PROJECT REPORT ON

"Stress Detection System"

Submitted to

SAVITRIBAI PHULE PUNE UNIVERSITY

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UNDER THE GUIDANCE OF

Prof. Dheeraj Patil

DEPARTMENT OF INFORMATION TEHNOLOGY

NUTAN MAHARASHTRA INSTITUTE OF ENGINEERING AND TECHNOLOGY

Samarth Vidya Sankul Talegaon Dabhade, PUNE-410507

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AFFILIATED TO

SAVITRIBAI PHULE PUNE UNIVERSITY

NUTAN MAHARASHTRA INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Information Technology

"Samarth Vidya Sankul" Talegaon Dabhade, PUNE-410507

CERTIFICATE

This is certified that the project entitled

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Is a record of bonafide work carried out by them, in the partial fulfillment of the requirement for the award of Degree of Bachelor of Engineering (Information Technology) at NUTAN MAHARASHTRA INSTITUTE OF ENGINEERING AND TECHNOLOGY, Pune under the University of Pune. This work is done during year 2022- 2023, under our guidance.

Nutan Maharashtra Inst. of Engg. & Tech. PUNE 410507

Date:

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Project Guide

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ACKNOWLEDGEMENT

It gives us great pleasure in presenting the preliminary project report on **'Stress Detection System using Machine Learning and Image Processing'**

We are profoundly grateful to **Prof. Dheeraj Patil** for his expert guidance and continuous encouragement throughout to see that this project rights its target since its commencement to its completion.

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Mahesh kanthale
Akshata shendkar
Payal kadadhekar
Siddheshwari Rao

ABSTRACT

The main motive of our project is to detect stress in the users using vivid Machine learning and Image processing techniques .Our system is an upgraded version of the old stress detection systems which excluded the live detection and the personal counseling but this system comprises of live detection and periodic analysis of employees and detecting physical as well as mental stress levels in his/her by providing them with proper remedies for managing stress by providing survey form periodically. Our system mainly focuses on managing stress and making the working environment healthy and spontaneous for theemployees and to get the best out of them during working hours.

Keywords: Image processing, KNN classifier, Open CV, Supervised machine learning, Training dataset.

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Chapter 1
Introduction

1.1 Overview

Nowadays as IT industries are setting a new peek in the market by bringing new technologies and products in the market. In this study, the stress levels in employees are also noticed to raise the bar high. Though there are many organizations that provide mental health related schemes for their employees but the issue is far from control. In this paper we try to go in the depth of this problem by trying to detect the stress patterns in the working employee in the companies we would like to apply image processing and machine learning techniques to analyze stress patterns and to narrow down the factors that strongly determine the stress levels. Machine Learning algorithms like KNN classifiers are applied to classify stress. Image Processing is used at the initial stage for detection, the employee's image is clicked by the camera which serves as input. In order to get an enhanced image or to extract some useful information from it image processing is used by converting image into digital form and performing some operations on it. By taking input as an image from video frames and output may be image or characteristics associated with that image. Image processing basically includes the following three steps:

- Importing the image via image acquisition tools.
- Analyzing and manipulating the image.
- Output in which result is altered image or report that is based on image analysis.

1.2 Motivation

The Motivation behind project is Stress detection in users by image processing and machine learning is to Monitoring the emotional status of a person who is working in front of a computer for longer duration. To Detect and reduce stress and create a much comfortable workplace for IT employees. This system mainly focuses on managing stress and making the working environment healthy and spontaneous for the employees and to get the best out of them during working hours

1.3 Problem Statement

The problem statement in our system is Stress Detection. If the person going through stress that time mental condition is not well. Detection of emotional status of a person who is stressed is important for the safety of a person. In that scenario we use our system to detect person is stressed or not using Image Processing and Machine learning.

1.4 Objectives

- To managing stress and making the users life healthy and spontaneous.
- To define mood and state of the person.
- To identify the impact of stress and other serious mental illnesses.
- To provide solutions and remedies for the person to recover his/her stress.
- To increase awareness of the prevalence and consequences of untreated stress in thesociety.

Chapter 2

Literature Survey

2.1 Paper name:- Detection of Stress Using Image Processing & Machine Learning Techniques

- **Author name :-** Nisha Raichur, Nidhi Lonakadi, Priyanka Mural
- **Description:-** Most of the researchers focused on detecting stress involved in a person, which causes in a person several emotional problems like anxiety, grief, low self-esteem and other mental health problems. Recent studies have shown that stress can also affect the aspects of your life, including your thinking ability and physical health. To reduce riskiness from being stress and affected with its adverse effects, it is crucial to detect such emotions and take certain actions to relax them we develop a stress detection system based on the analysis of the facial expression

2.2. Paper name :-Stress detection in IT professional by image processing and machine learning

- **Author name :-** Prof.Vishal R. Shinde, Mr.Shubham Memane, Miss.Priya Thakare, Miss.Vibha Vishe
- **Description :-** The main concept is to detect stress in the IT professionals with the help of Machine learning and Image processing techniques. It comprises of live detection and periodic analysis of employees and detecting physical as well as mental stress levels in his/her by providing them with proper remedies for managing stress byproviding survey form periodically. It mainly focuses on managing stress and making the working environment healthy and spontaneous for the employees and to get the best out of them during working hours.

2.3. **Paper name :-** A Summarization of the Visual Depression Databases forDepression Detection

- **Author name :-** Arselan Ashraf; Teddy Surya Gunawan; Farah Diyana Abdul Rahman; Mira Kartiwi; Nanang Ismail; Ulfiah
- **Description :-** Stress is a serious mental issue in our life. Thus there is requirement for the stress detection models, which will offer a helpful framework and early identification of stress. There is an essential need for relevant data to set up a stress detection model. This paper presents a brief summarization regarding ten stress datasets available, which will guide the researchers to select an appropriate dataset fortheir stress detection models. This summarization has been done over the non-verbal signs of stress, data collection techniques, clinical definition, and annotations.

Chapter 3

Software Requirements Specification

3.1 Assumptions And Dependencies

1. Availability of system camera to capture user image.
2. Availability of user face images which covers users face properly.
3. Prediction made as stressed or not for the following different facial expressions i.e.(Angry, sad, happy, stressed, worried, etc). The future scope might include other additional facial expression as per dataset availability.

3.2 Software and Hardware Requirement

- Frontend :- HTML, CSS, JS (Flash Framework)
- IDE : Jupiter notebook
- Backend :- Sqlite
- Language :- Python 3.8
- Dataset :- Kaggle
- Methodology :- Haar Cascade Algorithm, KNN, CNN

3.3 System Requirement:

- Operating System: Windows 10
- Hard Disk :- Greater than 500 MB
- RAM :- Greater than 4GB
- Processor :- I3 and above
- Browser - Google Chrome, Mozilla Firefox, Microsoft Edge and otherChromium Browsers

3.4 FUNCTIONAL REQUIREMENTS

1. User should get authenticated to enter into the system.
2. System should be able to capture image after user allow access to system camera.
3. Perform analysis on the user images which includes extracting user facial features, classifying those features to generate result.
4. Generate report based on the predictions of the machine learning models i.e person is stressed or not stressed.

3.5NON FUNCTIONAL REQUIREMENTS

- **Performance Requirements:**

1. The software should be robust and the classifier should give good validation accuracy.
2. Provide minimum latency for API responses and fast data retrieval and result generation
3. Fast data retrieval.

- **Safety Requirements:**

The database must be protected from unauthorized access and system failure.

- **Security Requirements:**

1. Ensure Data Confidentiality and Privacy for the users.
2. Data sharing consent

- **Software Quality Attributes:**

1. **Availability:** This software is freely available to all users. The availability ofthe software is easy for everyone..
2. **Adaptability:** The system should be portable
3. **Maintainability:** After the deployment of the project if any error occurs thenit can be easily maintained by the software developer.
4. **User Friendly:** Since, the software is a GUI application; the output generated ismuch user friendly in its behavior.
5. **Integrity:** Integrity refers to the extent to which access to software or data by unauthorized persons can be controlled.
6. Security: Users are authenticated using many security phases so reliablesecurity is provided.
7. **Testability:** The software will be tested considering all the aspects.
8. **Reliability:** The performance of the software is better which will increase thereliability of the Software

3.6 Data Requirements:

1. **User Data:** User data needed for Authentication purpose which enables user toenter in the system and use the system for their stress detection.
2. **User Image Dataset:** As our system need user image dataset that will used to extract the facial expression to detect person is stressed or not. When user enter intosystem the system camera will capture the image of user and store it in the image dataset.

3.7 User Requirements:

1. **User Account:** The application should be able to create user account andsave their information.

2. **Analysis Report :** The Reports need to be detailed with comparisons of thestressed and not stressed user images. With regression values of the prediction.

3. **Maintenance of user data:** The user data should be editable for the ease of access.

4. **Feedback** If the stressed analysis was incorrectly identified or feedback about something related to wrong labeling of facial expression it needs to be flagged so that data can be modified and issue can be resolved next time.

4.1 ANALYSIS MODEL : AGILE MODEL

Agile Methodology is used to adapt to changes fast and efficiently. Its main goal is to facilitate quick project completion. In Agile model the requirements are decomposed into small parts that are developed incrementally. These are the following phases

4.1.1 Concept

First is concept phase. Here we determine the scope of the project. We discussed key requirements and prepare documentation to outline them, includingwhat features will be supported and the proposed end results. We kept the requirements to a minimum as they can be added to in later stages. This detailed analysis helped us to decide whether or not a project is feasible.

4.1.2 Inception

Once the concept is outlined, we started with software development planning. We started the design process. We planned and drew some sample mockup user interface and build the project architecture. The inception stage helped us determine the product functionality.

4.1.3 Iteration

Next up is the iteration phase. It is the longest phase as the bulk of the work is carried out here. We will work on UX to combine all product requirements and turn the design into code. The goal is to build the bare functionality of the product by the end of the first iteration or sprint. Additional features and tweaks can be added in later iterations.

4.1.4 Release

The product is almost ready for release. But for quality assurance needs to perform some tests to ensure the software is fully functional. The team members will test the system to ensure the code is clean — if potential bugs or defects are detected, the developers will address them swiftly.

4.1.5 Maintenance

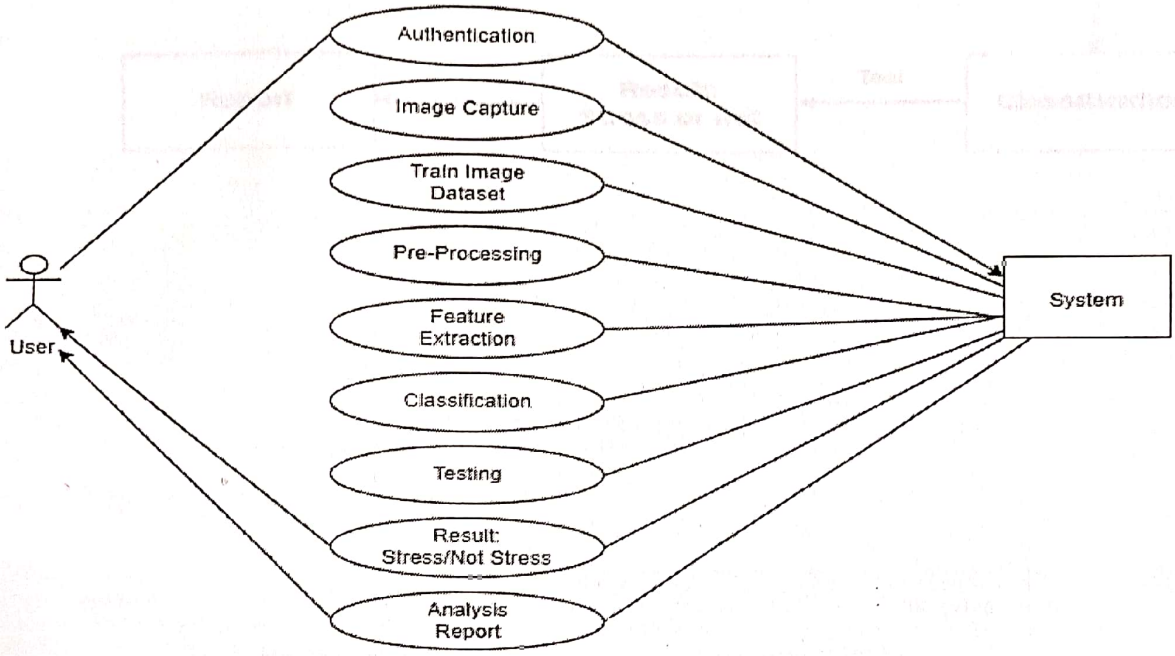
The software will now be fully deployed and made available to customers. This action moves it into the maintenance phase. During this phase, the software development team will provide ongoing support to keep the system running smoothly and resolve any new bugs.

Chapter 4

System Analysis

UML Diagrams:

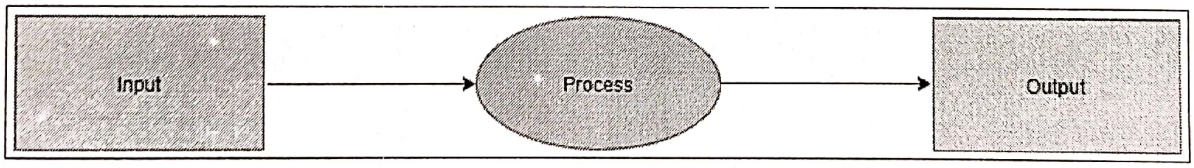
1.Use Case :



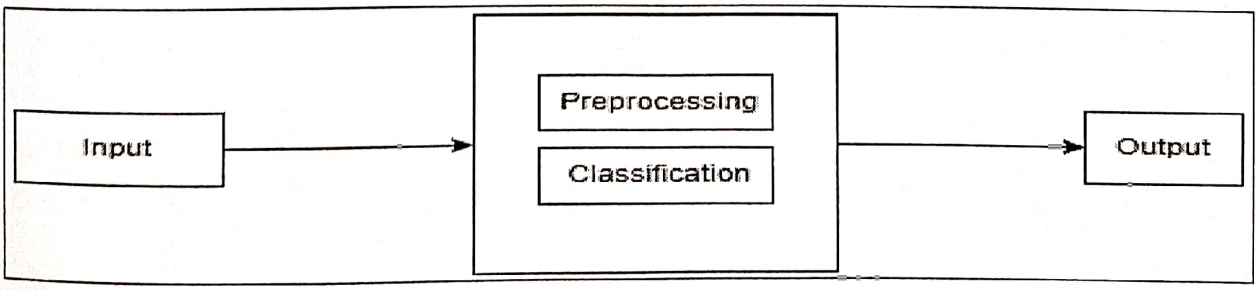
Stress Detection System Use Case Diagram

2.Data Flow(DFD):

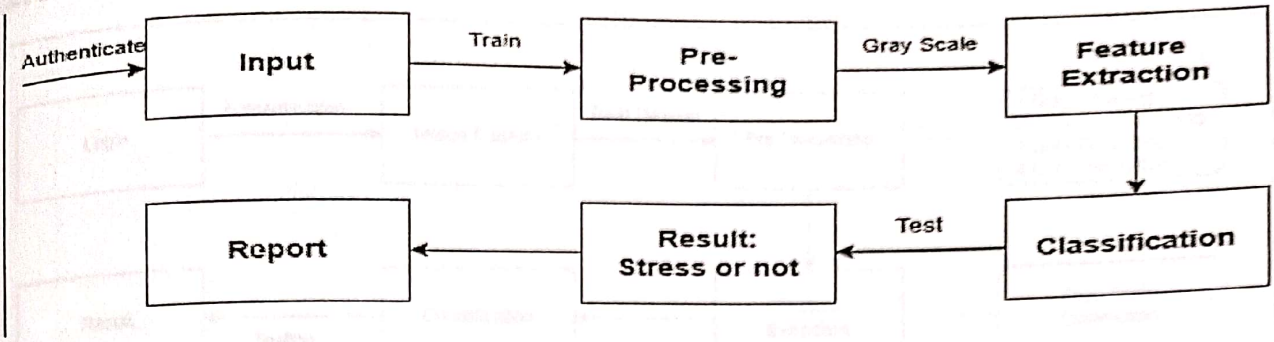
2.1.DFD0:



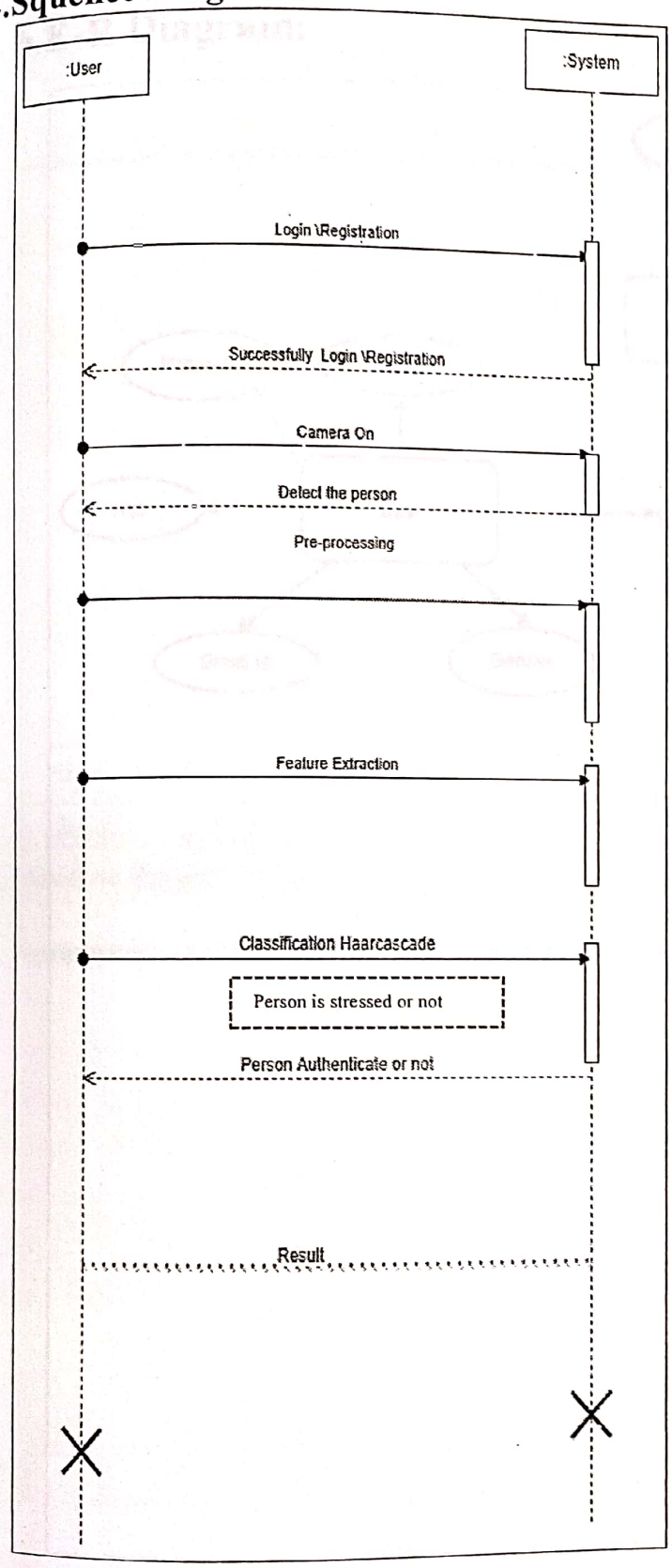
2.2.DFD1:



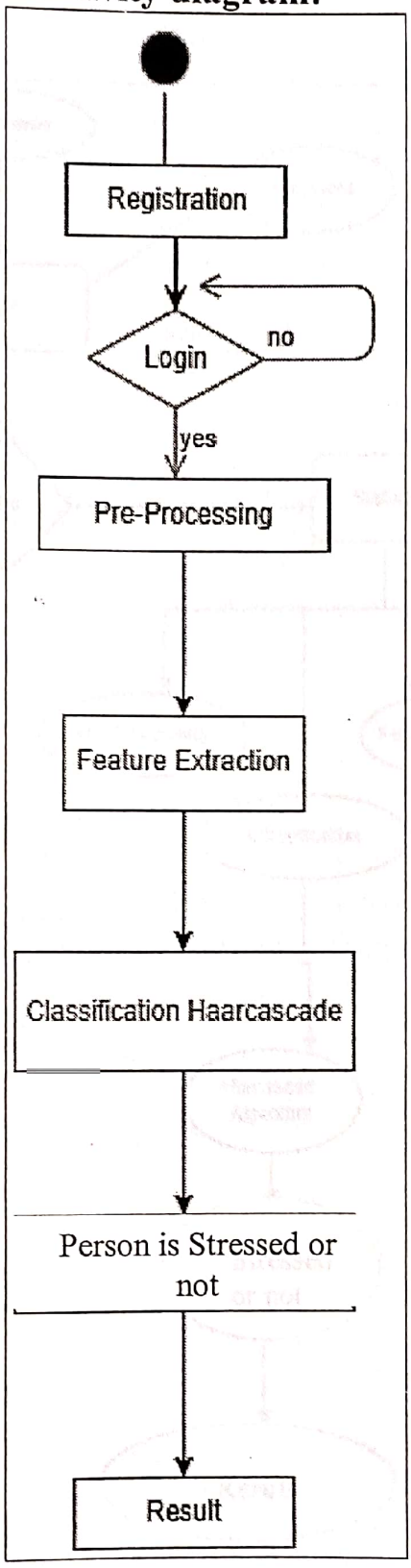
2.3.DFD2:



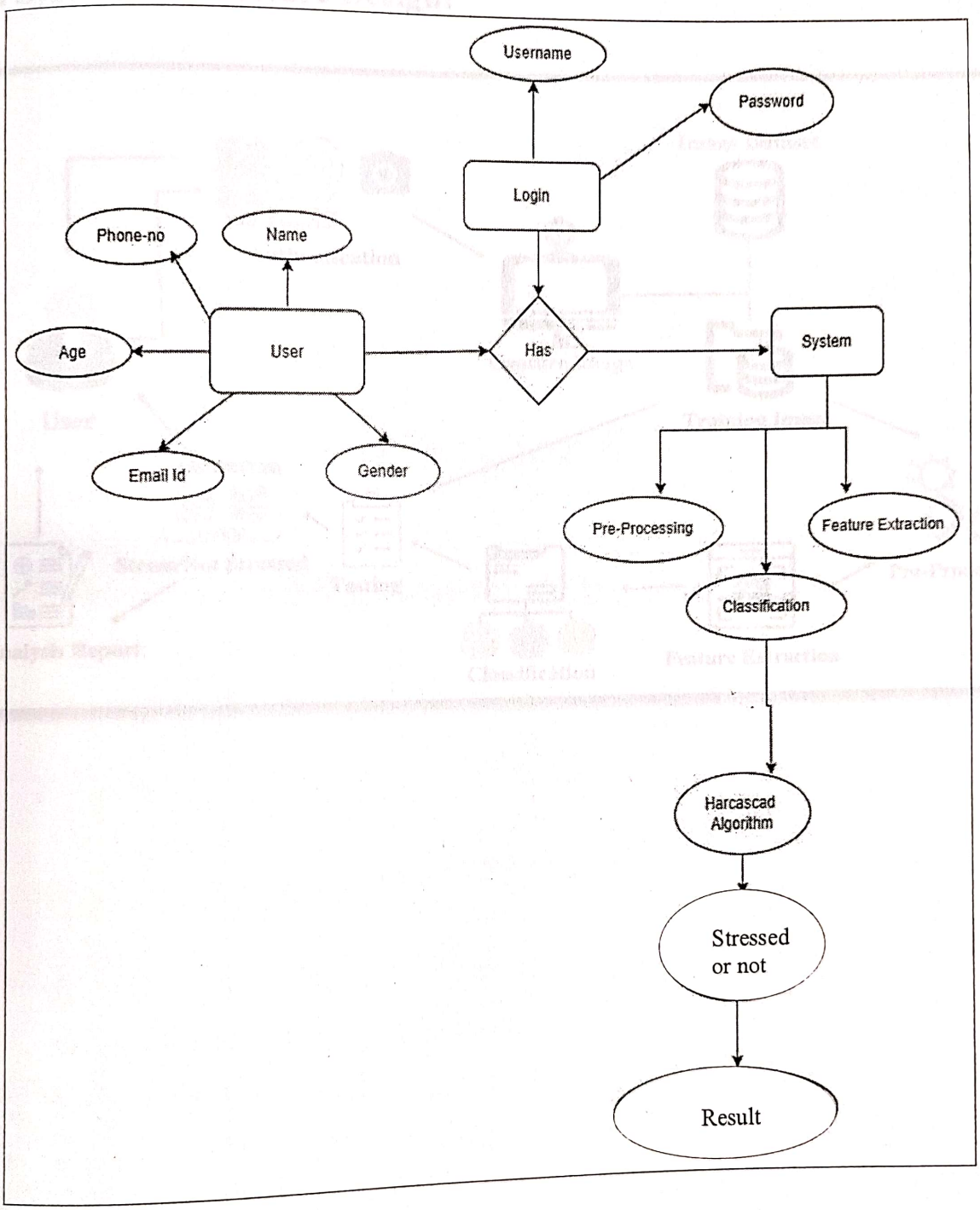
4.Squence Daigram:



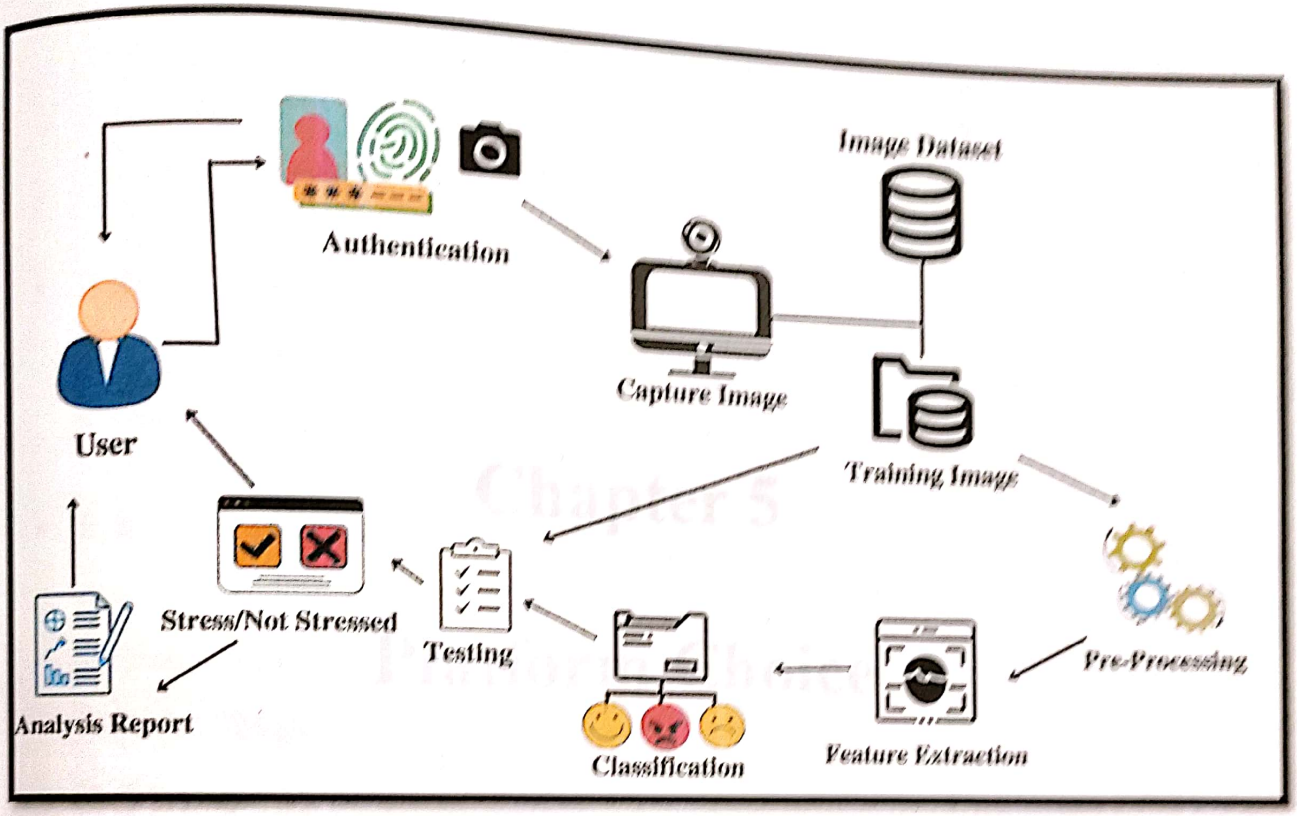
5.Activity diagram:



6.E-R Diagram:



7. System Architecture Design:



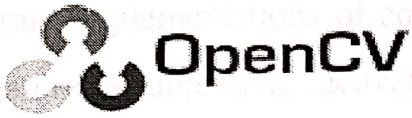
Chapter 5

Platform Choice

1. Python 3.10

- Python is a high-level, interpreted, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation.
- Python is dynamically-typed and garbage-collected. It supports multiple programming paradigms, including structured (particularly procedural),object -oriented and functional programming. It is often described as a "batteries included" language due to its comprehensive standard library.
- In this project we areusing Python 3.8 version for building this project.

2. 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.
- In this Project OpenCV will act as source to control camera and frame capturing of Live Input. Able to capture a video from camera using OpenCV and it will allow to perform desired operations on that media.

- By using OpenCV, 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 vector space canbe used and perform mathematical operations on these features.
- **OpenCV Functionality:**
  --Image/video I/O, processing, display
  --Object/feature detection (obj detect, features2d, non-free)
  --Computational photography (photo, video, media)
  --Machine learning clustering

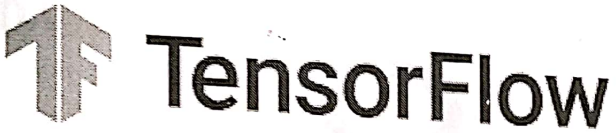
3. Keras

- Keras contains numerous implementations of commonly used neural-network building blocks such as layers, objectives, activation functions, optimizers, and a host of tools to make working with image and text data easier to simplify the coding necessary for writing deep neural network code. The code is hosted on GitHub, and community support forums include the GitHub issues page, and a Slack channel.
- Designed to enable fast experimentation with deep neural networks, it focuses on being user-friendly,modular, and extensible.
- In addition to standard neural networks, Keras has support for convolutional and recurrent neural networks. It supports other common utility layers like dropout, batch normalization, and pooling

- **Features:**
  1. Consistent, simple and extensible API.
  2. Minimal structure - easy to achieve the result without any frills.
  3. It supports multiple platforms and backend.
  4. It is a user-friendly framework which runs on both CPU andGPU.
  5. Highly scalability of computation.

- **Benefits:**
  1. Larger community support.
  2. Easy to test.
  3. Keras neural networks are written in Python which makes things simpler.

4. TensorFlow



- **TensorFlow** is a free and open source software library for machine learning and artificial intelligence. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks

- TensorFlow was developed by the Google Brain team for internal Google use in n research and production. The initial version was released under the Apache in 2015. Google released the updated version of TensorFlow, named TensorFlow 2.0, in September 2019.

- TensorFlow can be used in a wide variety of programming languages, most notably Python, as well as JavaScript, C++, and Java. This flexibility lends itself to a range of applications in many different sectors.

4. Keras supports both convolution and recurrent networks.

- **Advantages**
  1. Its flexible architecture allows for the easy deployment of computation
  2. TensorFlow computations are expressed as stateful dataflow graphs.
  3. TensorFlow serves as the core platform and library for machine learning. Tensor- Flow's APIs use Keras to allow users to make their own machine learning models. In addition to building and training their model, TensorFlow can also help load the data toTrain the model, and deploy it using TensorFlow Serving

5. ANACONDA

- Anaconda is a distribution of the Python and R programming languages for scientific computing (data science, machine learning applications, large-scale data processing, predictive analytics, etc.), that aims to simplify package management and deployment. The distribution includes data-science packages suitable for Windows, Linux, and macOS.
- It is developed and maintained by Anaconda, Inc., which was founded by Peter Wang and Travis Oliphant in 2012. As an Anaconda, Inc. product, it is also known as Anaconda Distribution or Anaconda Individual Edition, while other products from the company are Anaconda Team Edition and Anaconda Enterprise.

Chapter 6
Project Plan

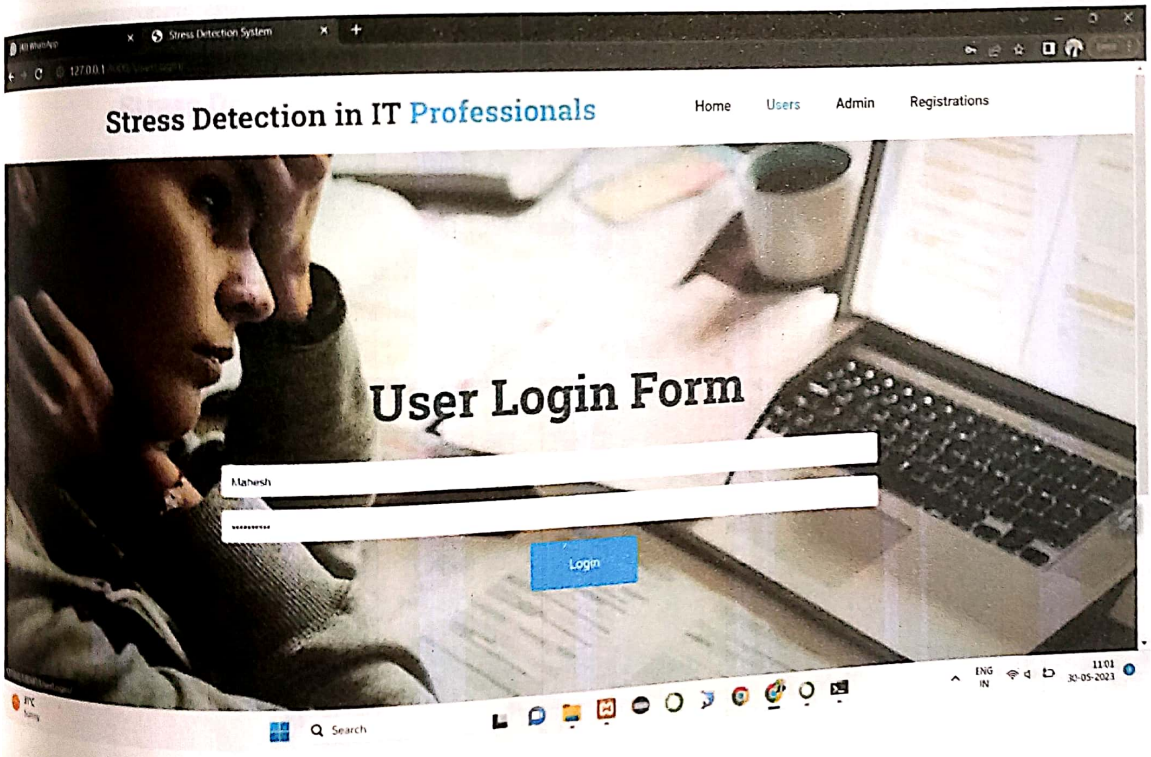
In this chapter we are going to have an overview about how much time does it took to complete each task like- Preliminary Survey Introduction and Problem Statement, Literature Survey, Project Statement, Software Requirement and Specification, System Design, Partial Report Submission, Architecture Design, Implementation, Deployment, Testing, Paper Publish, Report Submission and etcetera. This chapter also gives focus on stakeholder list which gives information about project type, customer of the proposed system, user and project member who developed the system.

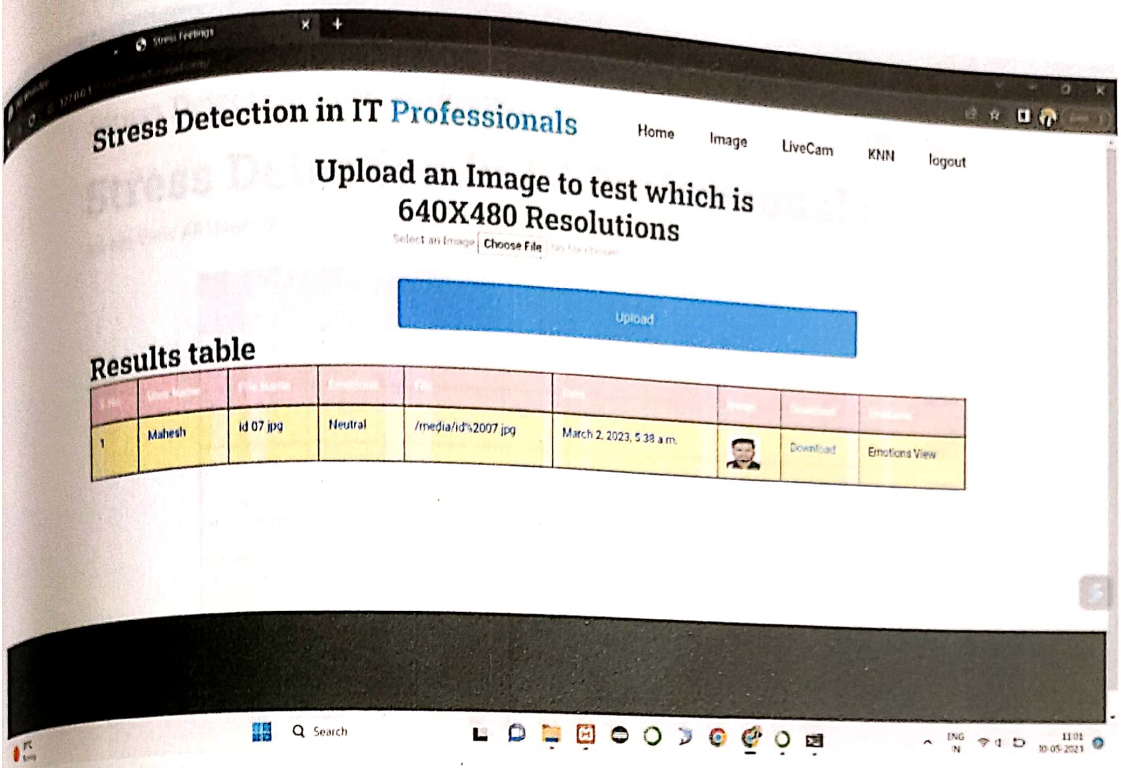
6.1 SYSTEM IMPLEMENTATION PLAN

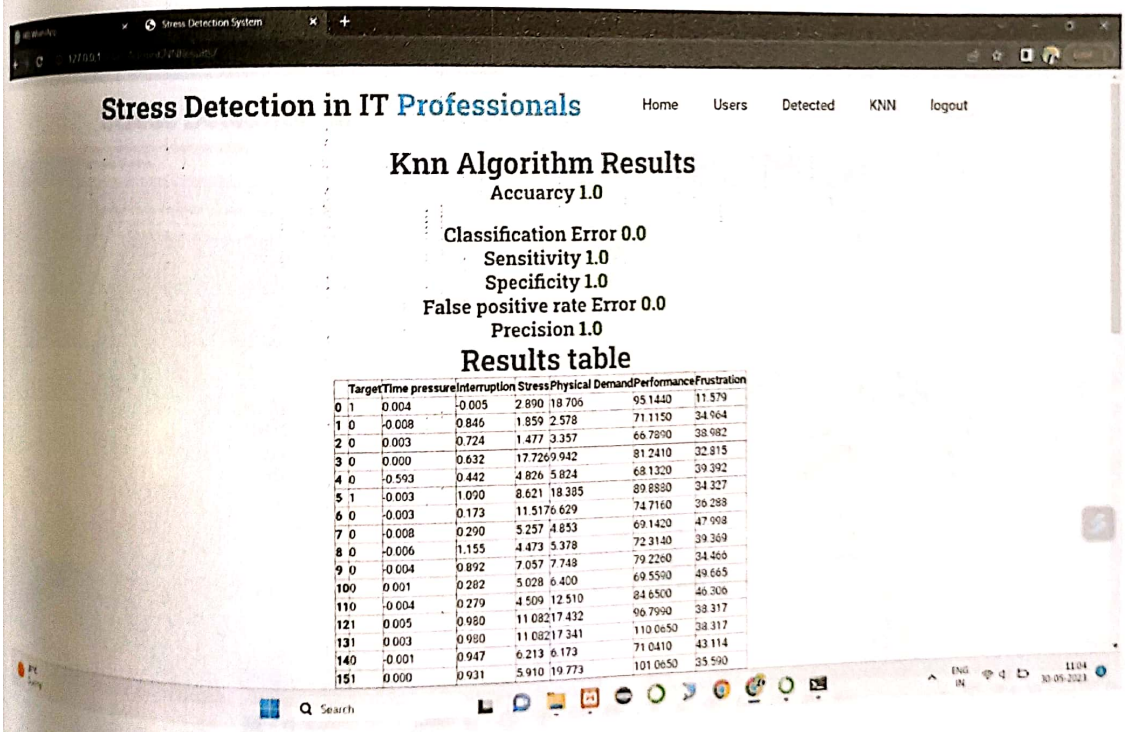
The System Implementation plan table, shows the overall schedule of tasks compilation and time duration required for each task.

Sr. No	Title	Start Date	End Date
1	Preliminary Survey	21/06/2022	24/06/2022
2	Introduction and Problem Statement	26/06/2022	01/08/2022
3	Literature Survey	2/08/2022	23/08/2022
4	Literature Survey	23/08/2022	27/08/2022
5	Software Requirement and Specification	28/09/2022	11/10/2022
6	System Design	18/10/2022	17/11/2022
7	Partial Report Submission	22/10/2022	23/11/2022.
8	Architecture Design	12/12/2022	27/12/2022
9	Implementation	30/01/2023	28/02/2023
10	Deployment	13/03/2023	28/03/2023
11	Testing	01/03/2023	21/03/2023
12	Paper Publish	11/03/2023	13/03/2023
13	Report Submission	26/05/2023	1/06/2023

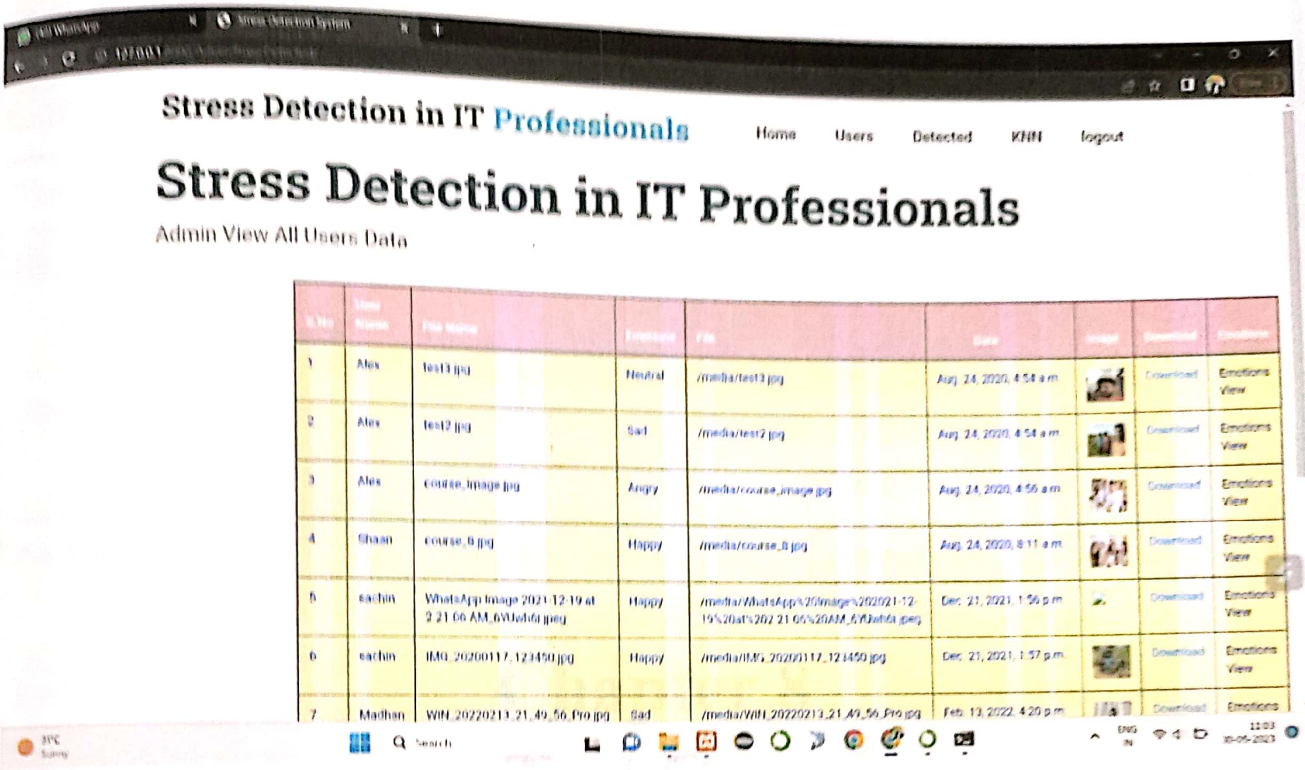
Chapter 7
Result



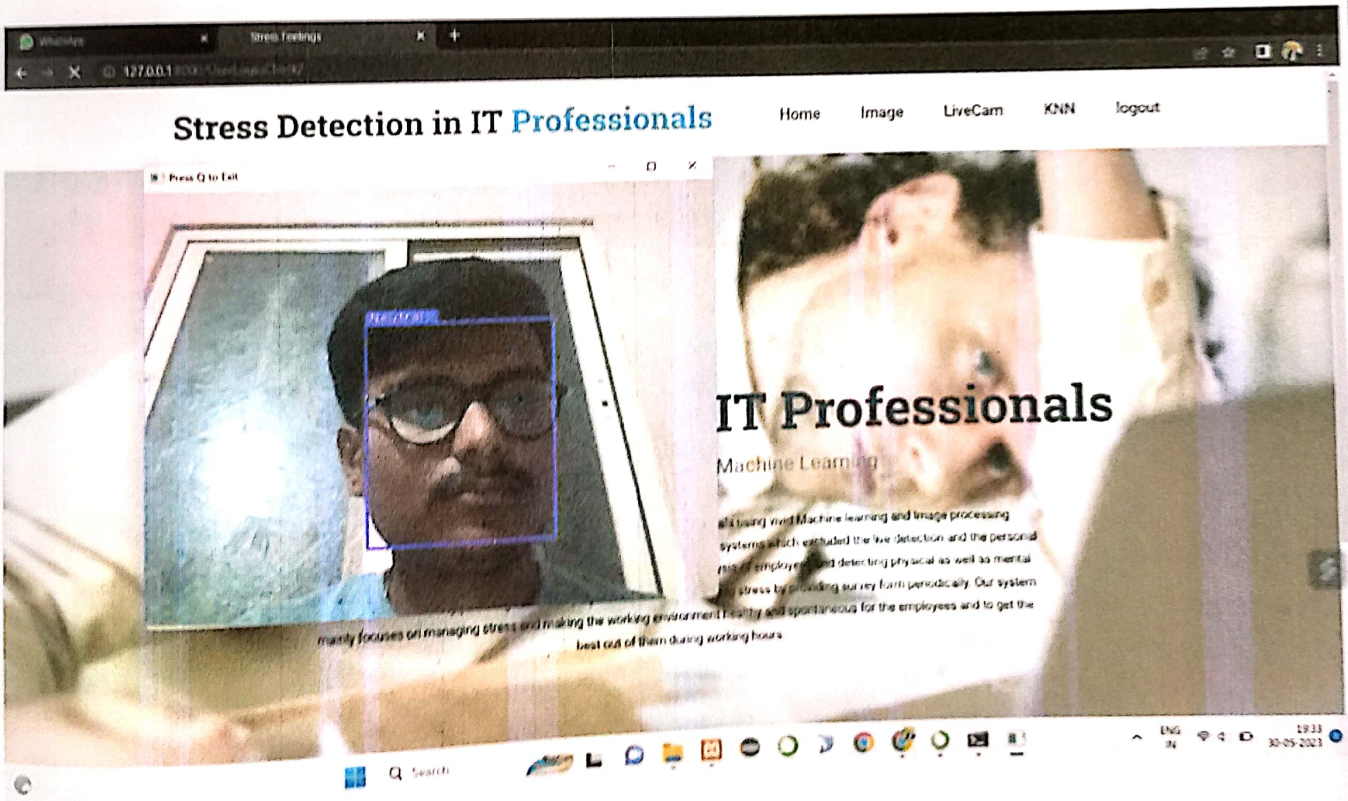




	Target	Time pressure	Interruption	Stress	Physical Demand	Performance	Frustration
0	1	0.004	-0.005	2.890	18.706	95.1440	11.579
1	0	-0.008	0.846	1.859	2.578	71.1150	34.964
2	0	0.003	0.724	1.477	3.357	66.7890	38.982
3	0	0.000	0.632	17.726	9.942	81.2410	32.815
4	0	-0.593	0.442	4.826	5.824	68.1320	39.392
5	1	-0.003	1.090	8.621	18.385	89.8880	34.327
6	0	-0.003	0.173	11.517	6.629	74.7160	36.288
7	0	-0.008	0.290	5.257	4.853	69.1420	47.998
8	0	-0.006	1.155	4.473	5.378	72.3140	39.369
9	0	-0.004	0.892	7.057	7.748	79.2260	34.466
100	0	0.001	0.282	5.028	6.400	69.5590	49.665
110	0	-0.004	0.279	4.509	12.510	84.6500	46.306
121	0	0.005	0.980	11.082	17.432	96.7990	38.317
131	0	0.003	0.980	11.082	17.341	110.0650	38.317
140	0	-0.001	0.947	6.213	6.173	71.0410	43.114
151	0	0.000	0.931	5.910	19.773	101.0650	35.590



S.No	User Name	File Name	Emotions	File	Date	Image	Download	Emotions
1	Alex	test3.jpg	Neutral	/media/test3.jpg	Aug. 24, 2020, 4:54 a.m.		Download	Emotions View
2	Alex	test2.jpg	Sad	/media/test2.jpg	Aug. 24, 2020, 4:54 a.m.		Download	Emotions View
3	Alex	course_image.jpg	Angry	/media/course_image.jpg	Aug. 24, 2020, 4:56 a.m.		Download	Emotions View
4	Shaan	course_6.jpg	Happy	/media/course_6.jpg	Aug. 24, 2020, 8:11 a.m.		Download	Emotions View
5	sachin	WhatsApp Image 2021-12-19 at 2.21.06 AM_6WJehfd.jpeg	Happy	/media/WhatsApp%20Image%202021-12-19%20at%202.21.06%20AM_6WJehfd.jpeg	Dec. 21, 2021, 1:56 p.m.		Download	Emotions View
6	sachin	IMG_20200117_123450.jpg	Happy	/media/IMG_20200117_123450.jpg	Dec. 21, 2021, 1:57 p.m.		Download	Emotions View
7	Madhan	WIN_20220213_21_49_56_Pro.jpg	Sad	/media/WIN_20220213_21_49_56_Pro.jpg	Feb. 13, 2022, 4:20 p.m.		Download	Emotions



Chapter 8
Test Case

Test Cases:

1. GUI Testing :

Test Cases	Expected result	Final result
Home tab	To navigate on home page	Sucessfully navigate on home page
User tab	To navigate on user login page	Successfully navigate on user login page
Admin tab	To navigate on admin login page	Successfully navigate on admin login page
Registration tab	To navigate on registration login page	Successfully navigate on registration page

2. Login Testing:

Test Case ID	Test Case	Test Case I/P	Actual Result	Expected Result	Test case criteria(P /F)
001	Enter the wrong username or password and click on login button.	Username or password	Error occurred	Error Should occur	P
002	Enter the correct username or password and click on login button.	Username or password	Accept	Accept	P

3.Registration Test Case

Test Case ID	Test Case	Test Case I/P	Actual Result	Expected Result	Test case criteria(P /F)
001	Enter the incorrect username, login id, password, mobile no, email, locality, address ,city, state	Number, character	Error occurred	Error Should occur	P
001	Enter the correct username, login id, password, mobile no, email, locality, address ,city, state.	Character, number	Accept	Accept	P
002	Enter the invalid email id format in email id field.	ram@gmail,com	Error occurred	Error Should occur	P
002	Enter the valid email idformat in email id field.	ram@gmail.com	Accept	Accept	P
003	Enter the invalid digitno in phoneno field.	87954125	Error occurred	Error Should occur	P
003	Enter the valid digit noin phone no field.	9874561230	Accept	Accept	P

Chapter 9

Conclusion

Conclusion:

Our proposed solution is machine learning based with face detection which allows to capture the face of person and detect different emtions levels of person like Happy, Angry, Neutral and Sad. It helps to avoid breakdown tendency of individuals. We use system camera to detect person face using Haar Cascade algorithm. The person face expression images use as dataset which will gives results that shown beat-to-beat accuracy of person expressions.

Chapter 10

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Chapter 11

Future Scope

❖ **Enhanced Security:**

Login combined with OTP can significantlyenhance the security of system. This combination ensures that only authorized individuals can participate, minimizing the risk of fraud or impersonation.

❖ **Increased Accessibility:**

Stress detection systems can improve accessibility for individuals who may have difficulty or not able to have individual to share their feeling with. Face recognition technology can facilitate stress identification from any location with an internet connection.

❖ **Cost and Efficiency:**

Implementing stress detection system can potentially reduce cost associated with problems that appears later on after person goes into physical damage, mentally depressed phase. Additionally, the use of face recognition and OTP can streamline the verification process, reducing the time and effort requiredfor authentication.

❖ **Trust and Transparency:**

The integration of face recognition and OTP can enhance trust and transparency in the process. By providing an additional layerof authentication, these technologies can increase trust level of users to correctly analyze their expressions and gives related result to them for further treatments.

Chapter 11

APPENDIX

PAPER PUBLISHED / CERTIFICATES

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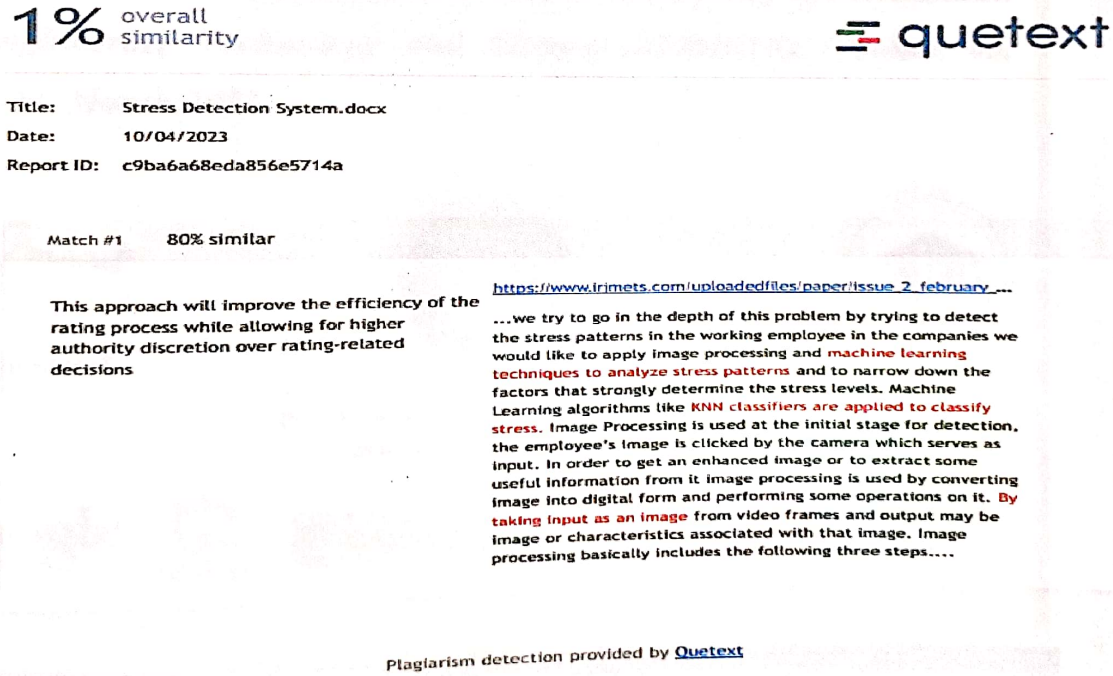

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This approach will improve the efficiency of the rating process while allowing for higher authority discretion over rating-related decisions

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...we try to go in the depth of this problem by trying to detect the stress patterns in the working employee in the companies we would like to apply image processing and machine learning techniques to analyze stress patterns and to narrow down the factors that strongly determine the stress levels. Machine Learning algorithms like KNN classifiers are applied to classify stress. Image Processing is used at the initial stage for detection, the employee's image is clicked by the camera which serves as input. In order to get an enhanced image or to extract some useful information from it image processing is used by converting image into digital form and performing some operations on it. By taking input as an image from video frames and output may be image or characteristics associated with that image. Image processing basically includes the following three steps....

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