B.M.S. COLLEGE OF ENGINEERING

(Autonomous Institute, Affiliated to VTU)
Bull Temple Road, Basavanagudi, Bengaluru - 560019

A Capstone Project Report on

"MENTAL HEALTH CARE APPLICATION"

Submitted in partial fulfillment of the requirements for the award of degree

BACHELOR OF

ENGINEERING IN

INFORMATION SCIENCE AND ENGINEERING

By

KUNALA SRI MANASWINI –

1BM18IS049

RIYA SURESH CHAPLOT –

1BM18IS082

Under the
guidance of Prof.
PREETHA S
ASSISTANT PROFESSOR

B.M.S. COLLEGE OF ENGINEERING

(Autonomous Institute, Affiliated to VTU)
Bull Temple Road, Basavanagudi,
Bengaluru – 560019

Department of Information Science and Engineering

C E R T I F I C A T E

This is to certify that the project entitled "**MENTAL HEALTH CARE APPLICATION**" is a bona-fide work carried out by **KUNALA SRI MANASWINI (1BM18IS049) and RIYA SURESH CHAPLOT (1BM18IS082),** and in partial fulfillment for the award of degree of Bachelor of Engineering in **Information Science and Engineering** from **Visvesvaraya Technological University, Belgaum** during the year **2021-2022**. It is certified that all corrections/suggestions indicated for Internal Assessments have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the Bachelor of Engineering Degree.

Preetha S	**Dr. P. Jayarekha**	**Dr. S. Muralidhara,**
Assistant Professor	**Professor and HOD**	**Principal**

Examiners

Name of the Examiner	**Signature of the Examiner**
1.	
2.	

DECLARATION

KUNALA SRI MANASWINI (1BM18IS049), RIYA SURESH CHAPLOT (1BM18IS082), students of B.E. Information Science and Engineering,

B.M.S. College of Engineering, Bangalore - 19, hereby declare that the capstone project entitled **"MENTAL HEALTH CARE APPLICATION"** is an authentic work carried out under the supervision and guidance of **Prof. Preetha S**, Assistant Professor, Department of Information Science and Engineering, B.M.S. College of Engineering, Bangalore. We have not submitted the matter embodied to any other university or institution for the award of any other degree.

Place: BENGALURU

Date: 6TH January 2022

Name	USN	Signature
Kunala Sri Manaswini	1BM18IS049	……...
Riya Suresh Chaplot	1BM18IS082	……

ACKNOWLEDGEMENT

The satisfaction that accompanies the successful completion of this Capstone Project Phase-2 would be incomplete without the mention of the people who made it possible through constant guidance and encouragement.

We would take this opportunity to express our heart-felt gratitude to **Dr. B. S. Ragini Narayan**, Chairperson, Donor Trustee, Member Secretary & Chairperson, BMSET. **Dr. P. Dayananda Pai,** Member Life Trustee, BMSET and **Dr. S. Muralidhara**, Principal, B.M.S. College of Engineering for providing the necessary infrastructure to complete this Capstone Project Phase-2.

We wish to express our deepest gratitude and thanks to **Dr. P. Jayarekha,** Head of the Department, Information Science and Engineering and the Project Coordinator's **Prof. Yogesh N** and **Prof. Preetha S** for their constant support.

We wish to express sincere thanks to our guide **Prof. Preetha S, Assistant Professor,** Department of Information Science and Engineering for helping us throughout and guiding us from time to time.

A warm thanks to all the faculty of the Department of Information Science and Engineering, who have helped us with their views and encouraging ideas.

Kunala Sri Manaswini (1BM18IS049)

Riya Suresh Chaplot (1BM18IS082)

ABSTRACT

In the globe, depressive disorders are the biggest cause of non-fatal health issues (7.5 percent of all years lost due to disability-YLD). In India, offering adequate mental health treatment remains a challenge due to a severe dearth of competent caregivers.To overcome the present gaps in mental health care services, the potential of digital technology and smart phone apps must be fully used. Assessment and outcome monitoring are critical for successful mental disorder diagnosis and treatment. Traditional techniques of gathering social, functional, and behavioural data are limited to what patients tell their doctor at regular intervals. As a result, these figures are usually erroneous representations of day-to-day operations, impacted by self-reporting biases.Web/smartphone applications technology (mobile apps for smartphones, activity wristbands) can alleviate traditional evaluation difficulties by providing real-time information on patient symptoms, behaviour, and functioning.

TABLE OF CONTENTS

CHAPTER-1

INTRODUCTION

1.1 Overview

Mental health is a state of well-being in which a person is aware of his or her own strengths, is able to deal with everyday problems, is more effective and efficient, and gives back to society. Our mental health includes our emotional, mental and social well-being. It affects the way we think, feel and act. It also influences how we deal with stress, build relationships, and make decisions. Mental health is important at any age, including friendship, adolescence, and adulthood. When you have mental health problems, your thoughts, feelings, and behavior may change over time. Mental health can be defined as "the absence of mental illness or can be defined as a state of existence that encompasses biological, psychological or social factors that affect a person's mental state and ability to function in the environment." A person's mental health is determined by emotional, mental and social well-being. Good mental stability is needed in relationships, personal and emotional well-being, and contributing to the community or society.

The problem of poor mental health has increased rapidly in recent years and as a result the need to improve mental stability has increased. The traditional methods of promoting emotional and mental well-being were to engage in every meeting with psychologists or other health professionals. .But this problem has increased dramatically in the last few years and it is important to take the task of reducing costs.As a result, there has been a growing interest in mobile applications to improve a person's mental health and reduce stress.Depression, it is the foundation of emotions, thinking, communication, learning, firmness, and confidence. Good mental health is essential in relationships, personal and emotional well-being, and contributing to the community or society. Many people with a mental illness are reluctant to talk about their problems. On the other hand, mental illness is not something to be ashamed of. It is a medical condition, such as heart disease or diabetes. On the other hand, mental illness may be treated.

Treatment is available to help people successfully manage mental health conditions, and our knowledge of how the human brain works is constantly evolving. Mental illnesses come in many forms and forms such as other phobias that are mild and have little effect on daily life (rare fears). Some mental health concerns are serious enough to require hospitalization.

According to various studies, Smartphone apps are becoming increasingly popular as a self-care tool. Ease of use, accessibility, and convenience have contributed to the popularity of apps. The number of smartphone users has grown from 2.5 billion in 2016 to 3.5 billion by 2020 .Mobile health (mHealth) applications on smartphones have grown in popularity over the years .People can use mHealth apps to get continuous feedback about their health status and progress.Due to the increase in awareness and popularity of mHealth applications, we have been able to build a smartphone application focused on mental health.

As mental health awareness grows day by day, it is not uncommon for people to seek simple and easy ways to manage themselves better. While treatment may seem like a long and arduous process for many, a simple, unobtrusive and step-by-step solution can appeal to many. However, most physicians agree that these applications cannot be used in place of treatment. However, it may well be a good way to deal with immediate anxiety.

Physical and mental health are the consequence of a complex interaction between a number of individual and environmental factors, including:

- Illness and disease in the family/genetics
- Personality traits and health habits (e.g., smoking, exercise, substance use)
- Stress levels in the home and at work
- Toxicological exposure
- Traumatic exposure
- Personal circumstances and background
- Access to assistance (e.g., timely healthcare, social supports)
- Coping abilities

Few examples that can all have a negative impact on mental health are as follows:-

- Working long hours in tough conditions
- Caring for a chronically ill relative
- Unemployment,
- Underemployment
- Poverty

Emotional and mental health are important because they affect our thoughts, behavior and emotions and are an important factor in our lives. Emotional well-being can improve productivity and efficiency in careers such as work, education, and care. Our mental health depends on the way we make decisions, the way we deal with stress, and the way we interact with people.

Our study aims to provide psychotherapy and reduce stress and anxiety for participants. It covers a wide range of ways to track a person's level of stress, and then, after examining the level of stress, offers a variety of stress relief tests.

As mental health awareness grows day by day, it is not uncommon for people to seek simple and easy ways to manage themselves better. While treatment may seem like a long and arduous process to many, a simple, unobtrusive and step-by-step solution can appeal to many. However, most physicians agree that these applications cannot be used in place of treatment. However, it may well be a good way to deal with immediate anxiety.

Because there is a link between physical health, mental health performance may be part of an app designed to address other health concerns. Welldoc, a platform for the treatment of chronic diseases such as diabetes and high blood pressure, has recently introduced mental health solutions.

We can divide mental health applications into three groups. Psychiatric applications are available. Psychological development applications are aimed at improving the mental health of people. Mental health applications can also be targeted generalists for anyone with a mental health problem. Let’s take a look at the differences between the apps in these three categories.

1.2 Motivation

People all over the world are suffering from depression, behavioral disorders, and mental illness. Many cannot afford traditional medicine, are concerned about the stigma attached to office treatment, or are unable to access treatment for a variety of reasons. The coronavirus epidemic has identified deep gaps in the healthcare system. People in all walks of life are feeling lonely, lonely, and frustrated. To overcome the problem mentioned above we have taken this article as a mental health app.

MHealth applications have proven to be promising and popular solutions to chronic diseases. According to a Pew Research Center study, more than two-thirds (64 percent) of patients used mHealth applications in 2015. Various studies have suggested that the number may increase dramatically. As the number of patients using mHealth applications increases, researchers should first evaluate the effectiveness of the application .

According to the German research team, although mHealth applications have not yet shown a change in behavior, they do identify a patient's intention to do better. A population-based study of 4,144 patients aged 35 and over was conducted by researchers.The survey collected data on social status, the presence of chronic conditions, health habits, quality of life, health education, and previous and current use of health information technology (i.e. smartphones and mHealth apps) .

In total, 61.25 percent of respondents said they used a smartphone. These smartphone users were young, did a lot of research online, and probably worked full-time and had college degrees than non-smartphone users.

1.3 Objective

- To make an application that facilitates users to deal with anxiety and stress on their own with help of AI based applications.
- Prediction of mood using Facial Recognition , journals and mood charts
- Depending on the level of depression and anxiety of the user the system recommends appropriate mindfulness methods like Cognitive games,Sleep trackers,eating habits tracker,like minded communities,random pair up calls etc.
- The application uses the CBT approach to help users deal with their negative areas.

1.4 Scope

Mental health nursing is a specialized field of nursing practice that enhances mental health through screening, diagnosis, and treatment using nursing, neurobiological, social psychology and research data as a science and intentional use as a skill. Human reactions to mental illness. Health problems and mental illness are common.

Psychiatrists provide comprehensive, patient-centered psychiatric care throughout the progress of care in many settings. From illness to health, there is a continuation of treatment levels. The primary goal of ongoing treatment is to help the patient achieve the best possible performance in an area with as little limitations as possible. Promoting mental health, prevention of mental health problems, mental health care and treatment, and rehabilitation of mental health professionals. important parts of the practice of mental nursing.

As the country develops as expected, we will have more resources to use in our health care needs - we will see the development and availability of more health care facilities, the use of new health care technologies, and more people using this to their advantage. from this and have more health and contribute to wealth creation pa pa This will result in significant improvements in the mental health care industry as well, because one in five people who need health care will be able to access and manage it. .If a country misses an opportunity and develops at a very low level, we look at another situation. If we assume that we are not benefiting from the demographic dividend, which means that more workers are left to fend for themselves and are no longer productively distributed, and the world misses the path to high growth, we can see inefficiency, inefficiency, and depression. a community with rising physical and mental health needs that are not adequately supported by support systems.
This will create a vicious decline, as a large number of affected people will put pressure on existing services, and the entire social arena will move towards a critical stage, perhaps leading to worse living conditions.

We would see a catastrophic economic and social catastrophe if one fed on the other. In short, the scope of the state of mental health in India is very attractive, with a large number of resource requirements, development needs, and new tools, methods, strategies, practice, processes, and innovations to be introduced, helping billions of people to improve and contribute more to new India.

The work of a psychiatrist covers a wide range of real and potential mental health problems, including:

- Well-being, mental and physical health are guaranteed.
- Mental disease prevention.
- Illness, pain, incapacity, and loss can cause emotional stress or crisis.
- Functional abilities are harmed as a result of mental health issues.
- Mental health issues cause changes in thought, perception, and communication.
- Behavioural and mental disorders that might endanger oneself or others.
- Changes in self-image and body image, developmental issues, shifts in life activities, or psychological changes can all cause physical symptoms.
- Changes in physiological state are linked to psychological problems.
- Complications or side effects from psychopharmacological therapies and other treatments
- Problems and dependency associated with alcoholism and substance abuse
- The impact of interpersonal, organisational, or other environmental factors on mental health People, families, and communities are affected.
- Today's mental health care goes beyond the doctor's office. Psychiatric nurses must be certified and clinically competent, sensitive to the social context.

1.5 Existing System

Existing mental health apps are primarily based on linking users and psychiatrists / physicians to expensive and time-consuming online medical sessions.

While therapists have a responsibility to keep your information confidential, mental health services do not require direct contact with another person, which may increase the anxiety or similar symptoms that someone may be seeking treatment for. Usually these apps have an excessive survey that leads to frustration.

Merits Of Existing System:

- Taking faster doctor appointments and smooth online therapy sessions.
- Gives user the ability to track daily progress

Demerits Of Existing System:

- Therapy sessions are expensive and time consuming
- Complex interface that users find difficult to understand
- Doesn’t provide instant remedy for mental health

1.6 Proposed System

PHQ-9 school will be used as the first step in identifying depressed users. This questionnaire consists of nine items associated with nine diagnostic methods for depressive disorders as outlined in the Diagnostic and Statistical Manual of Mental Disorders. Each question includes four ordinal answers with values ranging from 0 to 3; the more points, the more stress.

Example:

Question: Feeling bad about yourself - or that you are a failure or have let yourself or your family down?

- Not all days
- Several days
- More than half the days
- Nearly everyday

1. We will be using facial recognition (Deep learning) for mood monitoring of the user. Convolutional Neural Networks can be used to achieve this.
2. NLP can also be used to pick out some dull or negative keywords that the user usually uses to document his/her thoughts in the journal option provided by application and categorise them as different causes leading to stress and anxiety. (Text Sentiment Analysis)
3. Based on final stress level evaluation, the user receives appropriate CBT techniques(researched) to manage stress/anxiety on their own.

CHAPTER-2

PROBLEM STATEMENT

2.1 Problem Statement

In today's world, most people are at a loss as to where to start learning about improving their mental health, and access to professional treatment is also difficult because of the costs and unavailability, as well as family attitudes. We hope to contribute to building a safe space for everyone who needs a supportive and understanding community, as well as providing comprehensive mental health advice such as reducing stigma, self-care, additional treatment and support, and professional help.

2.2 Motivation

People all over the world are suffering from depression, behavioral disorders, and mental illness. Many cannot afford traditional medicine, are concerned about the stigma attached to office treatment, or are unable to access treatment for a variety of reasons. The coronavirus epidemic has identified deep gaps in the healthcare system. People in all walks of life are feeling lonely, lonely, and frustrated. To overcome the problem mentioned above we have taken this article as a mental health app.

MHealth applications have proven to be promising and popular solutions to chronic diseases. According to a Pew Research Center study, more than two-thirds (64 percent) of patients used mHealth applications in 2015. Various studies have suggested that the number may increase dramatically. As the number of patients using mHealth applications increases, researchers should first evaluate the effectiveness of the application .

According to the German research team, although mHealth applications have not yet shown a change in behavior, they do identify a patient's intention to do better. A population-based study of 4,144 patients aged 35 and over was conducted by researchers.

The survey collected data on social status, the presence of chronic conditions, health habits, quality of life, health education, and previous and current use of health information technology (i.e. smartphones and mHealth apps) .

In total, 61.25 percent of respondents said they used a smartphone. These smartphone users were young, did a lot of research online, and probably worked full-time and had college degrees than non-smartphone users.

2.3 Objectives

- Making an app that allows users to deal with worry and stress on their own with the support of an AI-based app.
- Facial Recognition, diaries, and mood charts are used to predict mood.
- The system proposes suitable mindfulness approaches based on the user's degree of sadness and anxiety, such as cognitive games, sleep monitors, eating habits trackers, like minded groups, random pair up calls, and so on.
- The programme employs a cognitive behavioural therapy (CBT) method to assist users in dealing with their negative aspects.

CHAPTER-3

LITERATURE SURVEY

[1]Development of the web application My Stress Control—Integrating theories and existing evidence [2018]

Its purpose is to explain how you can create a proven, customized, collaborative web-based stress management web application, and how to measure the complexity of system usage.

Evidence from stress management studies, behavioral modification, and web-based therapies was used to create a theoretical framework and content. The next step is for the professional and user to build and validate the web application. Finally, about 14 buyers were tested.

The online application is based on sound detection, according to a study. Introduction, psychological education, anticipation, stress management activities, lifestyle improvement, and nutrition management are among the 12 modules. Self-monitoring, goal setting, goal analysis, vision development, and finding the cause of change are effective ways to change behavior. People have trouble finding a way to use this program, depending on performance tests.

To prevent stress-related health problems, improved evidence-based control measures are needed. However, there is no explanation in the literature on how to go from idea to product ready, taking into account local knowledge about content, customization, communication, and individual feedback. As a result, the purpose of this study was to describe the development of a performance-based, personal, collaborative web application for self-management of work-related stress.

[2]Artificial Intelligence for Mental Health and Mental Illnesses: an Overview [2019]

Artificial intelligence (AI) technology has both immense promise and significant concerns in the field of mental health treatment. This article includes an introduction of artificial intelligence (AI) and its present uses in healthcare, as well as a review of recent original research on AI in mental health and a discussion of how AI may augment medical treatment while taking into account existing limits, research gaps, and ethical considerations.

EHRs,mood rating scales, brain imaging data, unique monitoring methods (e.g., smartphone, video), and social media platforms were used to divide mental health diseases such as depression, schizophrenia, and suicide thoughts and attempts in 28 studies on AI and mental health, according to recent findings

The majority of this study should be viewed as proof of study demonstrating the feasibility of using machine learning (ML) algorithms to address mental health issues, as well as which algorithms produce the greatest outcomes.As AI techniques improve, it will be possible to assist mental health practitioners in redefining mental illnesses more objectively than the DSM-5 currently allows, identifying these illnesses at an earlier or prodromal stage when interventions may be more effective, and personalisation treatments based on an individual's unique characteristics.

As there are advancements in AI techniques, it will be possible to assist mental health practitioners in redefining mental illnesses, identifying these illnesses at an earlier or prodromal stage when interventions may be more effective, and personalising treatments based on an individual's unique characteristics. However, caution is needed to prevent overinterpreting preliminary findings, and additional effort is needed to bridge the gap between AI in mental health research and clinical care.

[3]Enriching Mental Health Mobile Assessment and Intervention with Situation Awareness [2017]

Complex algorithms that can detect a user's location may now be performed on mobile devices, which could aid in the treatment of mental illnesses. The purpose of this work was to describe a solution for MoodBuster, that is used to collect self-assessments from depression patients. It contains a fuzzy inference engine that uses context data from embedded sensors in mobile devices to detect medical events. Situations are produced by the patient and the mental health professional in partnership, and they may mirror the patient's regular routine (for example, "studying," "at work," or "working out").

Patients' mental state self-assessments are obtained using context awareness by MoodBuster at the relevant periods. It also captures and summarises patient circumstances so that mental health professionals may consult them. A pilot study was carried out to assess user satisfaction with the approaches for defining and recognising situations. On both criteria, this trial showed that it was well-received. The fuzzy engine's accuracy in inferring conditions was tested in a second experiment. The findings of the second experiment demonstrated that the fuzzy inference engine is capable of accurately identifying circumstances.

A person's emotional, psychological, and social well-being are reflected in their mental health. According to a World Health Organisation survey, India is the world's most depressed country. As a result, the goal is to create a complete solution for detecting and treating mental health concerns. Using different analytical and psychological approaches, this study attempts to design an application to follow user behaviour, both online and offline, in order to understand and diagnose potential mental health concerns. Individuals just over the age of 18 who fall into the working class would be the target consumers of this programme. Following identification, the user is advised to make appropriate changes to his routine and behaviour that will result in a healthier lifestyle.

[4] Big Data Analytics and AI in Mental Healthcare [2019]

Mental disorders cause a lot of pain and suffering; depression alone will affect 11% of the world's population. Artificial Intelligence (AI) and big data technology have many promises in mental health to make treatment choices your own. However, unlike similar programs in other medical fields, there are a number of barriers in the mental health sector that now prevent this technology from being used. In mental health, there are a few widely used or certified biomarkers, which force heavy reliance on questionnaire data from patients and physicians, as well as the definition of emerging symptoms such as digital phenotyping.

Furthermore, unlike other conditions such as cancer, where physicians and researchers often rely on pathological research to confirm a diagnosis, the diagnosis has no 'gold standard.' This chapter discusses the great opportunities, limitations, and strategies for using AI and big data to improve mental health care.

Mental illness is a disorder that is affecting more and more people; depression alone will affect 11% of the world's population. The use of artificial intelligence (AI) and big data technology in mental health has many promises for personal treatment, predicting, monitoring relapses, detecting and helping to prevent mental health conditions before they reach clinical-level symptoms, and even bringing some. for medical treatment.

[5]A Service-Oriented Architecture for Web Applications in e-mental health: two case studies [2015]

E-mental health applications have recently gained popularity as a result of using advanced technology to maximize benefits over traditional medicine. First, mental health applications are measurable, whereas traditional psychotherapy is based on individual interactions between patient and physician. Second, in ways that paper-based medical data cannot, electronic data formats can help interact. Third, the flexibility of the web application ensures that any changes to the care system available by the app will benefit all users immediately. The online questionnaire is a major source of medical data in the field of mental health, and most of the applications on this site are dedicated to identifying, completing, and managing these questions.

A flood of new apps has appeared in recent years, with many of them being designed from the ground up and working on their own. We use two case studies in this study to develop and enhance the standard architecture of e-mental health applications. These state-of-the-art studies include HowNutsAreTheDutch and Leefplezier, two e-mental health apps with a total of about 13,000 users. By removing features from reusable Service-Oriented Architecture links, we may improve data authentication while minimising app-specific code, allowing faster development of e-mental health applications.

[6]Ensuring patient and public involvement in the transition to AI-assisted mental health care: A systematic scoping review and agenda for design justice [2021]

Artificial intelligence (AI), sometimes called machine learning algorithms and big data analysis, is being developed and used worldwide. The patient and community involvement in the transition to AI-assisted health care is critical to designing justice based on the diverse needs of patients. In order to drive future development of PPI in AI-assisted health care, researchers look at community involvement in vision, design, development, testing, implementation, use, and evaluation of AI mental health technologies.

Many ethical challenges and the potential for PPI development in relation to AI technology arise due to the health-rich data environment. Further research is needed to understand effective ways to engage the public in the context of AI technology, to assess stressful ethical and security issues, and to develop new PPI approaches at all stages of the technology development process, from conceptual construction to final technical updates to practice. This agenda can be guided by the principles of design justice. The methods used are: systematic search of the Web of Science (all information sites) and Ovid (MEDLINE, PsycINFO, Global Health, and Embase); (ii) hand thinking (reference and quotation tracking); (iii) gray books; and (iv) an analysis of the teaching theme, which was evaluated in a workshop with health researchers.

“These are the three main themes highlighting the key issues and the development of PPI in Ai assisted by mental health care: (a) the use of AI technology in mental health care; (b) ethics of community involvement in AI-assisted care; and (c) public participation in the planning, development, implementation, testing and dissemination of AI technology.

The new data-rich health environment raises a number of ethical concerns and the potential for PPI development in relation to AI technology. Further research is needed to identify effective mechanisms for public participation in the context of AI technology, to investigate critical ethical and security issues, and to create new PPI approaches at all levels, from conceptualization to final technical evaluation.

[7] A Mobile Application for Mental Health: Development and Usability evaluation with System Usability Scale [2021]

The COVID-19 epidemic is wreaking havoc on the mental health of people in affected countries. Despite the fact that a few digital solutions are designed to combat the COVID-19 epidemic, there has been little focus on establishing any digital tools that are useful in providing psychological support, especially in Bangladesh. As a result, the objectives of the research are to identify user needs that are critical to building a digital solution. To achieve these goals, a survey application was conducted with 37 people using an interview to determine the requirements for a mobile application.
Second, the mobile app is made up of features such as mental health-assisted mental health support through AI-based chat, virtual reality video and audios, support for medical establishments and other technologies in the field of mental health services, and a list of trusted media sources. Finally, the functionality and performance of the application was assessed using the System User Scale (SUS). The application is useful and helpful in increasing mental health during the outbreak of COVID-19, depending on the results of experimental studies.
“App theory was based on the wheel of behavior change, as well as the power, opportunity, and motivation of the behavior change system and the Behavior Change Technique Taxonomy (version 1). In addition, the evidence of scientific literature has driven the development process. A duplicate method was used to ensure the usefulness of the model. We have used the System Usage Scale for informal conversations with targeted individuals. We have used System User Scale definitions and theme analyzes to identify application features that have increased usability and usability.

[8].Bhalerao, Mrunal, et al. "Balanced: An Application To Improve Mental Health." ***ITM Web of Conferences*****. Vol. 40. EDP Sciences, 2021.**

Mental health reflects a person's emotional, mental and social well-being. The idea is to develop comprehensive solutions to diagnose and treat mental health problems. This article aims to develop an application that tracks user behavior both online and offline in order to understand and identify potential mental health problems using a variety of analytical and psychological methods. The intended users of this app are people 18 years of age or older who fall into the category of employees. Once identified, users recommend appropriate behavioral and behavioral changes that will lead to better quality of life. Getting a mental illness is difficult because a wrong diagnosis can have disastrous consequences. The Android app therefore takes the necessary steps to diagnose and treat mental health problems.

A person's emotional, mental and social health is reflected in his mental health. According to a study by the World Health Organization, India is the most depressed country in the world. As a result, the goal is to develop a comprehensive solution to diagnose and treat mental health problems. Using a variety of analytical and psychological methods, this study attempts to design an application to track user behavior, both online and offline, in order to understand and identify potential mental health concerns. People over the age of 18 who enter the workforce are the ones who are meant to use this program. Once identified, the user is advised to make appropriate changes in his or her behavior and behavior that will lead to a healthier lifestyle.

[9] Kim, Jina, Daeun Lee, and Eunil Park. "Machine Learning for Mental Health in Social Media: Bibliometric Study." ***J Med Internet Res*** **23.3 (2021): e24870**.

Reference information. The social networking site provides a more accessible and time-consuming way to communicate with people with a mental disability compared to face-to-face meetings with health care providers. More recently, machine-based (ML) research based on mental health research using large amounts of social media data has been the focus.

Purpose: We aim to provide textual analysis and style discussions on ML mental health research on social media. To calculate the source, country, organization, author and performance of a research topic, we analyze publishing distribution and use a keyword search network to identify trends in the region. The research method of the quote from previous research is also very detailed.

Method: Significant efforts have been made to utilize AI technology in healthcare services in managing physical health problems, including several medical institutions, researchers, organizations, and mental health as a rapidly growing social problem. Although mental health is a complete problem, its availability and exposure are a challenge. The World Health Organization estimates that billions of people worldwide suffer from some form of mental illness. In addition, 264 million people worldwide suffer from depression, which is a common mental disorder. However, more than 75% of people in less developed countries (i.e., low-income countries) with dementia do not receive treatment. Many experts also point out that people with dementia tend to choose to share their personal information and seek help to reduce their anxiety about online channels rather than having medical providers such as counselors or therapists.

Result: A total of 565 related articles published from 2015 to 2020. Over the past five years, the publication of highly productive computer science notes and online medical research journals has continued to grow. Scopus-based source and Web Science records. We also tested a well-known operating system using the data resources provided in the publishing series.

[10] Kamdar, Maulik R., and Michelle J. Wu. "PRISM: a data-driven platform for monitoring mental health." ***Biocomputing 2016: Proceedings of the Pacific Symposium*****. 2016.**

Neuropsychiatric disorders are the leading cause of disability in the world, yet there are currently no international methods of assessing mental health. The difficulty is compounded by the fact that physicians rely on narrative and often submissive information to diagnose these diseases. Due to its hostility and discomfort, the current Mental Health Monitoring Methodology relies on DSM 5 independent standards, and advances in EEG and imaging technology have not been widely accepted. Wear technology has become a common and widely used method of collecting patient patient data.We present PRISM ((Passive, Real-time Mental Health Awareness), real-time information for mental health recognition. smartwatch with user interaction and text recording from the web application.We have demonstrated the concept by collecting basic data from 13 study studies.We demonstrate that data can be useful in assessing mental health by improving contextual features for self-assessment. allows patients and nurses to access continuous inactivity data in order to accurately diagnose and continuously monitor patients with dementia up to first.

They introduced PRISM as a novel platform that allows for the collection of a wide variety of quantitative measurements found to be associated with mental health outcomes. In addition, online communication allows patients to easily access and understand their personal data, and therefore their health status. This approach has the potential to provide both additional information about which therapies work best for patients and to make informed clinical decisions. We expect that this integrated approach to collecting and evaluating patient information will have far-reaching implications for improving mental health treatment.

[11]Hatton, Christopher M., et al. "Predicting persistent depressive symptoms in older adults: a machine learning approach to personalised mental healthcare." *Journal of affective disorders* 246 (2019): 857-860.

In the background

Depression is an important health and mental illness. Predicting the duration of symptoms of depression allows for established immunity and minimizes the impact of stress. This method offers great guessing power, and machine learning is a rapidly growing discipline. The use of a machine-learning strategy to predict duration of symptoms of depression in the elderly was evaluated.

How

An electronic study method ("extreme gradient boost") was used to predict the risk of older people developing persistent depressive symptoms for 12 months using basic demographic and psychological data from 284 patients. Traditional mathematical methods were compared with predictable performance (retrospective regression). The CASPER “management as a general” research team provided data (collaborative treatment and effective monitoring of the diagnosis of patients with low blood pressure).

The result

When it comes to forecasting, machine learning overcomes retardation (mean AUC 0.72 vs. 0.67, p0.0001). By machine learning, 89 percent of people predict that they will earn PHQ9 points over a limit of 12 months indeed. If you use a deferred item, however, the percentage is 78 percent. On the other hand, the machine learning method showed a slightly lower predictive value.

[12] Dalal, Sumit, Sarika Jain, and Mayank Dave. "A systematic review of smart mental healthcare." ***Proceedings of the 5th International Conference on Cyber Security & Privacy in Communication Networks (ICCS)*****. 2019.**

The development and application of technology in everyday life has always been accelerated. Everything will be wise because of the use of technology, from homes to cars, gadgets to industries, and so on. Universal networks, sensors or actuators, embedded devices or objects, long battery life, and internet / networks are all factors that contribute to this intelligence. Increased pressure on conventional infrastructure, access to expensive health care, and the lack of 24-hour service in rural areas all drive the use of technology in the healthcare industry. This type of medical care is highly patient-centered, and treating patients with psychiatric disorders can be challenging due to the small number of psychiatrists per patient and social stigma. . As a result, good mental health is a matter of time. We provide a Semantic, cost-effective, and time-effective solution for self-help efforts to diagnose and treat patients with depression in this paper, and discuss the current state of discipline. Google Scholar, IEEE Xplore, Science Direct, PubMed, Web Science, and other websites have been used to obtain research resources. Articles are analyzed according to the structures used in various mental health programs, as well as IoT services in the mental health environment.

“Smart healthcare systems, in general, use data from smart devices / sensors and communication platforms. Intelligent medical / sensory devices are able to detect surroundings, collect and evaluate data.Data, action, communication, and online exchange This information is paired with a patient's medical history to provide us with individual Medicare. Smart gadgets that help with disruptive actions and patient actions are casually monitored. This provides privacy concerns and looks at the patient in a natural setting, which helps to better understand his or her health status by modeling and mimicking the converted sensory data into machine-readable formats and setting it up by augmentation using data from public profiles.

[13] Weber, Silvana, Christopher Lorenz, and Nicola Hemmings. "Improving stress and positive mental health at work via an app-based intervention: a large-scale multi-center randomised control trial." ***Frontiers in psychology*** **10 (2019): 2745.**

Individuals and companies alike can use cellular health interventions (such as "apps") to address mental health concerns, and are a common way to manage stress at work. However, there is currently insufficient evidence for the effectiveness of portable health care in preventing or alleviating stress-related health issues, especially in non-medical settings. The aim of this study was to evaluate mobile medical interventions to prevent occupational stress and treatment (psychologically based on job requirements and resource models). Staff conduct evidence-based, interactive psychological training as part of a mobile health intervention to reduce stress levels by collecting additional resources. Six European organizations participated in a large randomized controlled trial using four points for six weeks to assess mental health. effects such as depression, well-being, dizziness, and insomnia. The data, which included internal reports and user testing in the application, was analyzed using a multi-step model sequence of repeated steps.

Workplace stress is still a widespread problem but not well managed. Depression, if it occurs over a long period of time, can cause a variety of mental and physical health problems affecting both the individual and the business. Persistent stress without adequate rest can lead to physical fatigue, depression-related illnesses, and psychological problems such as depression. This has huge costs for organizations. In Germany, the days of mental illness-related illnesses2 increased by 67.5 percent between 2008 and 2017.

[14]Can, Yekta Said, et al. "How to relax in stressful situations: a smart stress reduction system." *Healthcare*. Vol. 8. No. 2. Multidisciplinary Digital Publishing Institute, 2020.

In today's world, depression is an inevitable part of life. Unprecedented depressive experiences can have a devastating effect on a person's health, well-being, and social status. Intelligent wearable technology and biofeedback personal health treatment for stress reduction have received little attention. Stress levels are determined for the first time using an invisible automatic smartband. During an eight-day EU project training session involving 15 first-phase researchers, we explored traditional and cellular relaxation techniques using our stress detection technology. Participants' daily stress levels were recorded, and they were exposed to a variety of traditional and cellular stress management methods. On the eighth day, participants were required to give an oral presentation, which they described as "depressing." Physiological indicators and manipulation reports were used to obtain data on the effectiveness of common relaxation techniques and cellular relaxation techniques.

“Depression is part of everyday life. However, its effects often differ from one person to another, and in spite of similar circumstances, some people feel depressed while others are deeply affected. Each variation can be attributed to a variety of factors, including how people perceive reality and how they respond to the thousands of victims. Imaginary stress occurs when a person realizes that a particular situation exceeds the available coping strategies. People who show a continual conflict between natural needs and imaginary resources (rather than just one time) are said to suffer from chronic stress. Many psychologists have examined the feeling of depression. People who show a continuing disparity between natural needs and imaginary resources (rather than just one time) are said to suffer from chronic stress. Chronic stress has been shown to be important not only for human well-being and quality of life, but also for the development and preservation of many physical and mental illnesses. ”

[15] Tuarob, Suppawong, et al. "How are you feeling?: A personalised methodology for predicting mental states from temporally observable physical and behavioural information."

Unusual emotional states of the individual, such as stress and anxiety, are considered not only to bring suffering, but also tragedy in some difficult situations. Health care workers may need to be able to predict a person's attitude toward both present and future. Currently, the most effective way to predict a person's mood is to consult a psychologist with the help of psychiatrists. On the other hand, such treatments may be time-consuming and expensive, limiting their use to a large number of people. In addition, some people may be unaware of their moods or have difficulty expressing their opinions during the test. As a result, their irrational attitudes may not be apparent for a long time. The goal of this project is to demonstrate that complex machine-based learning methods can be used to create mathematical models that predict current and future human attitudes. The difficulty of predicting a person's mood is translated into the predictive nature of the time series, in which the person is represented as a series of time series of physical and behavioral controlled variables. The relationships between these factors are then automatically captured by a personal mathematical model, later used to anticipate individual attitudes. We show the shortcomings of predictive series of methods such as vector autoregression first.

CHAPTER-4

SURVEY SUMMARY TABLE

SL. No	Paper Details	Problems addressed	Author's approach	Results
1	Development of the web application My Stress Control—Integrating theories and existing evidence [2018]	Describes the systematic development of an evidence-based, personal, collaborative web-based tool for self-management of work-related stress, and an assessment of usability issues as the process progresses.	Phase I: A review of current evidence-based literature on pressure management guidelines, behavior change, and web-based behavior change. Phase II: This was the phase in which stress management software was developed as a web application. Phase III: Behavior change, content verification, and testing of the original version.	Introduction, psychoeducation, ambivalence, stress management measures, lifestyle changes, and care are all integrated into the web system. Self-monitoring, goal setting, goal review, feedback, and the promotion of the goal of change are all effective ways to change behavior.
2	Artificial Intelligence for Mental Health and Mental Illnesses: an Overview [2019]	In health care, there is a comparison between the old strategy and the ML / AI-based approach.	There is a total of 28 real AI and mental health studies in this review. Columns indicate the main purpose of the study. size, age, predictions used as input data, and output data.	AI is becoming a major component of digital medicine and will play a major role in future learning and practice in the mental health field. The future of AI in mental health care seems bright.

3	Enriching Mental Health Mobile Assessment and Intervention with Situation Awareness [2017]	We provide a way to bring contextual awareness to a temporary assessment of the environment and a mobile intervention app used to request self-assessment of patients receiving depressive treatment in this study. Based on contextual data obtained from the sensors of the mobile device, the app uses an incomprehensible engine to detect patient conditions.	The app uses the EMA (real-time monitoring of current behaviour), a method that asks people to answer questions about what they do and experience repeatedly at some point in their daily routine, and then display results on a graph that a mental health professional can consult later.	The mobile system that provides user contexts uses sensors that are widely available on many mobile platforms and an obscure search engine.
4	Big Data Analytics and AI in Mental Healthcare [2019]	Creating machine models for almost any attitude, that is, using simple separators or data-driven algorithms to try to find a model that describes the collected data.	A survey on the effectiveness of existing applications for mental health care has been conducted. Because speeches are analysed (usually over time) by a psychologist using natural language, instant messaging software is modelled after speech / text communication.	Test results will assist in diagnosis, forecasting, treatment and delivery options, disease monitoring, and resource allocation in the health care system.

5	A Service-Oriented Architecture for Web Applications in e-mental health: two case studies [2015]	Designing and promoting the standard design of electronic mental health applications by extracting features into a reusable Service-Oriented Architecture link, begins with two case studies as a starting point.	The author provided two case studies. Case Study 1: A separate study with the Ecological Momentary Assessment conducted separately. Case Study 2: Aims to improve and maintain the well-being of older persons.	Based on the findings, a general design of mental health research applications is performed.
6	Ensuring patient and public involvement in the transition to AI-assisted mental health care [2021]	In order to drive future development of PPI in AI-assisted health care, researchers are looking at community involvement in vision, design, development, testing, implementation, use, and evaluation of AI mental health technologies.	Systematic review of the scope based on the principles of design justice, which includes systematic search of the web of Science (ii) manual search (iii) gray books; and (iv) an analysis of the teaching theme, which was evaluated in a workshop with health researchers.	Demonstrates the complexity and strength of the PPI presenting in AI-assisted mental health care.
7	A Mobile App for Mental Health Care Development and Usability Evaluation with System Usability Scale [2021]	The COVID-19 epidemic is wreaking havoc on the mental health of people in affected countries. Although many digital solutions are being developed to deal with the COVID-19 epidemic, very little attention has been paid to	Recommended properties contain four strategies for meeting the stated conditions for providing mental health care: self-care, chatbot, calling a doctor, and a reliable source of information.	The software delivers visual therapy, AI-based chatbot, a link to doctors, and reputable sources of information to meet user needs.

		developing any effective digital solutions for providing psychosocial support.		
8	Balanced : An Application To Improve Mental Health [2021]	Create applications that track user behaviour to identify potential mental health problems using different mental methods.	Improving applications where users fill out forms. You can use this form to get background information about your users : When user login, digital data, chatbot data, and mental health are analysed. Based on this data, users can access the findings about their risk of mental illness. We use random forest algorithm by combining patterns to predict patterns in data.	Track changes for unhealthy digital behaviour and help users improve their digital lifestyle with smart, personalised health recommendations.
9	Machine Learning for Mental Health in Social Media: Bibliometric Study [2021]	It includes a bibliometric study and discussion of ML for mental health research trends on social media..	We extracted social media and OA publications in the field of mental health, analysed the distribution of publications for performance measurement by source, country, institution, author, and topic, and visualised trends in this field using a keyword matching network. Research methods in high citation studies prior to are also detailed.	Provides higher accuracy of mental health analysis.

10	PRISM: A DATA-DRIVEN PLATFORM FOR MONITORING MENTAL HEALTH [2016]	Neuropsychiatric disorders are the leading cause of disability among non-communicable diseases worldwide.	The approach includes (i) Data acquisition, ii) Text mine, ii) Feature engineering, iv) Machine learning, v) Access once vi) Introduction.	Mental health can be detected using a variety of continuous streams of data collected in a non-invasive and non-insane way. Using a model that can duplicate emotional states reported by users. I The Visualization Panel is composed of to help users check and understand their data.
11	A machine learning approach to personalised mental healthcare [2019]	Predicting symptoms of ongoing depression in older adults using machine learning algorithms..	Demographic data include age, gender and previous level of education, which can be found in the Patient Health Questionnaire. LR and Extreme Gradient Boosting (ML) models were created in the training database to predict the incidence of people with persistent depressive symptoms (PHQ9 10) after 12 months.	Ability of models to predict depressive symptoms (PHQ-9 ≥10) at 12 months
12	A Systematic Review of Smart Mental Healthcare [2019]	Provides a semantic web, cost and time-based solution for self-diagnostic and therapeutic programs for patients with depressive disorder as well as a review of the current state	Provides intelligent mental health management using real data from IoT devices such as cell phones and wearable sensors as well as social media data to predict the onset of depression. Based	Analysis of community, regional, or group data based on a particular classification system, can be used in multidisciplinary psychotherapy.

		of the arena..	on this data, Health Knowledge Graph (PHKG) is created for each patient. . The data collected is used to monitor and recommend the person's negative emotions and activities based on his or her preferences.	
13	Improving Stress and Positive Mental Health at Work [2019]	suggestions for dealing with risk assessments associated with high levels of stress in the workplace	To provide contextual and informative content. The monitoring feature helps to track stress, well-being, and firmness using proven scientific metrics with short internal system questions. The software also measures and monitors the quality and quantity of your sleep using the built-in sensors of your phone (such as the accelerometer).	Good health and reduce work stress.
14	How to Relax in Stressful Situations: A Smart Stress Reduction System [2020]	The market for developing pressure management software for smart wearable devices is growing. .	The main research contributions for this study are: Work-Based Situation Analyst and Relaxation Recommendation System Development Using a smartwatch-based stress management system, comparisons of stress reduction methods and outcomes were	Using a medical grade device, we created a work that feels pressure in the lab. Smart watches and smart watches are starting to be used in studies that measure pressure levels.

			performed. The use of the famous James A. Gross model emotional model using smart tape.	
15	How are you feeling?: A personalised methodology for predicting mental states from temporally observable physical and behavioural information [2017]	The creation of statistical models of certain individuals who, using only visual information, can predict certain hidden features that represent human attitudes.	It is an adjustment to the existing machine-based retrieval system for predicting long-series series data. Embedding methods of time delay are used as a pre-processing step in the feature space to allow standard machine learning algorithms to analyze inputs over time.	This highlights how emotional and psychological predictive frameworks can assess knowledge of various time-series mental models using machine learning algorithms to improve outcomes.

CHAPTER-5

SYSTEM REQUIREMENTS SPECIFICATIONS

5.1 Functional Requirements

- Registration/login of users
- Stress/Anxiety Analysis
- Techniques to manage stress

5.2 Non-Functional Requirements

- Performance
  - ❖ Response Time: The system provides techniques to manage stress in just 5 seconds once the user has filled in the information/form regarding stress analysis.
  - ❖ User Interface: The user interface acknowledges within five seconds.

- Reliability

  Availability: The system is available at all times

- Security

  Data provided by the user is not misused and is protected.

5.3 Hardware Requirements

- Memory - recommended 4-GB RAM or more
- Processor - 4 GHz minimum, multi-core processor
- Network requirements - Bandwidth greater than 50 KBps (400 kbps) and Latency under 150 ms

5.4 Software Requirements

- Anaconda
- Python 3.10.4
- Tkinter Library
- Tensorflow
- OpenCv

CHAPTER-6

SYSTEM DESIGN

6.1 System Design

6.1.1 System Architecture

System Architecture is shown in Figure below.

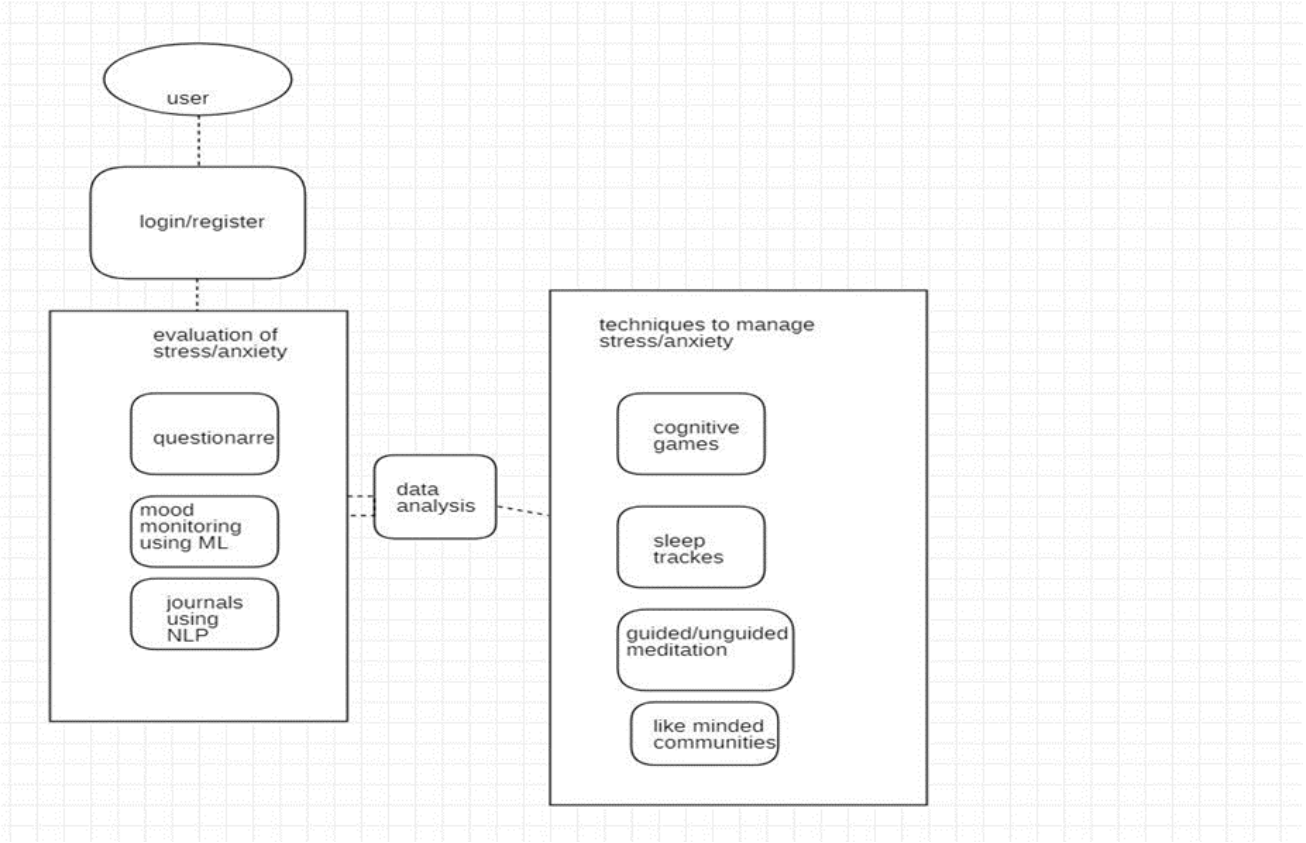


Figure 6.1: System Architecture

6.1.2 Module Design

The module design is shown in the form of data flow diagrams in the figures 7 and 8 below.

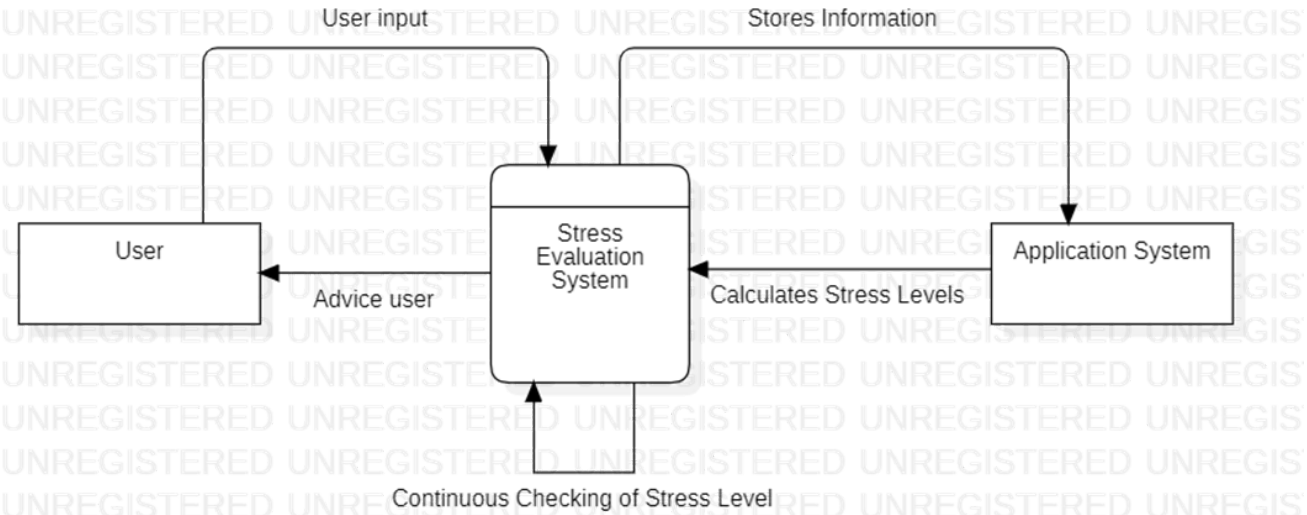


Figure 6.2: Module Design (Data Flow Diagram Level 0)

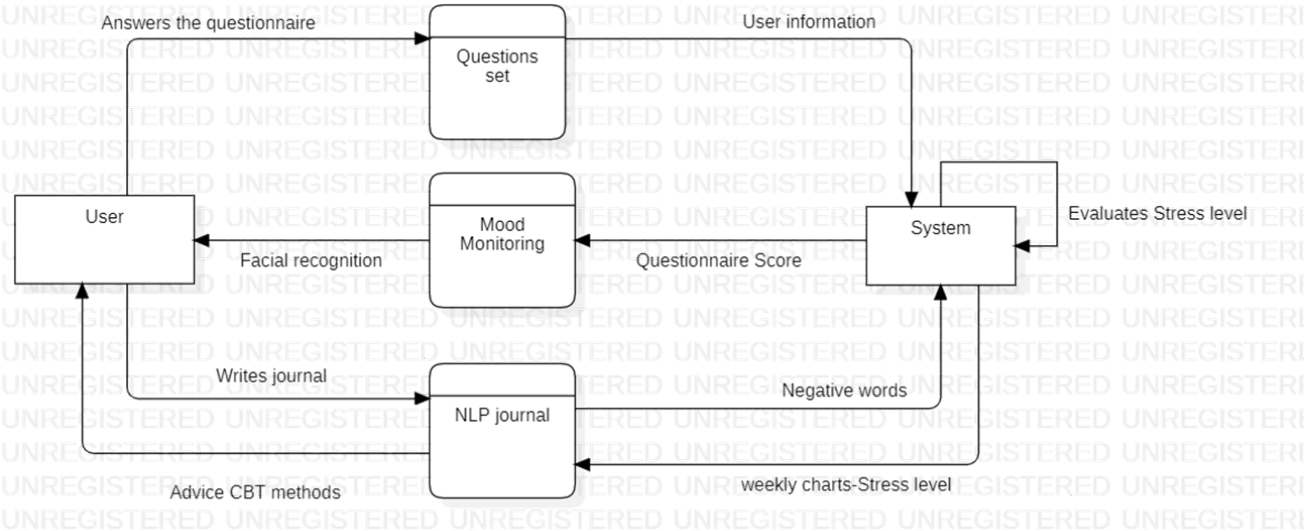


Figure 6.3: Module Design (Data Flow Diagram Level 1)

6.2 Detailed Design

6.2.1 Activity Diagram

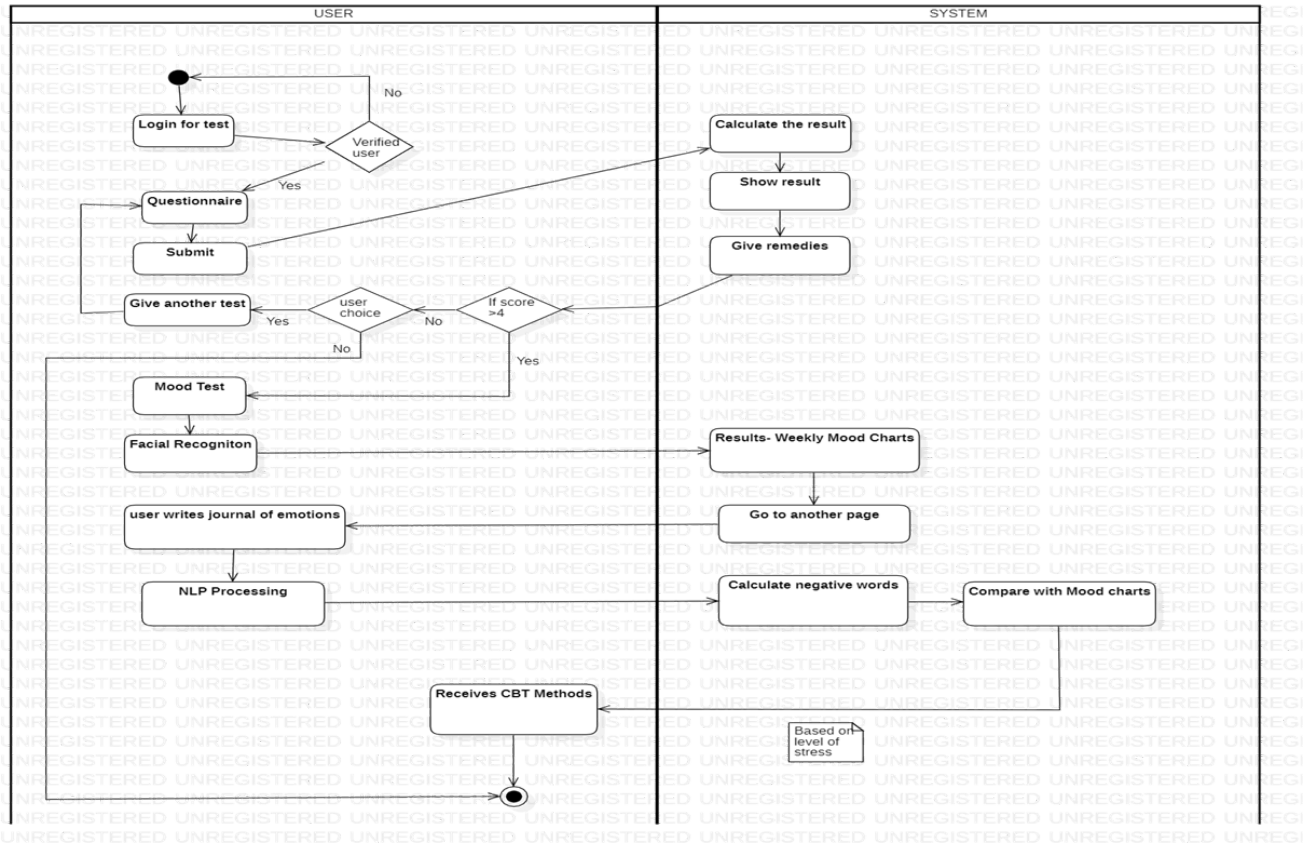


Figure 6.4: Activity Diagram

6.2.2 Use-Case Diagram

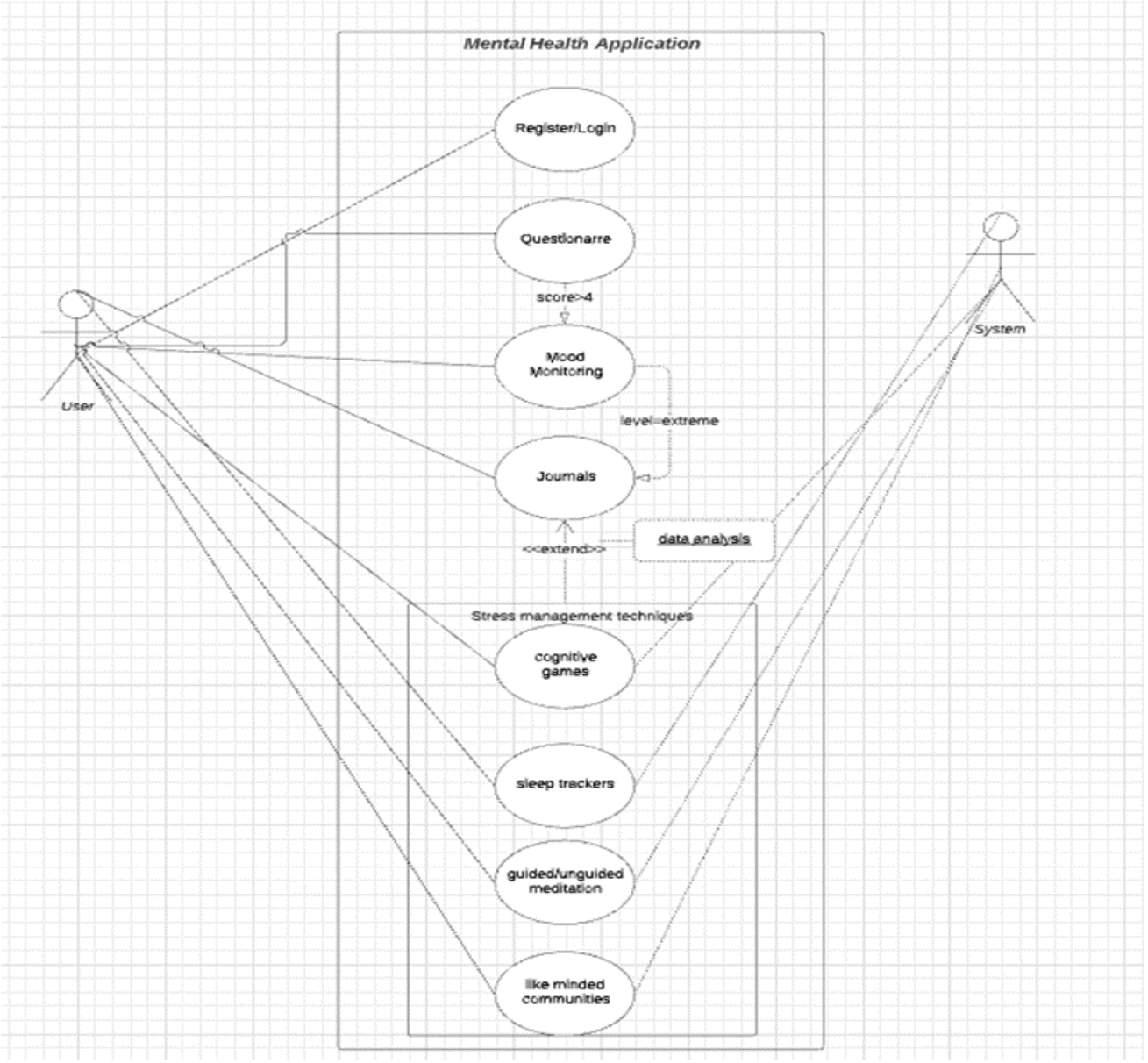


Figure 6.5: Use Case Diagram

CHAPTER-7

IMPLEMENTATION

Application purpose : Real time emotion-detection model.

Algorithm steps:

- Data Access (from the kaggle FER-13 dataset)
- Preview data
- Data Reconstruction
- Addition of Face Recognition Image
- Add a generator to our data (We used batch_size 31)
- Creating a Face Recognition Model using CNN (Designing a CNN Sensitivity Model using an Active API. We are building blocks using a Conv2D layer, Batch-Normalization, Max-Pooling2D, Dropout, Flatten , and pack it together again at the end of use.
- Integrating Face Sensitivity Model
- Training Face Sensitivity Model
- Save Model
- Model Testing using Webcam Feed (In this section, we will test our model in real time using face detection)
- Loading saved model
- Read Frames and Use Preview using OpenCV (Use OpenCV to read frames and image processing)

Open sources used: FER-13 dataset of facial expressions from www.kaggle.com

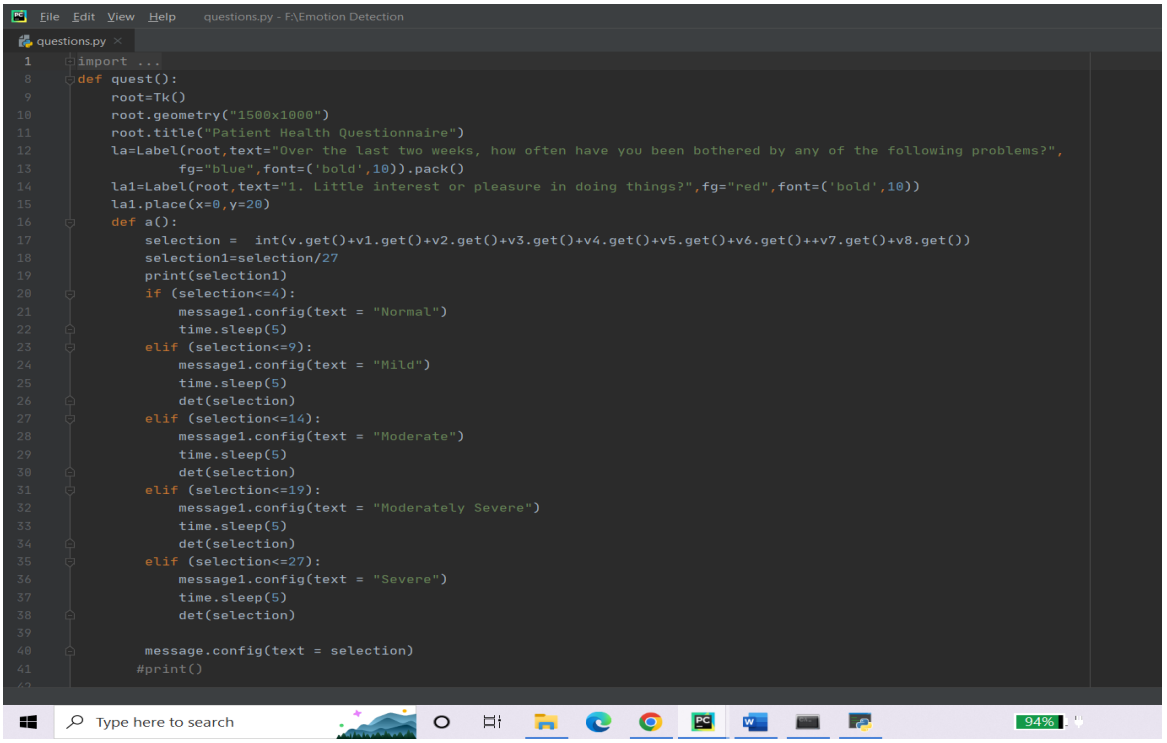


Figure 7.1: Questionnaire

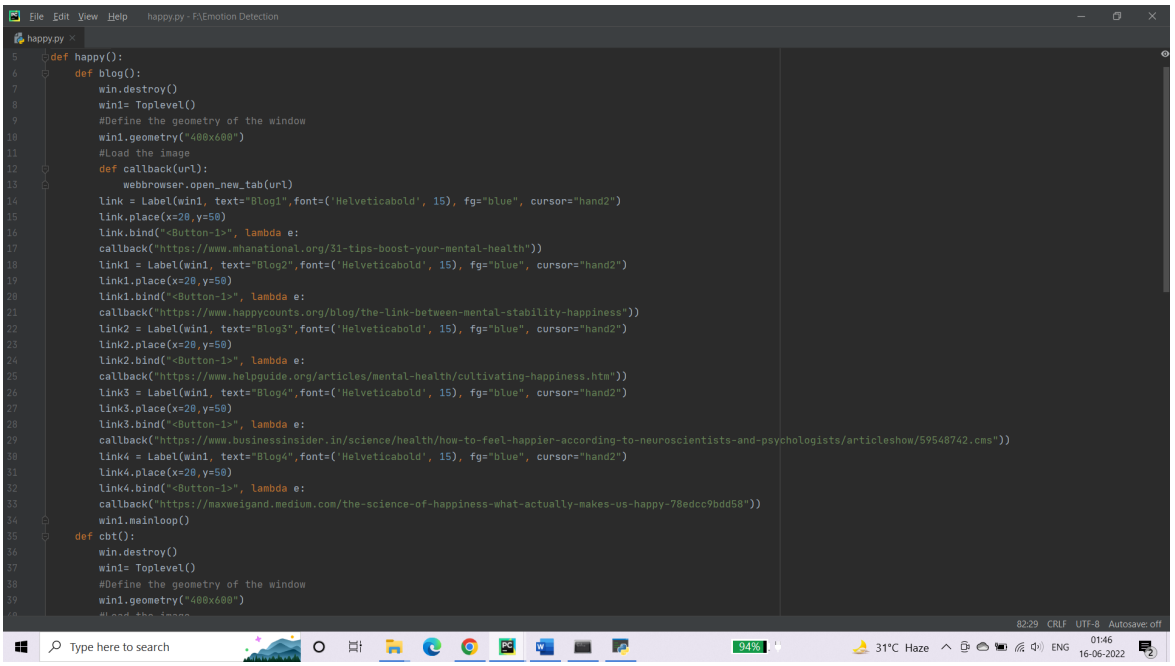


Figure 7.2: Emotion

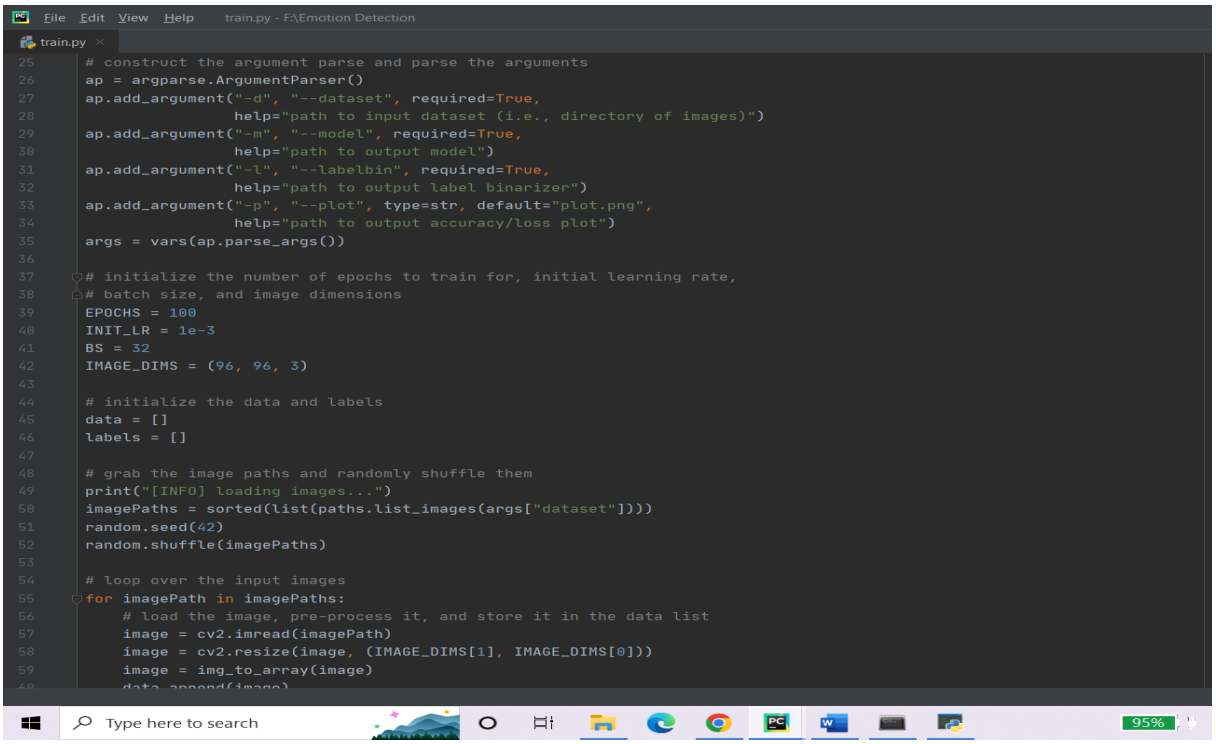


Figure 7.3:Detect emotion

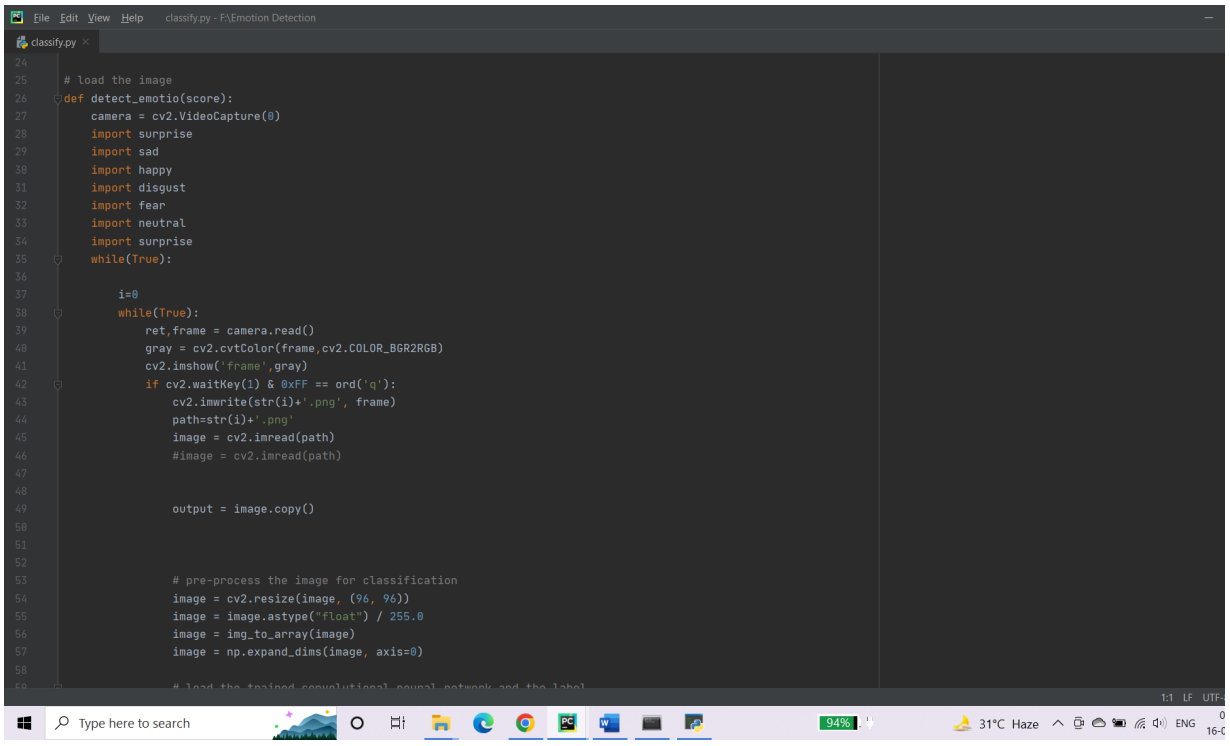


Figure 7.4: Classify emotions

CHAPTER-8

RESULTS(SNAPSHOTS)

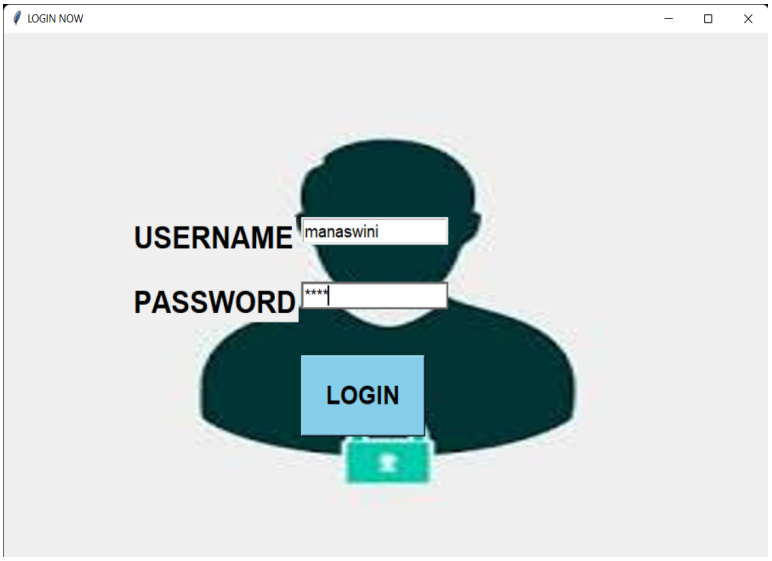


Figure 8.1: Login window

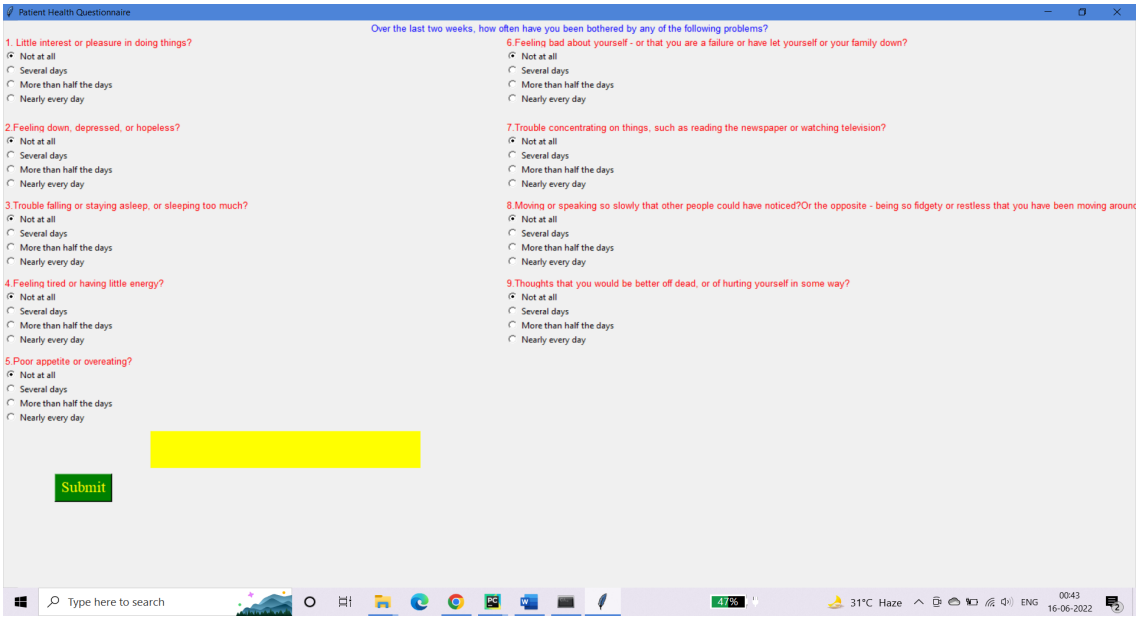


Figure 8.2: Questionnaire

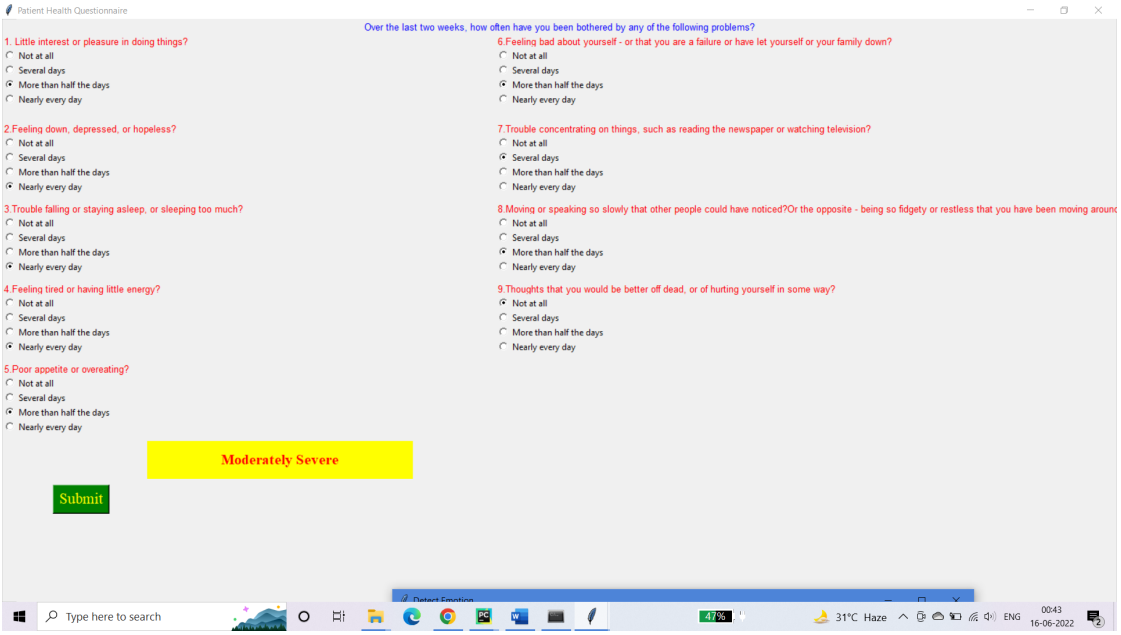


Figure 8.3: Result of Questionnaire

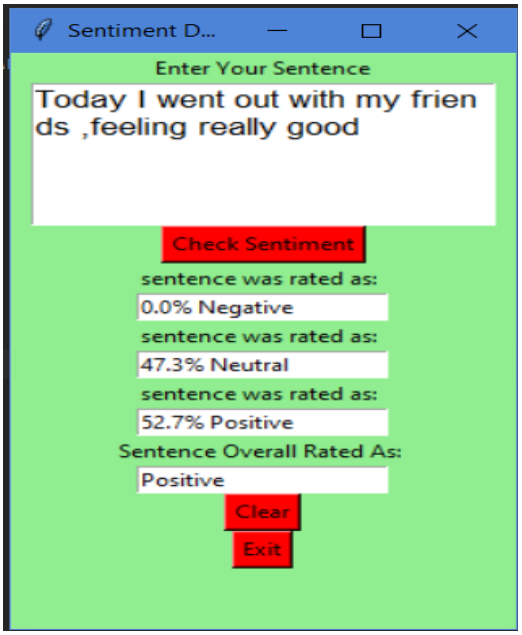


Figure 8.4:Text Sentiment

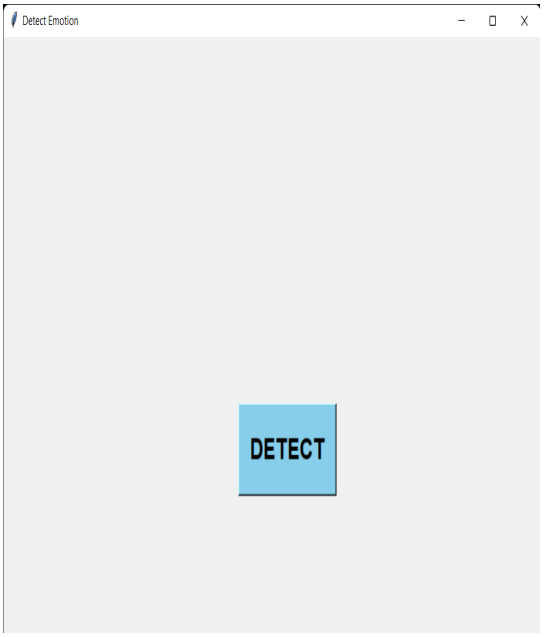


Figure 8.5:Detect model

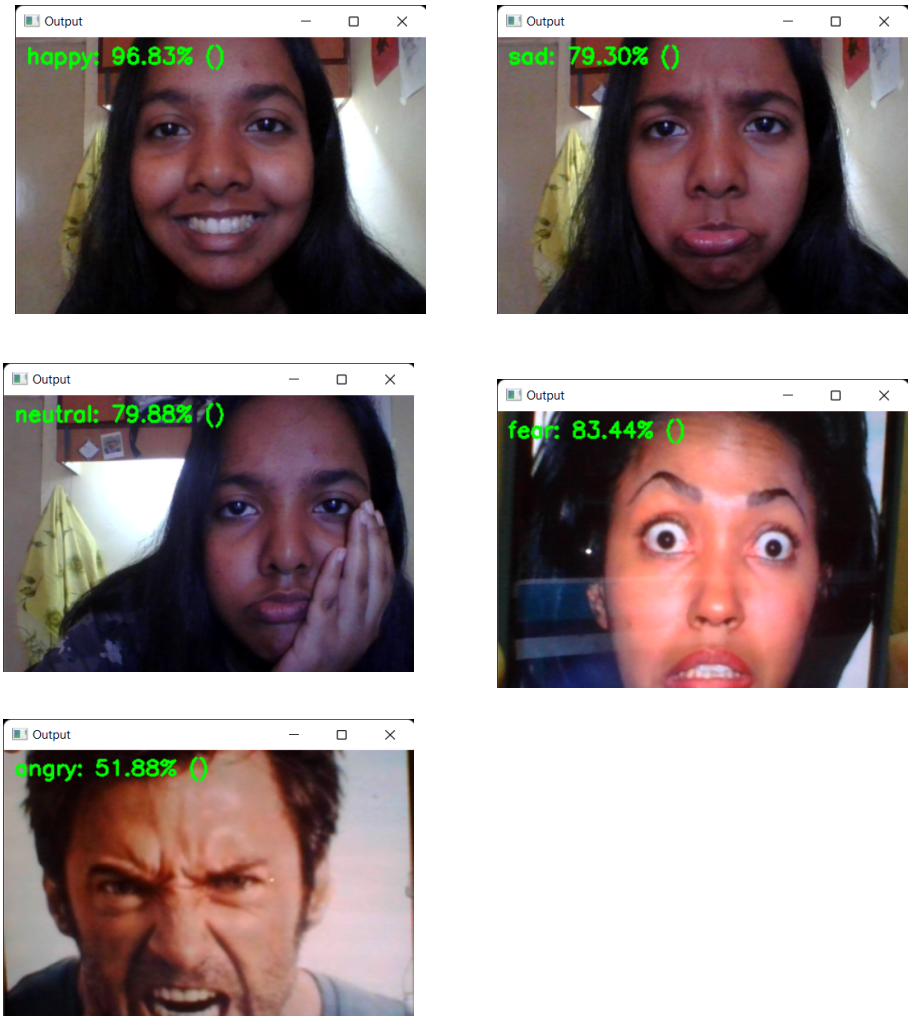


Figure 8.6 : Detecting emotions via live webcam

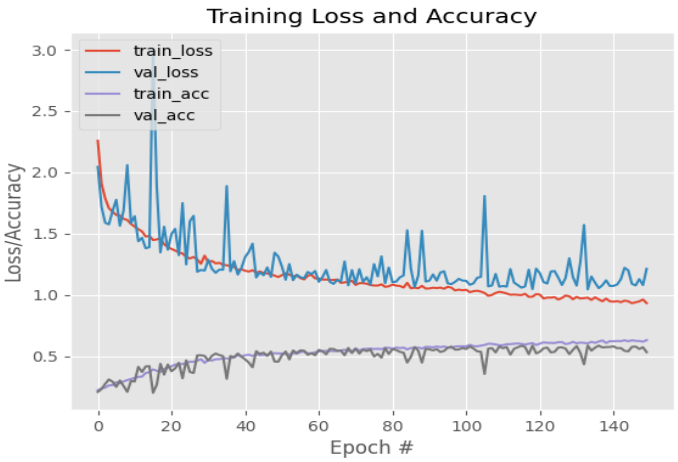


Figure 8.7 : Plot of accuracy/loss of the model

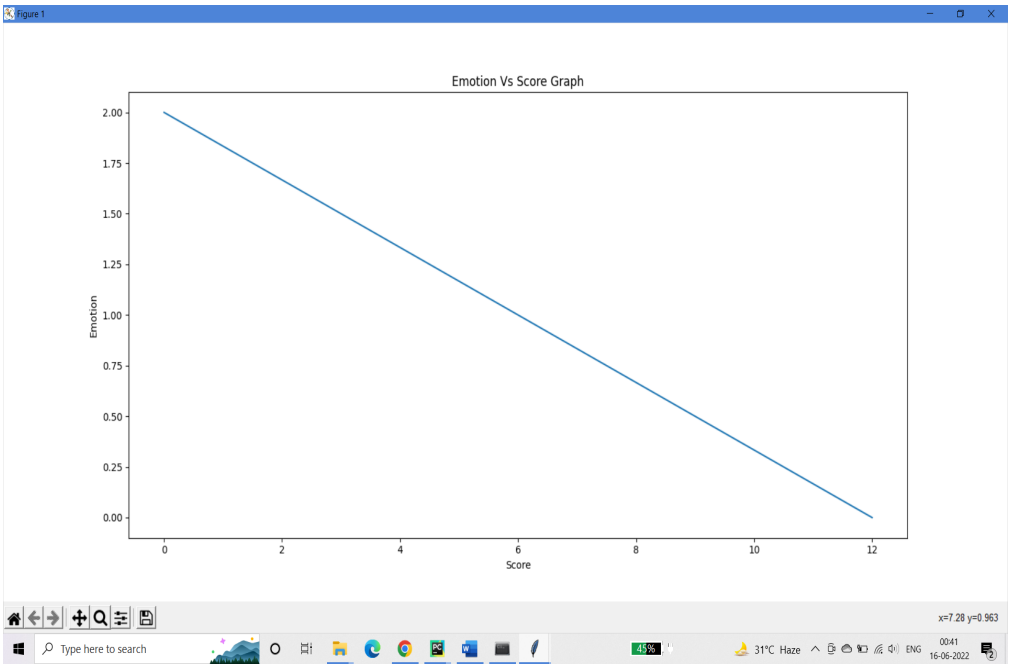


Figure 8.8 : Plot of emotion vs quiz score

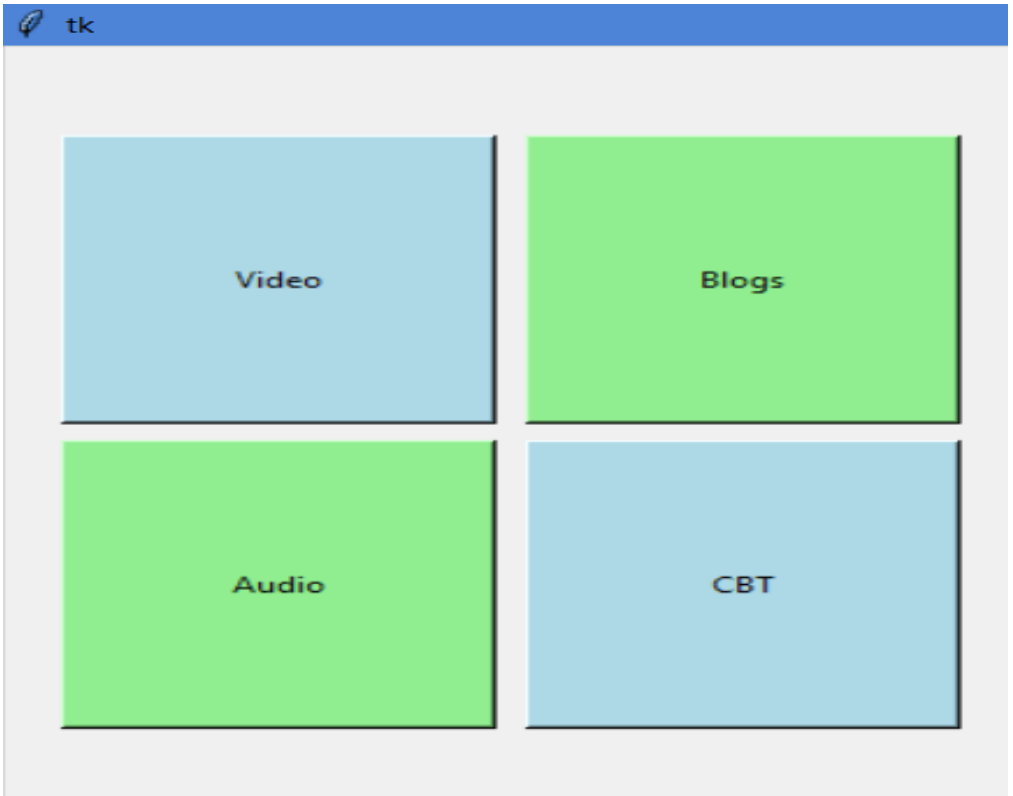
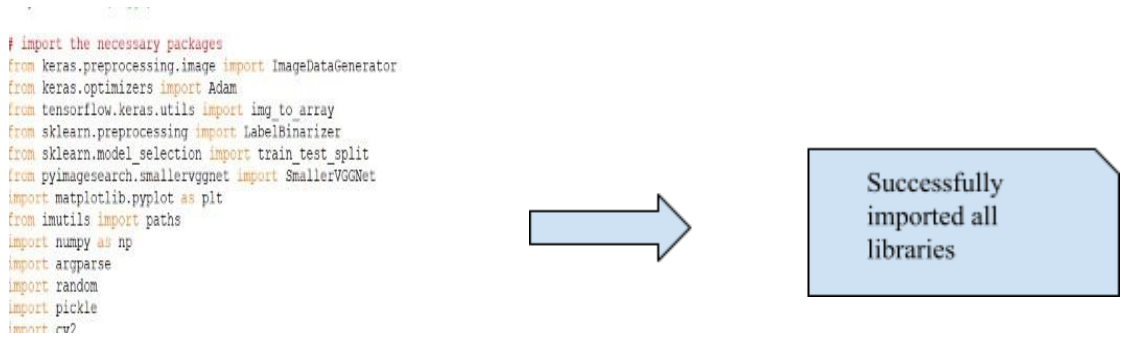


Figure 8.9 : Resources for emotion detected

CHAPTER-9

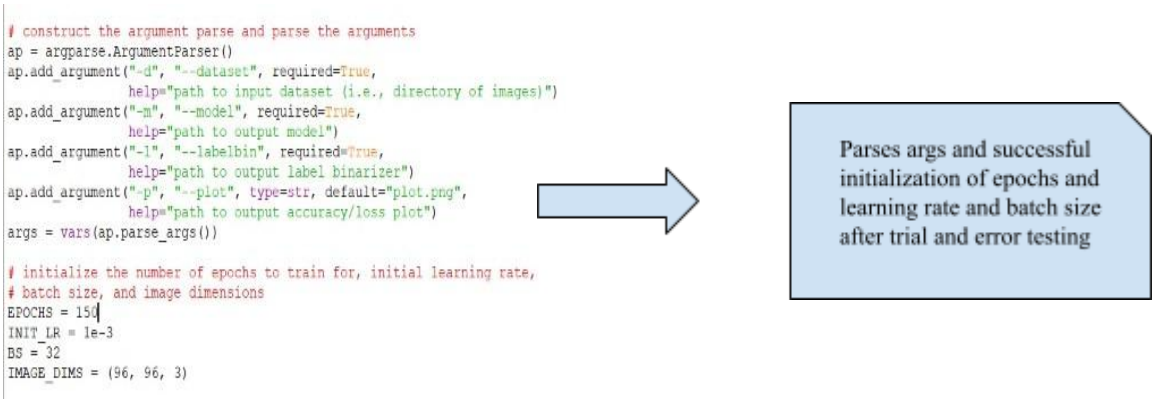
TESTING

1. **Unit Testing -** In this type of testing we make modular codes and run each of them separately.




```
# import the necessary packages
from keras.preprocessing.image import ImageDataGenerator
from keras.optimizers import Adam
from tensorflow.keras.utils import img_to_array
from sklearn.preprocessing import LabelBinarizer
from sklearn.model_selection import train_test_split
from pyimagesearch.smallervggnet import SmallerVGGNet
import matplotlib.pyplot as plt
from imutils import paths
import numpy as np
import argparse
import random
import pickle
import cv2
```

Figure 9.1: Testing Module 1




```
# construct the argument parse and parse the arguments
ap = argparse.ArgumentParser()
ap.add_argument("-d", "--dataset", required=True,
                help="path to input dataset (i.e., directory of images)")
ap.add_argument("-m", "--model", required=True,
                help="path to output model")
ap.add_argument("-l", "--labelbin", required=True,
                help="path to output label binarizer")
ap.add_argument("-p", "--plot", type=str, default="plot.png",
                help="path to output accuracy/loss plot")
args = vars(ap.parse_args())

# initialize the number of epochs to train for, initial learning rate,
# batch size, and image dimensions
EPOCHS = 150
INIT_LR = 1e-3
BS = 32
IMAGE_DIMS = (96, 96, 3)
```

Figure 9.2: Testing Module 2

```
# partition the data into training and testing splits using 80% of
# the data for training and the remaining 20% for testing
(trainX, testX, trainY, testY) = train_test_split(data,
                                                  labels, test_size=0.2, random_state=42)

# construct the image generator for data augmentation
aug = ImageDataGenerator(rotation_range=25, width_shift_range=0.1,
                         height_shift_range=0.1, shear_range=0.2, zoom_range=0.2,
                         horizontal_flip=True, fill_mode="nearest")
```

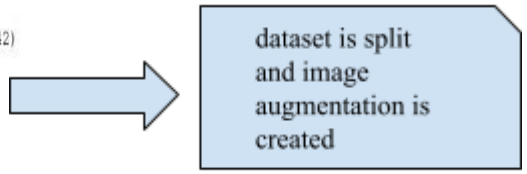


Figure 9.3: Testing Module 3

```
# train the network
print("[INFO] training network...")
H = model.fit_generator(
    aug.flow(trainX, trainY, batch_size=BS),
    validation_data=(testX, testY),
    steps_per_epoch=len(trainX) // BS,
    epochs=EPOCHS, verbose=1)

# save the model to disk
print("[INFO] serializing network...")
model.save('model.h5')

# save the label binarizer to disk
print("[INFO] serializing label binarizer...")
f = open(args["labelbin"], "wb")
f.write(pickle.dumps(lb))
f.close()

# plot the training loss and accuracy
plt.style.use("ggplot")
plt.figure()
N = EPOCHS
plt.plot(np.arange(0, N), H.history["loss"], label="train_loss")
plt.plot(np.arange(0, N), H.history["val_loss"], label="val_loss")
plt.plot(np.arange(0, N), H.history["accuracy"], label="train_acc")
plt.plot(np.arange(0, N), H.history["val_accuracy"], label="val_acc")
plt.title("Training Loss and Accuracy")
plt.xlabel("Epoch #")
plt.ylabel("Loss/Accuracy")
plt.legend(loc="upper left")
plt.savefig(args["plot"])
```

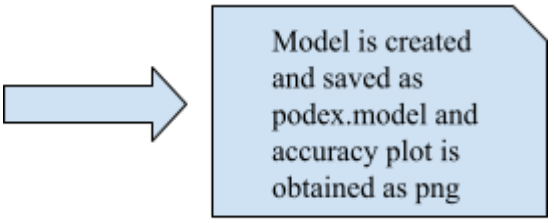


Figure 9.4: Testing Module 4

2. Integration Testing:

Here the software modules are logically integrated and tested as a team.

We have four modules with a specific function to use.

- train.py - a set of training data and download model created
- classify.py- classifying images captured using a webcam into emotion categories included in the model.
- smallervggnet.py- creates a CNN model with a thick layer and an exit layer.
- GUI.py- this creates a user GUI using the Tkinter python library.

➢ Integration Case 1- Tkinter Library is imported into GUI.py and allows the app to use the library successfully.

➢ Integration Case 2- Classify.py was introduced to GUI.py for phase-sensitive detection after pressing a button called detect in the GUI. The test worked well together.

➢ Integration Case 3- smallervggnet.py merging case is introduced to train.py where the CNN model created by smallervggnet.py is launched on train.py.This has led to the successful operation of two modules

3. System Testing:

It is a test of quality that ensures complete and fully integrated software product.

- The GUI is well integrated with the emotion detection model
- The GUI captures user login details and allows users to click to get emotional predictions.
- The model gets the user's feelings in real time.
- The output frame is indicated by the predicted sensor and the image of the loss structure and accuracy of the saved model as png.

CHAPTER-10

CONCLUSION AND FUTURE ENHANCEMENTS

CONCLUSION:

The use of digital applications to deliver effective mental health treatment has many potential. Apps have become a useful tool to close the mental health gap, given the global shortage of psychiatrists and the lack of mental health care services in rural areas. The Technique offers great capabilities to transform the way mental health care is provided and achieved, but achieving this goal may require the combined promotion of research, law, and design.

There is a lack of research investigating the usefulness of mental health programs, and most have little evidence of value. Physicians should be aware that applications provide this type of evidence and use care when interpreting applications to patients. Guidelines for future research are proposed, which include a request for clinicians to be more active in creating and evaluating the effectiveness of mental health applications.

It is widespread discrimination that prevents patients from seeking help for their mental health problems from qualified people. However, by providing many applications for mental health, modern technology helps to eliminate the stigma of mental illness.

With the growing awareness of mental health issues, it is not surprising that people are looking for simpler and easier ways to better manage their lives. While treatment may seem to many people to be a time-consuming and tedious process, a simple, unobtrusive and step-by-step solution may appeal to you. Most therapists, however, believe that these applications cannot be used instead of treatment. However, it may well be a good way to deal with stress ’.

These apps are easy to use for anyone dealing with mental health problems, and are thought to be useful in tracking the treatment process for people suffering from a variety of mental illnesses. Because of the anonymity, 24-hour services, and low cost, technology-based mental health solutions, according to the National Institute of Mental Health, work well for a variety of mental health conditions.

FUTURE ENHANCEMENTS:

Future improvements may be made according to the criteria below.

- The database used for sensory models can be improved by adding more images as well as photos of us and the people around us.
- The checklist for the first level test may contain a variety of questions related to some type of stress or mental illness.
- Model accuracy can be increased.
- GUI can be easy for the user.

CHAPTER -9

REFERENCES

[1] Eklund, Caroline, et al. "Development of the web application My Stress Control—Integrating theories and existing evidence." *Cogent Psychology* 5.1 (2018): 1489457.

[2] Graham, Sarah, et al. "Artificial intelligence for mental health and mental illnesses: an overview." *Current psychiatry reports* 21.11 (2019): 1-18.

[3] Soares Teles, Ariel, et al. "Enriching mental health mobile assessment and intervention with situation awareness." *Sensors* 17.1 (2017): 127.

[4] Rosenfeld, Ariel, et al. "Big data analytics and AI in mental healthcare." *arXiv preprint arXiv:1903.12071* (2019).

[5] Blaauw, Frank J., and Ando Emerencia. "A service-oriented architecture for web applications in e-mental health: two case studies." *2015 IEEE 8th International Conference on Service-Oriented Computing and Applications (SOCA)*. IEEE, 2015

[6] Zidaru, Teodor, Elizabeth M. Morrow, and Rich Stockley. "Ensuring patient and public involvement in the transition to AI‐assisted mental health care: A systematic scoping review and agenda for design justice." *Health Expectations* (2021).

[7]Islam, Muhammad Nazrul, et al. "A Mobile Application for Mental Health Care During COVID-19 Pandemic: Development and Usability Evaluation with System Usability Scale." *International Conference on Computational Intelligence in Information System*. Springer, Cham, 2021.

[8].Bhalerao, Mrunal, et al. "Balanced: An Application To Improve Mental Health." *ITM Web of Conferences*. Vol. 40. EDP Sciences, 2021.

[9] Kim, Jina, Daeun Lee, and Eunil Park. "Machine Learning for Mental Health in Social Media: Bibliometric Study." *J Med Internet Res* 23.3 (2021): e24870.

[10] Kamdar, Maulik R., and Michelle J. Wu. "PRISM: a data-driven platform for monitoring mental health." *Biocomputing 2016: Proceedings of the Pacific Symposium*. 2016.

[11]Hatton, Christopher M., et al. "Predicting persistent depressive symptoms in older adults: a machine learning approach to personalised mental healthcare." *Journal of affective disorders* 246 (2019): 857-860.

[12] Dalal, Sumit, Sarika Jain, and Mayank Dave. "A systematic review of smart mental healthcare." *Proceedings of the 5th International Conference on Cyber Security & Privacy in Communication Networks (ICCS)*. 2019.

[13] Weber, Silvana, Christopher Lorenz, and Nicola Hemmings. "Improving stress and positive mental health at work via an app-based intervention: a large-scale multi-center randomised control trial." *Frontiers in psychology* 10 (2019): 2745.

[14]Can, Yekta Said, et al. "How to relax in stressful situations: a smart stress reduction system." *Healthcare*. Vol. 8. No. 2. Multidisciplinary Digital Publishing Institute, 2020.

[15] Tuarob, Suppawong, et al. "How are you feeling?: A personalised methodology for predicting mental states from temporally observable physical and behavioural information." *Journal of biomedical informatics* 68 (2017): 1-19.

APPENDIX A: LIST OF FIGURES

APPENDIX B: LIST OF TABLES