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FACE MASK AND SOCIAL DISTANCE DETECTION USING DEEP LEARNING TECHNIQUES

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Abstract: Face mask and social distancing measures are necessary for many infectious diseases that spreads through droplets and micro- droplets. According to WHO, the preventive measure for COVID-19 is to follow strict social distancing. It is not easy to enforce social distance easily in a crowded region and people often not maintain sufficient distance with neighbors. SSD and face mask and social distancing detection involves two major steps: first the pedestrian in the video frames is identified with the aid of Deep Learning (DL) and in the second step, distance between the two pedestrian is estimated through image processing techniques. face mask and social distancing detection can be done through various methods. Mainly convolutional neural network method is used rapidly. The accuracy and decision making is very high in CNN compared to others.

INTRODUCTION TO PROJECT

face mask and social distancing detection is a challenging task. It has been receiving more and more attention in this era due to the spreading of corona virus disease. Hence many countries following the rule like "No entry without mask". face mask and social distancing detection is very important issue in security purpose and Covid-19 prevention. In the case of medical field, mask reduces potential exposure risk from an infected person whether they have symptoms or not. face mask and social distancing detection is used in Airports, Hospitals, Offices and Educational Departments etc. So face mask and social distancing detection is become a very critical and challenging issue. The face recognition without mask is easier but face recognition with mask is critical one because feature extraction of masked face is very complicated than normal face. That is so many face features such as nose, mouth and chin are absent in the masked face. In medical field, mask reduces potential exposures risk from an infected person whether they have symptoms or not. So many face mask and social distancing detection can be concentrated in two steps.

1) Face Recognition
2) Feature Extraction

Face recognition is the first step; here we need to detect the face from an image. Mainly there is a problem such as detecting the multiple mask and unmasked faces in an image. It can be solved by using a traditional object detection method. The traditional face detection algorithms are used Viola-Jones Algorithm, Adaptive Boost Algorithm and HOG (Histogram of Gradient). Here the object detection method is classified as multi-stage detectors and single short detectors (SSD). Faster RCNN is included in multi-stage detectors and YOLO (You Only Look Once) and Single-Short Detection (SSD) included in Single Stage Detectors. Here so many papers are studied about face mask and social distancing detection. Several techniques are used for mask detection such as video analytic, image semantic segmentation, from finger prints, DWT (Discreet Wavelet transform) and LBP (Local Binary Pattern). All of these techniques are analyzed for checking a person wear mask or not and also identify the face recognition of a person. The section II in this work explains different methods used for face mask and social distancing detection

1.1 OBJECTIVES:

Classification and detection of objects have been the state-of-art approach for many areas in computer vision. In the domain of video surveillance classification of objects have been a major breakthrough.The proposed system is able to detect faces and showed that the wear mask detection performance was greatly improved with higher accuracy and robustness.

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2. TECHNOLOGIES USED:

2.1 PYTHON LANGUAGE

Python is an object-oriented programming language created by Guido Rossum in 1989. It is ideally designed for rapid prototyping of complex applications. It has interfaces to many OS system calls and libraries and is extensible to C or C++. Many large companies use the Python programming language include NASA, Google, YouTube, BitTorrent, etc. Python programming is widely used in Artificial Intelligence, Natural Language Generation, Neural Networks and other advanced fields of Computer Science. Python had deep focus on code readability & this class will teach you python from basics.

Python Programming Characteristics

- It provides rich data types and easier to read syntax than any other programming languages
- It is a platform independent scripted language with full access to operating system API's
- Compared to other programming languages, it allows more run-time flexibility
- It includes the basic text manipulation facilities of Perl and Awk
- A module in Python may have one or more classes and free functions
- Libraries in Pythons are cross-platform compatible with Linux, Macintosh, and Windows
- For building large applications, Python can be compiled to byte-code
- Python supports functional and structured programming as well as OOP
- It supports interactive mode that allows interacting Testing and debugging of snippets of code
- In Python, since there is no compilation step, editing, debugging and testing is fast.

Applications of Python Programming

Web Applications

You can create scalable Web Apps using frameworks and CMS (Content Management System) that are built on Python. Some of the popular platforms for creating Web Apps are: Django, Flask, Pyramid, Plone, Django CMS. Sites like Mozilla, Reddit, Instagram and PBS are written in Python.

Scientific and Numeric Computing

There are numerous libraries available in Python for scientific and numeric computing. There are libraries like: SciPy and NumPy that are used in general purpose computing. And, there are specific libraries like: EarthPy for earth science, AstroPy for Astronomy and so on. Also, the language is heavily used in machine learning, data mining and deep learning.

Creating software Prototypes

Python is slow compared to compiled languages like C++ and Java. It might not be a good choice if resources are limited and efficiency is a must. However, Python is a great language for creating prototypes. For example: You can use Pygame (library for creating games) to create your game's prototype first. If you like the prototype, you can use language like C++ to create the actual game.

Good Language to Teach Programming

Python is used by many companies to teach programming to kids and newbies. It is a good language with a lot of features and capabilities. Yet, it's one of the easiest language to learn because of its simple easy-to-use syntax.

2.2 OPENCV PACKAGE

Python is a general purpose programming language started by Guido van Rossum, which became very popular in short time mainly because of its simplicity and code readability. It enables the programmer to express his ideas in fewer lines of code without reducing any readability.

Compared to other languages like C/C++, Python is slower. But another important feature of Python is that it can be easily extended with C/C++. This feature helps us to write computationally intensive codes in C/C++ and create a Python wrapper for it so that we can use these wrappers as Python modules. This gives us two advantages: first, our code is as fast as original C/C++ code (since it is the actual C++ code working in background) and second, it is very easy to code in Python. This is how OpenCV-Python works, it is a Python wrapper around original C++ implementation.

And the support of Numpy makes the task more easier. Numpy is a highly optimized library for numerical operations. It gives a MATLAB-style syntax. All the OpenCV array structures are converted to-and-from Numpy arrays. So whatever operations you can do in Numpy, you can combine it with OpenCV, which increases number of weapons in your arsenal. Besides that, several other libraries like SciPy, Matplotlib which supports Numpy can be used with this.

So OpenCV-Python is an appropriate tool for fast prototyping of computer vision problems.

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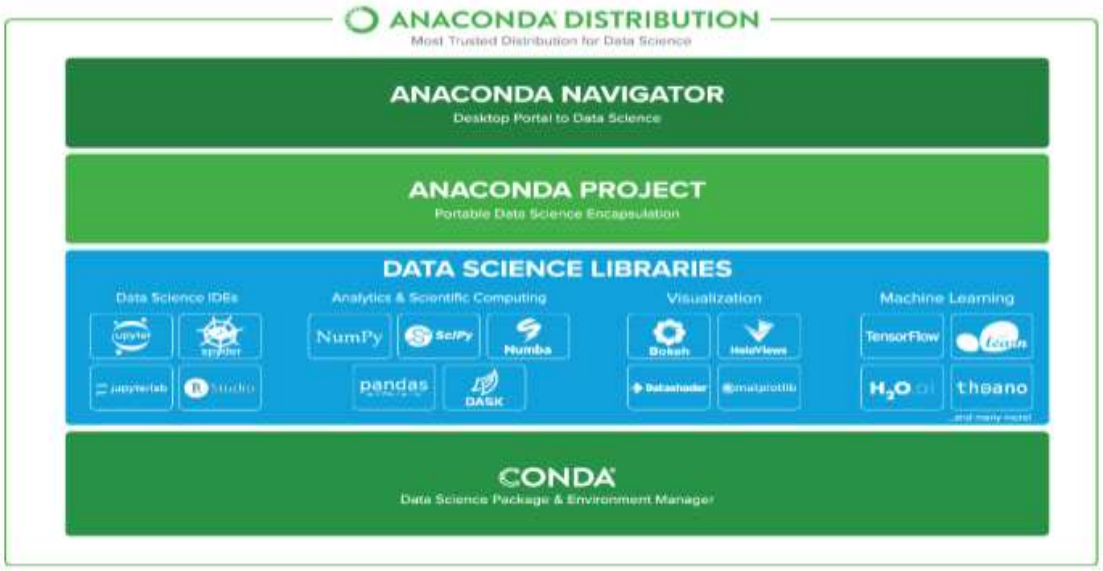
2.3. FEATURES OF ANACONDA NAVIGATOR

Anaconda is a free and open source, easy to install distribution of Python and R programming languages. Anaconda provides a working environment which is used for scientific computing, data science, statistical analysis and machine learning.The latest distribution of Anaconda is Anaconda 5.3 and is released in October, 2018. It has the conda package, environment manager and a collection of 1000+ open source packages long with free community support.



What is Anaconda Navigator?

Anaconda Navigator is a desktop graphical user interface (GUI) included in the Anaconda distribution. It allows us to launch applications provided in the Anaconda distribution and easily manage conda packages, environments and channels without the use of command-line commands. It is available for Windows, macOS and Linux.

Applications Provided In Anaconda Distribution

The Anaconda distribution comes with the following applications along with Anaconda Navigator.

1. JupyterLab
2. Jupyter Notebook
3. Qt Console
4. Spyder
5. Glueviz
6. Orange3
7. RStudio
8. Visual Studio Code

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