
 [162 161 162 ..., 144 144 144]  
 [163 162 162 ..., 144 145 145]  
 ...,  
 [108 136 193 ..., 130 119 102]  
 [103 113 92 ..., 127 125 109]  
 [ 95 101 94 ..., 121 121 98]]
```

NumPy n-dimensional array

Two dimensional NumPy Array

Top left intensity value of first pixel

Image Shape/ Resolution

```
import cv2  
|  
# Black and White (Gray Scale)  
img = cv2.imread("Penguins.jpg",0)
```

```
print(img.shape)
```

ic Operations

```
C:\Users\Saurabh\AppData\Local\Program
```

```
(768, 1024)
```

Shape of the NumPy array

768 rows and 1024 columns

Images Shape/ Resolution

```
import cv2  
  
# Black and White (Gray Scale)  
img = cv2.imread("Penguins.jpg",0)
```

```
print(img.shape)
```

ic Operations

```
C:\Users\Saurabh\AppData\Local\Programs\Python\Python37\python.exe
```

```
(768, 1024)
```

Shape of the NumPy array

768 rows and 1024 columns

Go ahead and do that for colored image as well and notice
the difference in the shape and the image NumPy array

Displaying the Image

```
# Black and White (Gray Scale)  
img = cv2.imread ("Penguins.jpg", 0)
```

Image object

```
cv2.imshow("Penguins", img)
```

Opens a window to display the image

```
cv2.waitKey(0)
```

Name of the window

```
# cv2.waitKey(2000)
```

Wait until a user presses a key

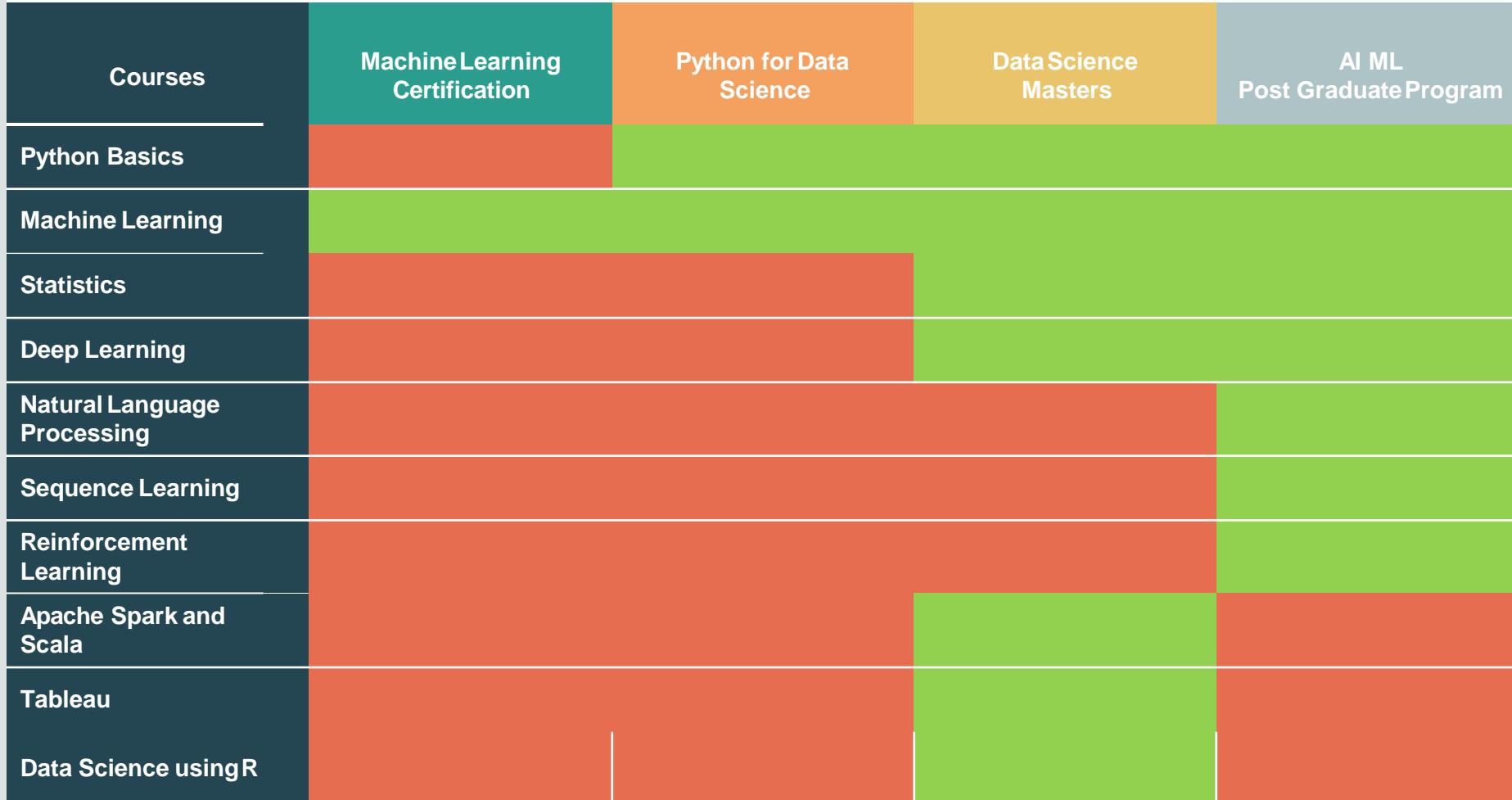
```
cv2.destroyAllWindows()
```

Wait for 2000 milliseconds

Closes the window based on waitforkey parameter

Displaying the Image





Features	Machine Learning Certification	Python for Data Science	Data Science Masters	AI ML Post Graduate Program
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24/7 Doubt Clearing Support				
Capstone Project				
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Hours of LIVE Class	36 hours	42 hours	250+ hours	450+ hours
Price	₹19,995	₹21,995	₹ 89,999	₹2,22,450



Thank You

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