BIRLA INSTITUTE OF TECHNOLOGY
MESRA, RANCHI-835215
(Deemed University)
EXTENSION CENTER LALPUR, RANCHI.

Final Year Project
On Activity Tracker
Using Python

Batch : 1

Documentation And Report

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Certificate

This is to certify that the contents of this project entitled "Activity Tracker using Machine Learning in Python" is a bonafide work carried out by Prince,Tirthoraj , Shubham, Binay in fulfillment of the requirement for the award of Bachelor of Computer Applications under my guidance.

This is to further certify that the matter of the project has not been submitted by anyone else for the award of any degree.

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Dept. of Computer science.
Birla Institute of Technology.

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Certificate of Approval

The foregoing project is hereby approved as a creditable work on "Activity Tracker using Machine Learning in Python", carried out and presented in the manner satisfactory to warrant its acceptance as prerequisite to the degree for which it has been entitled.

It is understood that by this approval the undersigned do not endorse any statement made or opinion expressed but approve work for the purpose for which it is submitted.

Committee for evaluation of the project

External Examiner   **Internal Examiner**
Date: **Date:**

In Charge
BIRLA INSTITUTE OF TECHNOLOGY
Extension center Lalpur, Ranchi

Acknowledgement

We would like to express our special thanks of gratitude to my teacher Mrs. Aparna Shukla Ma'am who gave us the golden opportunity to do this wonderful project on the topic "Activity Tracker Using Machine Learning in Python," which also helped me in doing a lot of Research and hence we came to know about so many new things. We are really thankful to her.
Secondly, we would also like to thank our parents and friends who helped us a lot in finalizing this project within the limited time frame.

Above all, we would like to thank Almighty God for showering his blessings on us which enlightened our path and helped us in successful completion of our project.

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What our project is all about.

- Our Project is a Real time **Activity Tracker software**.

- The aim of the project is to keep a track of the activity of the user.

- It monitors whether the user who has logged In , is present in his position.

- It also has a **Countdown timer** for the user which works to show the left working hours.

- The software checks for the user availability infront of the monitor , continuously after a random interval of time.

- If **Presence** of the user is recognized, The software notes the time and the **countdown timer is carried forward**.

- If **Absence** of the user is recognized, The software **stops the countdown timer** until user is recognized.

- It maintains the record, whether the user is present for the allotted hours or not.

- We have used Python to build this project.

Essential Modules

- **OS module :** The OS module in Python provides functions for interacting with the operating system. In our project, we use this module to check whether path, directory, files, or images available or not.

- **Time module :** The Python time module provides many ways of representing time in code, such as objects, numbers, and strings.

- **Tkinter module :** Tkinter is the standard GUI library for Python There are various widgets like button, optionMenu, entry, checkbutton, etc. that are used to build the python GUI applications.

- **Datetime module :** Datetime module supplies classes to work with date and time. These classes provide a number of functions to deal with dates, times and time intervals.

- **String module :** Python string module provides additional tools to manipulate strings. In our project, we use this module to convert integer and time value into string format.

- **OpneCV module :** OpenCV or cv2 module is a huge open-source library for computer vision, machine learning, and image processing. It can process images and videos to identify objects, faces, or even the handwriting of a human. We use this module to recognize employee face.

- **Face Recognition module :** This module is used recognize and manipulate faces. It automatically find all the faces in an image, locate the facial features of a person in an image and recognize faces in images and identify who they are.

- **Numpy module :** It stands for Numerical Python, is a library consisting of multidimensional array objects and a collection of routines for processing those arrays.

  Using NumPy, mathematical and logical operations on arrays can be performed. We use this module in our to find maximum matching distance of faces in frame.

- **Shutil Module** : Shutil module in Python provides many functions of high-level operations on files and collections of files. We use this module in our project to copy and remove the image of employee from directory.

- **Smtplib Module** : smtplib module defines an SMTP client session object that can be used to send mail to any Internet machine with an Simple Mail Transfer Protocol (SMTP). We use this, to send mail if employee is face any problem this software.

- **Random Module** : Python has a built-in random module that you can use to make random numbers, shuffle the list, etc. We use this module to generate a random integer between two integer.

Algorithm

HOG Algorithm

A HOG is a feature descriptor generally used for object detection. HOGs are widely known for their use in pedestrian detection. A HOG relies on the property of objects within an image to possess the distribution of intensity gradients or edge directions. Gradients are calculated within an image per block. A block is considered as a pixel grid in which gradients are constituted from the magnitude and direction of change in the intensities of the pixel within the block.

What is a Histogram of Oriented Gradients (HOG)?

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The descriptors are gradient vectors generated per pixel of the image. The gradient for each pixel consists of magnitude and direction, calculated using the following formulae:

$$g = \sqrt{g_x^2 + g_y^2}$$

$$\theta = \arctan \frac{g_y}{g_x}$$

# Real World Example Application

A project of **eInfochips :**

This real-world example application involved access management and analytics using face recognition in a video management system. In this project, a team at eInfochips (an Arrow Company) designed and implemented a video management system with face recognition to detect and recognize faces in the feeds of multiple IP cameras. This setup was deployed in a manufacturing industry, wherein cameras were installed at various locations in multiple buildings and were interconnected using a Local Area Network (LAN).

The team developed and installed a complete video management solution into this network, which empowered the security department with video streaming, alerts through video analytics, and access authentications. The face recognition service within the Video Management System was used to recognize the faces in real-time from camera feeds and generate system events to trigger the authentication process for employees and visitors to the premises. Additionally, these events consisted of details such as time of recognition, the name of the person, the location of the person on the map, etc. These events from the database were then analyzed using user interface clients within the video management system.

HOG Algorithm For Face Recognition

- The recognition of a face in a video sequence is split into three primary tasks: Face Detection, Face Prediction, and Face Tracking.

- The tasks performed in the Face Capture program are performed during face recognition as well. To recognize the face obtained, a vector of HOG features of the face is extracted.

- This vector is then used in the SVM model to determine a matching score for the input vector with each of the labels. The SVM returns the label with the maximum score, which represents the confidence to the closest match within the trained face data.

- The task of calculating matching scores is exceptionally heavy to compute. Hence, once detected and identified, the labeled face in an image needs to be tracked to reduce the computation in future frames until the face eventually disappears from the video. Of all the available trackers, the Camshift tracking algorithm is used since it produces the best results with faces.
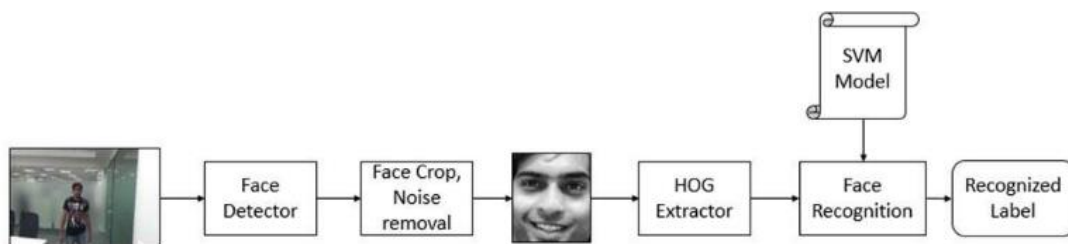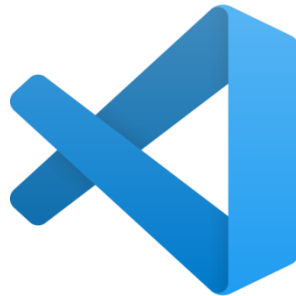

Block diagram of the face recognition process (Source: eInfochips)

Software Used

1.Visual Studio Code

Visual Studio Code is a freeware source-code editor made by Microsoft for Windows, Linux and macOS. Features include support for debugging, syntax highlighting, intelligent code completion, snippets, code refactoring, and embedded Git. Visual Studio Code is a source-code editor that can be used with a variety of programming languages, including **Java, JavaScript, Go, Node.js, Python and C++.**

Instead of a project system, it allows users to open one or more directories, which can then be saved in workspaces for future reuse. This allows it to operate as a language-agnostic code editor for any language. It supports a number of programming languages and a set of features that differs per language. Unwanted files and folders can be excluded from the project tree via the settings. Many Visual Studio Code features are not exposed through menus or the user interface but can be accessed via the command palette.

Visual Studio Code can be extended via extensions, available through a central repository. This includes additions to the editor and language support. A notable feature is the ability to create extensions that add support for new languages, themes, and debuggers, perform static code analysis, and add code linters using the Language Server Protocol.

Visual Studio Code includes multiple extensions for FTP, allowing the software to be used as a free alternative for web development. Code can be synced between the editor and the server, without downloading any extra software.

Visual Studio Code allows users to set the code page in which the active document is saved, the newline character, and the programming language of the active document. This allows it to be used on any platform, in any locale, and for any given programming language.

2.Python

Python is a multi-paradigm programming language. Object-oriented programming and structured programming are fully supported, and many of its features support functional programming and aspect-oriented programming (including by metaprogramming and metaobjects. Many other paradigms are supported via extensions, including design by contract and logic programming. Python uses dynamic typing and a combination of reference counting and a cycle-detecting garbage collector for memory management. It also features dynamic name resolution (late binding), which binds method and variable names during program execution.

Python's developers strive to avoid premature optimization, and reject patches to non critical parts of CPython that would offer marginal increases in speed at the cost of clarity. When speed is important, a Python programmer can move time-critical functions to extension modules written in languages such as C, or use PyPy, a just-in-time compiler. Cython is also available, which translates a Python script into C and makes direct C-level API calls into the Python interpreter. An important goal of Python's developers is keeping it fun to use. Python's design offers some support for functional programming in the Lisp tradition. It has filter, map, and reduce functions, list comprehensions, dictionaries, sets, and generator expressions. The standard library has two modules (itertools and functools) that implement functional tools borrowed from Haskell and Standard ML.
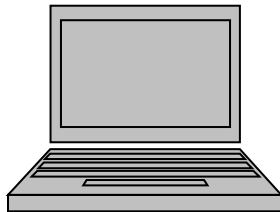
Benefits of Python

- Presence of Third-Party Modules
- Extensive Support Libraries
- Open Source and Community Development
- Learning Ease and Support Available
- User-friendly Data Structures
- Productivity and Speed
- Highly Extensible and Easily Readable Language

Hardware Used

- **Laptop/ PC**

- **External Web Cam / Web Cam**

Advantages

- The User cannot trick the organisation .

- The work efficiancy is increased. And Hence organization develops more.

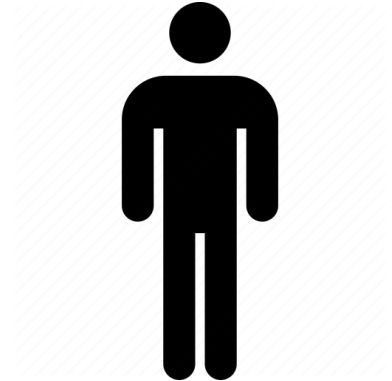- Potential of an individual is correctly determined.

Glitches

- It is restricted to single user
  functioning.

- During its run , As it uses the camera
  the camera may not open for some
  Other applications.