

PERSONAL HEALTH ASSESSMENT USING AN APPLICATION BASED ON MACHINE LEARNING

Major Project submitted in partial fulfillment of the requirements for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

Submitted by

M S S BHARADWAJ, 221710313031

G NAVYA OLIVE, 221710313012

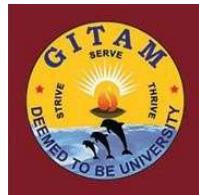
B HEMANTH, 221710313006

P V SAIKESH CHOWDARY, 221710313045

Under the esteemed guidance of

Ms. B.K.V.P.S. MAHALAKSHMI

ASSISTANT PROFESSOR



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

**GITAM
(Deemed to be University)**

HYDERABAD

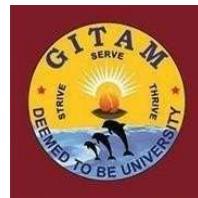
MAY 2021

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

GITAM INSTITUTE OF TECHNOLOGY

GITAM

(Deemed to be University)



DECLARATION

We hereby declare that the project report entitled "**PERSONAL HEALTH ASSESSMENT USING AN APPLICATION BASED ON MACHINE LEARNING**" is an original work done in the Department of Computer Science and Engineering, GITAM Institute of Technology, GITAM (Deemed to be University) submitted in partial fulfillment of the requirements for the award of the degree of B.Tech. in Computer Science and Engineering. The work has not been submitted to any other college or university for the award of any degree or diploma.

Date:06/05/2021

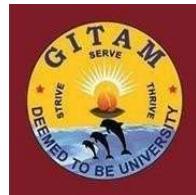
Registration No(s).	Name(s)	Signature(s)
221710313031	M S S BHARADWAJ	M S S BHARADWAJ
221710313012	G NAVYA OLIVE	G NAVYA OLIVE
221710313006	B HEMANTH	B HEMANTH
221710313045	P V SAIEESH CHOWDARY	P V SAIEESH CHOWDARY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

GITAM INSTITUTE OF TECHNOLOGY

GITAM

(Deemed to be University)



CERTIFICATE

This is to certify that the project report entitled "**PERSONAL HEALTH ASSESSMENT USING AN APPLICATION BASED ON MACHINE LEARNING**" is a bonafide record of work carried out by **M S S BHARADWAJ (221710313031), G NAVYA OLIVE (221710313012), B HEMANTH (221710313006), P V SAIEESH CHOWDARY (221710313045)** students submitted in partial fulfillment of requirement for the award of degree of Bachelors of Technology in Computer Science and Engineering.

Project Guide

Ms. B. K. V. P. S. MAHALAKSHMI

(Asst. Professor)

Head of the Department

Dr. S. PHANI KUMAR

(Professor)

ACKNOWLEDGEMENT

Our project would not have been successful without the help of several people. we would like to thank the personalities who were part of our project in numerous ways, those who gave us outstanding support from the birth of the project.

We are extremely thankful to our honorable Pro-Vice Chancellor, Prof. N. Siva Prasad for providing necessary infrastructure and resources for the accomplishment of our project.

We are highly indebted to **Prof. N. Seetharamaiah**, Principal, School of Technology, for his support during the tenure of the project.

We are very much obliged to our beloved **Prof. S. Phani Kumar**, Head of the Department of Computer Science & Engineering for providing the opportunity to undertake this project and encouragement in completion of this project.

We hereby wish to express our deep sense of gratitude to **Ms.B.K.V.P.S. Mahalakshmi**, Assistant Professor, Department of Computer Science and Engineering, School of Technology for the esteemed guidance, moral support and invaluable advice provided by him for the success of the project.

We are also thankful to all the staff members of Computer Science and Engineering department who have cooperated in making our project a success. We would like to thank all our parents and friends who extended their help, encouragement and moral support either directly or indirectly in our project work.

Sincerely,

M S S BHARADWAJ **221710313031**

G NAVYA OLIVE **221710313012**

B HEMANTH **221710313006**

P V SAIEESH CHOWDARY **221710313045**

TABLE OF CONTENTS

S. No	Contents	Page No.
1.	Abstract	1
2.	Introduction	2
3.	Literature Review	6
4.	Problem Identification & Objectives	13
4.1.	Problem Identification	13
4.2	Root Causes	13
4.3	Limitations of the problem	16
4.4	Final Objectives	18
5.	Design and System Methodology	19
5.1	Design Phase	19
5.2	System Architecture	23
5.3	Data Flow	24
5.4	How it works?	25
6.	Overview of Technologies	27
7.	Implementation	31
7.1	Coding	31
7.2	Testing and Validation	40
8.	Results and Discussions	44
9.	Conclusion & Future Scope	49
10.	References	50

LIST OF FIGURES

Fig. No.	Figure Name	Page No.
1	Good Health	2
2	World Health Organization (WHO)	3
3	Healthcare in earlier days	7
4	Germ hypothesis	10
5	Healthcare nowadays	12
6	Long standing queues in hospitals	13
7	High costs of treatment	14
8	Limited doctors	15
9	Doctor	16
10	Machine	16
11	Accuracy in medicines	17
12	Believe	17
13	Stages of design thinking	19
14	Basic design of dashboard	21
15	System architecture	23
16	Data flow	24
17	Working model	25
18	Multi-layer perceptron	26
19	OpenCV detection	26
20	DeepFace detection	26
21	Python logo	27
22	HTML & CSS	28
23	Depiction of AI	29
24	Machine Learning	29
25	MLP classifier	29
26	Testing	40
27	Unit testing	40
28	Integrity testing	40
29	System testing	41

30	Acceptance testing	41
31	Black box testing	41
32	White box testing	42

LIST OF SCREENS

1	Code snapshots (8)	32
2	General Information page	44
3	Physiological questions page	45
4	Psychological questions page	45
5	Vitamin Deficiencies page	45
6	Typing questions page	46
7	Video upload page	46
8	Report generation page	46
9	Report snapshots (7)	47 - 48

LIST OF TABLES

1	Design checks	26
2	Black box & White Box testing	43
3	Validation	43

1. ABSTRACT

The impact of machine learning algorithms on healthcare services is currently a broad point of interest. It is considered that ML will be an essential part of healthcare services shortly and incorporated into numerous aspects of health care. The ML-based systems may improve the prediction and diagnosis of a health condition efficiently. We've seen a contribution of ML techniques to healthcare services in image analysis, surgery, and clinical judgment or diagnosis. Whenever we visit a doctor for a simple check-up, we are burdened with an unimaginable bill. To get rid of these bills, we are proposing an application to get your health assessed. A personal health assessment application. It analyzes the psychological, physiological state of a person using images, voice, facial gestures, and many more aspects. Various Machine Learning techniques are incorporated into the application to provide a complete and thorough report about multiple aspects. OpenCV for back image analysis. Data visualization is adopted for displaying reports in a more understandable format, and some machine learning techniques will be integrated to deliver suggestions. From associating with patients to guiding patients to the most effective care setting, this acts as a personal health assessment application that can remedy, monitor, provide prompt solutions and help in many other ways.

2. INTRODUCTION

A condition of emotional, social, and physical well-being in which there is no sickness or weakness is known as health. The definition of health has evolved over time. From a scientific standpoint, the initial definitions of wellness focused on active body function; fitness was defined as a natural function that can be disrupted by disease. For example, the health definition states: "a state characterized by anatomic, physical, and mental integrity; the ability to perform the most important family, occupational, and social functions; the ability to cope with such things as biological, physical, psychological and social stress". The World-Health-Organization (WHO) suggested a higher definition in 1948: applied to health and well-being in terms of "physical, psychologically, and social well-being and not just being free from sickness and frailty." as well thought out, It was mocked for being abstract, too broad, and incapable of being considered immeasurable. It was ignored as irrational for a long time, and many health problems were relegated to the real essence of the biomedical paradigm.

Fig. 1. Good Health



Similarly as there has been a shift from viewing sickness as a status to considering everything as a way, comparative changes happen in wellbeing definitions. WHO assumed a part in advancing the advancement of the wellbeing advancement association during the 1980s. This brought another meaning of wellbeing, not as a state, but rather as a strong, all in all, as a "instrument of life". The WHO evaluated the significance of the word wellbeing and characterized it as "how much an individual/bunch can comprehend their own requirements and address their issues and to supplant or endure the regular habitat, 1984. Wellbeing is a general help, not a reason throughout everyday life; and individual wellbeing, and actual strength. " Therefore, wellbeing is characterized as the capacity to oversee homeostasis and get back to embarrassment. Mental and social prosperity is about the capacity to oversee pressure, master abilities, oversee connections, every one of these assets for adaptability and individualistic living. This opens up numerous wellbeing openings that should be instructed, learned, and reinforced.

Medical care, medical care, or medical services is the consideration or improvement of wellbeing by anticipation, determination, therapy, recuperation, or therapy of infections, diseases, wounds, and other bodily and psychiatric inabilities in individuals. Medical protection is given by wellbeing experts and related wellbeing areas. It incorporates work done in essential consideration, optional consideration, and advanced education care, just as in general wellbeing. Health care and health policies can vary from country to country, from community to country, from person to person, depending on socio-economic factors and health policies. Things to evaluate when availing health care assistance include financial restrictions (such as access to insurance), local restrictions (such as travel expenses, ingress to paid work time to use those services), and also individual limitations (inability to contact health care providers, inefficient health education, short income). Impediment of health care assistance adversely affects the consumption of medical services, the working of treatment options, and the final outcome.

Fig. 2. World Health Organization



Medical services programs are associations that are set up to meet the wellbeing needs of their intended interest group. As per the World-Health-Organization (WHO), a successful medical services framework needs support, very much prepared and generously compensated staff, dependable data about dynamic and arrangements, and all around kept up wellbeing offices to convey quality medication and innovation. A successful medical care framework can add to a significant piece of the nation's economy, advancement, and industry. Medical services is regularly seen as a basic choice in improving individuals' by and large physical and enthusiastic prosperity all throughout the planet. The worldwide destruction of smallpox in 1980, which was announced by the World Health Organization to be the main scourge in mankind's set of experiences to be destroyed by intentional wellbeing measures, is an illustration of this.

The present wellbeing conveyance relies upon the groups of prepared and qualified experts who meet as different gatherings. This remembers experts for physiotherapy, brain science, medication, nursing, dentistry, obstetrics, and gynecology, just as numerous others, for example, local area wellbeing laborers, local area wellbeing laborers, and care staff, who give individual and individual consideration, administrations. While the meanings of various kinds of medical care change as per diverse disciplinary, hierarchical, political, and social points of view, there is by all accounts some agreement that essential consideration is the principal segment of an economical medical services

framework and may incorporate ever more elevated quality consideration. Medical services can be characterized as private or private. General medical services is frequently given by the public authority through public wellbeing programs. "For-profit" hospitals and private insurance agencies can provide personal health care, while "non-profit" providers, such as charitable groups, could deliver "non-profit" care. Under Health Care there are many types of care:-

- Basic-care
- Second-care
- Care-in-higher-education-institutions
- Quaternary-Care
- Home-and-community-care

1. BASIC-CARE

Essential consideration includes a wide scope of medical services, at any time and any kind of patients belonging to different foundations, people who try keeping up health life, and patients with a variety of genuine and unresolved physical, psychiatric, and social problems, as well as a variety of chronic illnesses. Accordingly, the main doctor should have broad information in numerous spaces. Patients also want to consult the same doctor for routine admission, preventive care, and wellness training, as well as if they need to begin a conference about a different medical problem. The "Worldwide ICPC" is a limited apparatus for comprehending and breaking down knowledge by mediating in critical regard based on the justification for patient visits. Hypertension, diabetes, wretchedness, uneasiness, joint inflammation, or thyroid brokenness are examples of common ongoing illnesses that are often viewed with critical regard. Various maternal and child medical care administrations, such as family planning and inoculation administrations, are also important considerations. US surveys stated that, "the 2013 a survey on health found that skin issues (42.70%), joint issues and osteoarthritis (33.60%), back issues (23.90%), and lipid digestion issues (22.40%), and upper respiratory lot contaminations (22.10%, barring asthma) were the most well-known purposes behind looking for clinical consideration".

2. SECOND-CARE

Auxiliary consideration incorporates serious consideration: treatment required present moment yet momentary disease, injury, or other medical issue. This consideration is generally accessible from the

clinic's crisis division. Optional consideration incorporates talented conveyance during labour, serious consideration, and clinical reasoning administrations. The expression "auxiliary consideration" is at times utilized similarly as "emergency clinic care". Numerous optional consideration suppliers, like specialists, specialists, word related advisors, numerous dental experts or physiotherapists, don't work in emergency clinics. Some essential consideration administrations are given in medical clinics. In light of the association and approaches of the public wellbeing framework, patients may have to see an essential consideration supplier for references prior to accepting second consideration.

In nations working under a blended market medical care framework, a few doctors are lessening their training to auxiliary consideration by expecting patients to initially counsel an essential consideration supplier. This cut-off might be set under conditions of instalment arrangements in particular or gathering medical coverage plans. Sometimes, clinical experts can see patients without a reference, and patients can choose if the actual reference is liked.

3. CARE-IN-HIGHER-EDUCATION-STITUTIONS

Institutional consideration is specific medical services, normally for inpatients and references from an essential or optional wellbeing proficient, a staff place, and progressed examination and therapy focuses, like a tertiary reference emergency clinic. Disease executives, neurosurgery, cardiac medical procedure, plastic medical technique, experimental medicine, advanced neonatology administrations, palliative, and other complex health and vigilant mediations are examples of care administrations in advanced education foundations.

4. QUARTERLY-CARE

The term four-term care is here and there utilized as an augmentation of advanced education care to allude to significant degrees of exceptionally specific and profoundly attainable medication. Symptomatic drugs and different kinds of flighty indicative or surgeries are viewed as youngster care. These administrations are generally given distinctly in a set number of provincial or public medical services offices.

5. HOME-AND-COMMUNITY-CARE

Numerous kinds of wellbeing mediations are presented outside wellbeing offices. It incorporates numerous intercessions for general wellbeing interests, for example, food handling observing, condom conveyance, and needle trade projects to forestall irresistible infections. They remember proficient administrations for private and local area settings to help self-care, locally situated consideration, long haul care, helped living, treatment of substance misuse problems among different sorts of wellbeing and social administrations.

3. LITERATURE REVIEW

The centralised distribution of health care to individuals and families is referred to as healthcare. Doctors, nurses, and other frontline clinicians aren't the only ones who come to mind when people think about healthcare workers, according to the description. Administrators, trainers, chiropractors, paramedics, and technological experts all have a role to play in assisting people in living a healthy lifestyle. Medical services advancement is so reformist.

To begin with we need to discuss people. Beginning with the significant moment of apes—explicitly, sort Homo and provoking the ascent of Homosapiens as an unquestionable kind of the primate race, which fuses the incredible chimps, human headway is the remarkable cycle that sparked the ascent of anatomically present individuals. The incremental evolution of traits like human bipedalism and language, as well as interbreeding with other hominins, were all part of this cycle, showing that human evolution was just not sequential but rather a network.

The investigation of human advancement envelops numerous logical controls, including actual human sciences, primatology, antiquarianism, fossil science, neuroscience, morals, etymology, transformative brain research, embryology, and hereditary qualities.

They didn't have a lot of insight when people were simply beginning. They used to roam and shout and do all sorts of things similar to chimpanzees. Humans took the pain and all problems.

Slowly they evolved from normal helpless species to the smartest and prominent species on earth.

The Healthcare system for humans can be categorized into the following eras: -

1. Healthcare system in BC (Before Christ)
2. Healthcare system after BC to 1700
3. Healthcare system in 17th century
4. Healthcare system in 18th century
5. Healthcare system in 19th century
6. Healthcare system in 20th century
7. Healthcare system at Present

1) HEALTHCARE SYSTEM IN BC (BEFORE CHRIST)

There are three distinct periods in the stone age which are the paleolithic, Mesolithic, and Neolithic. Devices were first utilized in neolithic-period by early people in 300,000 B.C and the further

development from conventional chasing to developing or cultivating food. Numerous primate family members which are terminated now lived in the world with early people like the neanderthals and Denisovans. Around 2.50 million years ago up until 10,000BC that is the paleolithic period, early ancestors had a simpler housing system like tepees or huts and they were also hunters. They hunt down birds or wild animals using their tools like the crude stone axes or tools made with bones. They ate fruits and nuts and also animals like deers or bisons after burning them. Little stone devices, presently cleaned and frequently drawn with specks, insects, and bolts, were utilized by people during the Mesolithic time frame. To go about as a, it is appended to prongs or lumber. They lived in camps close to waterways and different waterways and were for the most part traveling. Farming was presented during this period, bringing about more lasting pioneers in the towns.

Eventually, around 8,000 BC to 3,000 BC that is the neolithic period, ancient humans swapped from hunting to food growing and production. Around 3,000 BC to 1,300 BC, the metal was progressed, such as bronze, tin alloys and, copper was found. Now in the form of tools and weapons, the hard metal re-established its stone archetypes and aided flash advancements including the furrow and wheel created by the bull. This time span additionally got progress design and craftsmanship, with the innovation of wheel (potter's), and materials—apparel comprised of generally fleece things like skirts, kilts, tunics, and shrouds.

Fig. 3. Health care in earlier days



The revelation of techniques for warming and iron mineral was dated to the Iron Age (c. 1,300 BC to 900 BC). At that point, the metal was viewed as more significant than gold, and the metal made (to be supplanted by metal with the appearance of refining metal) was simpler to make than copper.

People have failed to understand the difference between being healthy and having a problem. They ate and died one day or another.

The only grief was physical injury. People used to use saliva to heal and to soothe the flesh.

- Licking the wound

Oral mucosa repairs much faster than the skin, indicating that saliva may have areas that help treat injuries. Saliva has antibacterial or anti-healing properties and a feature of tissue made by cells.

- Meat Treatment

Meat contains a lot of protein and fat that help to heal wounds and is helpful in healing.

These were just a few of the traditional examples of health care they used. Gradually, they applied whatever came to their mind. Most of them are inspired by animalistic ideas.

2) HEALTHCARE SYSTEM AFTER BC TO 1700

Unwritten history isn't not difficult to decipher. While contemplating the representations, hard bones, and careful instruments of early people will encourage us a great deal, it's hard to reproduce their psychological perspectives toward infection and demise. Almost certainly, when they quit wasting time of reasoning, they utilized experimentation to sort out which plants could be eaten, which plants were toxic, and which plants had therapeutic worth. Society medication, otherwise called "homegrown medication," is a type of medication that is comprised of spices. or then again vegetable items started in this design and continued. Be that as it may, it isn't the finish of the matter. Passing and ailment were not at first viewed as normal events by people. Regular issues, like colds or blockage, were acknowledged as a feature of presence and managed through such natural cures. Genuine and crippling sicknesses, then again, were appointed to a different division. There were enchanted in nature. They could be the result of a foe's curse, the manifestation of a dangerous evil entity, or they could have been created by an enraged God who had either projected something into the setback's body, such as a dart, a hammer, or a worm, or engrossed something, usually the patient's soul. Counter charms, potions, toxic agents, tug, or other methods were used to entice the wandering ghost back to its proper climate inside the body, or to detach the devilish attacker, be it dart or artefact.

Aside from the care of broken bones and wounds, folk medicine is perhaps the oldest part of the healing arts, since primitive physicians demonstrated their experience by treating the entire human, spirit, and body. At the point when the specialist and the patient trust their adequacy, medicines and prescriptions that have no actual impacts on the body can cause a patient to feel more grounded. Furthermore, current regular practice will profit by a self-influenced consequence.

3) HEALTHCARE SYSTEM IN SEVENTEENTH CENTURY

The natural sciences made significant progress in the 17th century. Rationalists, endeavoured to wrestle with the pith of information. The theory that everything is comprised of soil, air, fire, and water was supplanted by new science, and the old Aristotelian speculations began to be disposed of. Harvey's description of blood pumping was the pinnacle of 17th-century medical accomplishment.

Harvey and the experimental method: William Harvey was born in the English town of Folkestone, and studied at Cambridge before spending several years at Padua, where he was influenced by Fabricius. He founded a thriving medical practise in London and refined his circulation theory through careful study and ethical reasoning. The “Motion of Heart and Blood in Animalibus (De Motu Cordis)”, In 1628, it was released. William Harvey's book, a woodcut illustrates his principle of blood circulation. “Maryland: That the book”, blended conversation isn't shocking. Various followed to the instructing of Galen that the blood takes after a recurring pattern improvement inside the veins.

Harvey's work achieved from various mindful tests, yet not many of his savants took the bother to repeat the tests, fundamentally battling for the more prepared see. In 1651, he published his second great book, Tests Concerning Creature Age, which laid the groundwork for embryology of today. Finally, the importance of oxygen, which had been misidentified as a period by some as phlogiston, was discovered. Regardless, it wasn't until the late eighteenth century that the brilliant scientist Antoine-Laurent Lavoisier discovered the basic thought oxygen and revealed its interaction with breath. However, the compound intensifying instrument had been imagined somewhat already, presumably in Holland, its new turn of events, similar to that of the telescope, was made by Galileo. He hurried to demand the worth of appraisal in science and medication, as such supplanting hypothesis and mystery with precision.

4) HEALTHCARE SYSTEM IN THE EIGHTEENTH-CENTURY

In actuality, even inside the eighteenth century, the mission for a significant method for wiped out the game proceeded. In Edinburgh the maker and expert abolitionist clarified his read that there have been exclusively 2 infections, sthenic (solid) and asthenic (slight), and 2 solutions, energizer and sedative; his essential fixes were liquor and controlled substance. Lively and warm discussions occurred between his devotees, the Brunonians, and in this way the extra far reaching Cullenians (partners of William Cullen, an instructor of prescription), and accordingly the contention unfurl to the clinical central marks of European country.

In the beginning of century, Some experts were the involved in partner degree activity and clinical strength. The reasonable instructor John Hunter drove sweeping examination in relative life structures and physiology, made mindful pathology, partner degreed raised an activity to the degree of a decent piece of science. Male experts were as of now getting to women parturient, and consequently the essential clinical expert in London was William Smellie.

Stethoscope; Laennec, René: A clinical instrument produced using one void compartment of wood and metal, having a spot with French expert René Laennec (1781–1826). Laennec made the clinical instrument in 1816. gallery London: One astoundingly essential clinical flip of occasions, late inside the century, was inoculation.

5) HEALTHCARE SYSTEM IN NINETEENTH-CENTURY

Following changes were progressed

- **Physiology:**

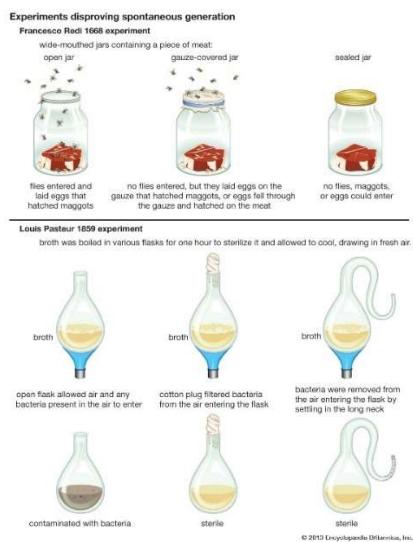
In the beginning of the century, thanks to modern microscopy and mixtures techniques, the human body's growth was fully understood. Even the body's little plan was visible, to be sure. In either case, knowledge of physiological cycles, which was rapidly explained, particularly in Germany, was just as important as anatomical details.

Under Johannes Müller's supervision, physiology became an unquestionable discipline. He depicted his revelations in a commended understanding material, Manual of Human Physiology, circulated throughout the 19th century. He was an enthusiastic educated practitioner and a motivating instructor.

Claude Bernard, the most outstanding physiologist of the time in France, was the result of carefully planned investigations, and his various major revelations were the result of carefully orchestrated investigations. He suggested the possibility of working within the confines of the environment. (1865) “An Introduction to the Study of Experimental Medicine” is at this point meriting concentrate by all who embrace research.

- **Check of the germ-hypothesis:**

Fig. 4. Germ hypothesis



Perhaps the most significant scientific breakthrough of the nineteenth century was the unequivocal demonstration that specific diseases, analogous to the disease of vigil cut, is directly accomplished by minute living natural compounds. This disclosure altered the whole substance of anatomy and influenced a full-fledged revolt in the demonstration of an operation.

- **Disclosures in clinical medication and sedation:**

There was probably a risk that in the journey for organisms, different reasons for dysfunction would drift away from recognition. Various experts, however, were employed in various directions in the nineteenth century. Richard Bright, Thomas Addison, and Sir William Gull were among those who attended a social event at Guy's Hospital in London. Astonishing made significant contributions to the knowledge of kidney diseases, including Bright ailment, and Addison gave his name to problems with the adrenal glands and the blood. Gull, a well-known clinical trainer, left a tradition of fast apothegms that may or may not be comparable to Hippocrates'.

- **Advances toward the century's end:**

Different triumphs in preventive solution came to fruition, considering the way that the upkeep of success was as of now winding up being as colossal a worry as the fix of sickness, and the twentieth century was to see the new development and progress of public flourishing associations in various nations. Similarly, incredible advances in finding and therapy followed the exposure of X-transmits by Wilhelm Conrad Röntgen. In 1895, and of radium by Marie Curie and Pierre, in 1898. Prior to the turn of the century, additionally, the colossal new field of psychiatry had been opened up by Sigmund Freud. The gigantic expansion in authentic information during the nineteenth century drastically changed and extended the exhibition of medications. Stress for keeping up the possibility of associations induced the foundation of public and expert bodies to deal with the standards for clinical arranging and practice.

6) HEALTHCARE SYSTEM IN TWENTIETH CENTURY

In this term passed on such a great deal of exposures and advances that here and there or another or another the object of medication modified of all certification. Despite the way that specialization broadened, cooperation changed into the standard. It thusly has gotten even more hard to credit clinical achievements to unequivocal people. In the essential portion of the 20th century, feature being put with engaging debasement, uncommon accomplishments were in like way gotten in endocrinology, food, and different districts. Not long after World War II, snippets of data got from cell science changed basic contemplations of the pollution cycle. Huge advances in biomedical arranging empowered the trained professional and master to test into the turns of events and segments of body with non-intruding imaging procedures like ultrasound, robotized focus tomography, and atomic appealing reverberation. Each predictable new turn of events, clinical exhibits quite a while sooner went downhill.

Fig. 5. Healthcare nowadays



The quick progression of drug in this period was upheld by enormous updates in correspondence between analysts all through the world. Through appropriations, social events, and later PCs and electronic media, they transparently exchanged considerations and explored their endeavors. Never again was it typical for an individual to work in separation.

8) HEALTHCARE SYSTEM AT PRESENT

Everything changed now, Healthcare got influenced by

- Artificial Intelligence
- Machine Learning
- Robotics... etc

Latest Researches:

- Cross-corpus validation of automated facial video recognition of depression and anxiety symptom severity
- Suffering-based medicine: the practise of modern medicine with a humanistic perspective. Auro del Giglio's formal name is Auro del Giglio
- Breast MRI and tumour biology forecast the response of axillary lymph nodes to neoadjuvant chemotherapy for breast cancer. Sarah J. VinnicombeSamia Al-Hattali Jane Macaskill, E
- GANs for medical image analysis
- Data reduction and data visualization for automatic diagnosis using gene expression and clinical data
- Autism AI: a New Autism Screening System Based on Artificial Intelligence

4. PROBLEM IDENTIFICATION & OBJECTIVES

4.1. PROBLEM DEFINITION:

Whenever we think of a doctor or regular health check-up, we get frustrated for many reasons.

Some of the main reasons are: -

- Confusion over which doctor to visit
- High fees to be paid
- Timings to see a doctor
- Long queues at the hospital
- Unnecessary expenses like the lab tests
- Fear of getting exposed to new diseases, etc

4.2 ROOT CAUSES

The key issue is the impatience of people in general. Not only the patience but it also depends upon the various factors. The following are the factors: -

1. Economic Status:

Sometimes, when there is a high demand to a hospital and there is a shortage of beds or medication then people who are rich tend to buy it with money making it unfair and impossible for the poor to afford. So getting treated does depend on the economic status sometimes.

2. Impatience of Humans:

Another reason why people avoid paying a visit to the doctors is because of the long standing line or the long waiting time. Most people visit a hospital on a holiday or a Sunday, so it gets really crowded. And it contributes as to why most people try to avoid hospital visits

Fig. 6. Long standing queues in the hospital



3. Fear of Patients:

Some patients believe that going to the doctor might not be the smartest of choices. They fear that visiting a doctor could in fact bring them into contact with other diseases as hospitals are a place where many patients go for treatment.

4. Commercial Angle of Doctors:

Most people decide whether or not to go to the doctor based on their financial situation rather than whether or not it is medically necessary. Even a basic doctor's appointment can be difficult to budget for, particularly whether you're uninsured or have a high-deductible health care package with no copays. Half of those who have spent money on health insurance in the last year state their premiums were higher than they anticipated.

5. Laziness of Humans:

People are always engrossed in their own fast-paced lives.. After a day of heavy work or on a holiday they refuse to make time for doctor visits or general checkups. They just procrastinate and avoid making time for other important things like check ups. This could increase the severity of an already existing problem.

6. Corporate Hospital:

Corporate hospitals maintain high quality of medication and treatment but the high costs makes it unaffordable for the people below the poverty line. Thus, rise in the corporate hospitals is only helping some classes of the society.

7. Cost of Tests:

Taking tests for diagnosis also has become a problem for people with its increased costs. Most doctors recommend their patients to take medical tests to access them. So patients have stopped approaching the doctor altogether to avoid the high costs of medical tests.

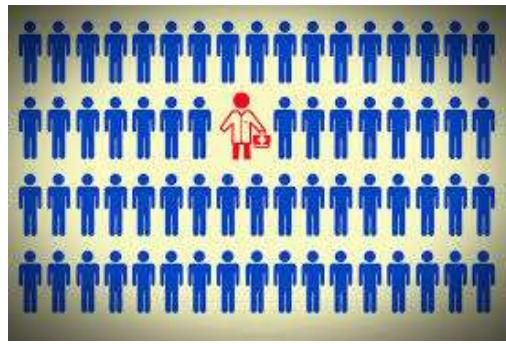
Fig. 7. High costs of treatment



8. Government:

With the low quality of medications and sanitation in the government hospitals, people avoid going to a government hospital and rather choose to visit a private hospital but the costs at a private hospital are very high.

Fig. 8. Limited doctors



9. Government policies:

Government policies are failing to bring about a change to make healthcare accessible to everyone. Though some policies are introduced to help everyone, the implementation is thorough enough. And ultimately, many people struggle to get treated at their own expenses.

10. Fraud Doctors:

The propagation of unethical or ignorant medical procedures is known as quackery, which is often confused with health fraud. A quack is a " ignorant pretender or fraudulent of medical expertise" or "a person who pretends to have skill, experience, qualification, or qualifications they do not have, legally or publicly." Patients are hesitant to trust doctors in general due to an uptick in quackery in the region.

11. General Beliefs:

People generally choose to believe that they can treat themselves sometimes. They consider going for the most commonly suggested medication and take it. Medical halls are becoming lenient too, making it easier to get medicines without a prescription.

12. Medical Faults:

A medical mistake is an avoidable side consequence of treatment ("iatrogenesis"), whether or not the patient is aware of it. An incorrect or inadequate diagnosis or treatment of an illness, accident, syndrome, behaviour, infection, or other ailment is one example. According to estimates, 142,000 people died worldwide in 2013 as a result of adverse medical care, up from 94,000 in 1990.

13. Unavailability of Doctors:

Patients argue that they frequently report to city government clinics without even having to see physicians in the emergency units, in addition to the lack of basic services. This is especially popular in government hospitals with a limited number of physicians. Lack of medical supplies, adequate suppliers of medications, proper curable medication and remedies, and proper rooms to practise on medical services all contribute to doctors' lack of desire to work in rural areas for their own benefit..

Majorly if we see these factors, we start thinking what have to do. To get clarity in healthcare aspect, we need to do the following: -

1. Money to be invested for healthcare
2. Need of check-ups
3. Need of tests
4. Selection of doctor

4.3 LIMITATIONS OF THE PROBLEM

1. A Doctor is a Doctor and Machine is a Machine:

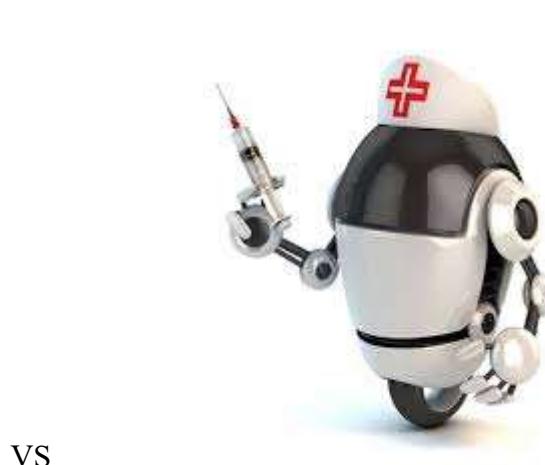
People in general and especially aged-people choose to get treated or diagnosed in the traditional way of visiting a doctor and have little or no trust in the virtual diagnosis.

Healthcare in particular is perceived as something that cannot be done virtually by many.

Fig. 9. Doctor



Fig. 10. Machine



VS

But it is more likely that a doctor understands you better than a machine. There are some obvious limitations in virtual health diagnosis that forces people not to opt for it.

2. Accuracy in medication:

Fig. 11. Accuracy in medication



With the virtual assessment of a patient's condition, there is a slight chance of inaccuracy in the resulting patient health reports because of technical glitches. And for some health conditions, virtual assessment might not be enough to thoroughly understand the patient's current condition. Thus there is a slight doubt about the accuracy among people.

3. Believe:

It is also possible that the patients might not be trusting the virtual diagnosis as they might think it could turn out to be inefficient or inaccurate and has a high chance of predicting error because of technical glitches. People might want to continue to rely on the traditional health assessment of visiting a doctor.

Fig. 12. Believe



4. General Beliefs:

People generally choose to believe that they can treat themselves sometimes. They consider going for the most commonly suggested medication and take it. Medical halls are becoming lenient too, making it easier to get medicines without a prescription. They don't do for a proper diagnosis before getting treated.

5. Physical Evaluation is Confined:

As of not long ago, live video interchanges innovations didn't accommodate careful clinical treatment. Most patients and guardians additionally have simple admittance to excellent video-conferencing innovations. A virtual visit, then again, can not be sufficient for specific clinicians to recognize or treat a patient. While virtual treatment might be extremely fruitful for some minor diseases, doctors might be reluctant to direct an assessment through video visit. Any patients may consider this to be a legitimization to plan an in-person arrangement as opposed to a virtual one.

4.4 FINAL OBJECTIVES:

The main aim of this project are: -

“PERSONAL HEALTH ASSESSMENT USING AN APPLICATION BASED ON MACHINE LEARNING”

It will give preliminary analysis of

- Physical Health
- Mental Health
- Vitamin Deficiency

It will give overall health analysis. Moreover, it will provide detailed report with health score, health tips, depression and anxiety analysis. Positives about report:

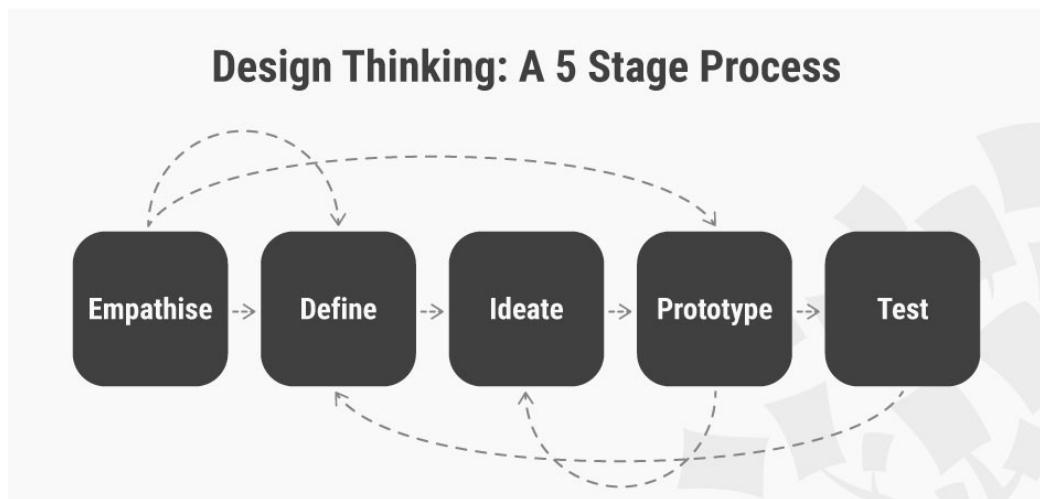
- Provides a detailed analysis
- Helps us to understand the severity of the problem
- It suggests simple yet efficient remedies.
- Eliminates all health insecurities
- Limits the risk of complications
- Helps in early understanding of health conditions and the possible remedies.
- Rehabilitates user to a healthier lifestyle

5. DESIGN & SYSTEM METHODOLOGY

5.1 DESIGN PHASE:

In design-stage, in any event one plans are made, with which the endeavor result can be refined. Dependent upon the endeavor's subject, the consequences of the arrangement stage can join exact models, stream charts, HTML-screenplans, photo clicks, models and UML creations. The assignment managers use these designs to pick the indisputable arrangement that will be made in the endeavor. The improvement stage follows this. As in the definition stage, when the creation has been picked, it can't be changed in a later period of the endeavor.

Fig. 13. Stages of Design Thinking



1. Design Thinking process.
2. Material generation and collecting.
3. Start developing proposals.
4. Create a number of scaled-down, cheap prototypes.
5. Test everything.

Design is very important phase because:

1. Standardization Is Extremely Beneficial:

It is a quality-assured, well-thought-out programming strategy. It suggests breaking down the massive programming project into smaller components. It effectively implies dividing the initiative into small parts, or undertakings (modules). Isolating the simple programming project as modules essentially improves on it to cope with each need of the project. It also provides the convenience of making improvements later on. If the customer's basic changes, you should still go with patching up a module

rather than the whole project. It offers you the simplicity of finding flaws in modules rather than the whole composed tangled code. Properly, separation deals with the thing and straightforwardness makes it persuading, this is the clarification programming arrangement is basic.

2. Maintainability A Positive Sign:

It is easier to manage programme architecture and it is done by the creation of modules. Due to software architecture, tasks such as identifying glitches, testing, reorientation, and modifying configuration related to basic ones in a software-programme turned out relatively simple. Working on a single module allows you the ability to change the look, configuration, and other aspects of the software. For example, if you have already finished the development of a software application but now need to make adjustments to the interface, you can simply make changes to the interface module without affecting other-existing modules.

It's how design work helps in device maintenance.

3. Usability and Efficiency Flow:

The success of a software programme is reflected in its architecture. When the programme is running, a successful software design easily shows the flow of functions. A program configuration should show all means from contribution to yield with the goal that the usefulness of the product application can be assessed. On the off chance that a product project is passed starting with one designer then onto the next, the current engineer ought to have the option to get a handle on the product basically by perusing the product plan, which is the advantage of fruitful programming plan.

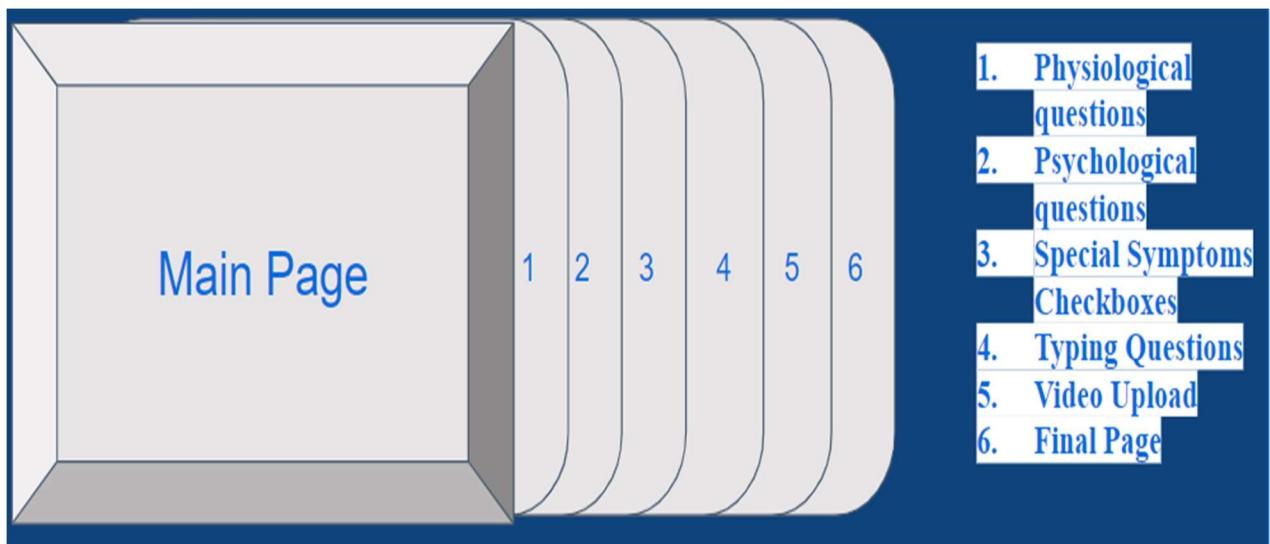
4. Adaptability & Traceability:

Making programme updates, features like portability come in handy. Since it can allow a variety of improvements in the configuration of software applications, portability in software architecture makes it easy to switch features from one module to another. Trackability is another critical aspect of software architecture. As the name implies, trackability is the ability to trace the distribution of functions that occur when the programme is in use. Good product architecture gives the software programme trackability, making it easy to use and manage.

Basic design:

Basic design → Basic idea how project should look like

Fig. 14. Basic design of dashboard



The main idea behind the project design is to have two pages

- Main page
- Physiological questions
- Psychological questions
- Special Symptoms Checkboxes
- Typing Questions
- Video Upload
- Final Page

Main page:

- It should be a single point to get check-up
- Its theme should match with the others theme
- Main page == Introduction

Physiological page:

- Same theme as Main page
- An array of questions is arranged
- One by one question will be displayed

- Question purely based on physical health

Psychological page:

- Same theme as Main page
- An array of questions is arranged
- One by one question will be displayed
- Question purely based on mental health

Special Symptoms Checkboxes page:

- Same theme as Main page
- An array of questions is arranged
- One by one question will be displayed
- Question purely based on physical health

Typing Questions page:

- Same theme as Main page
- An array of questions is arranged
- One by one question will be displayed
- Question purely based on physical health

Video Upload page:

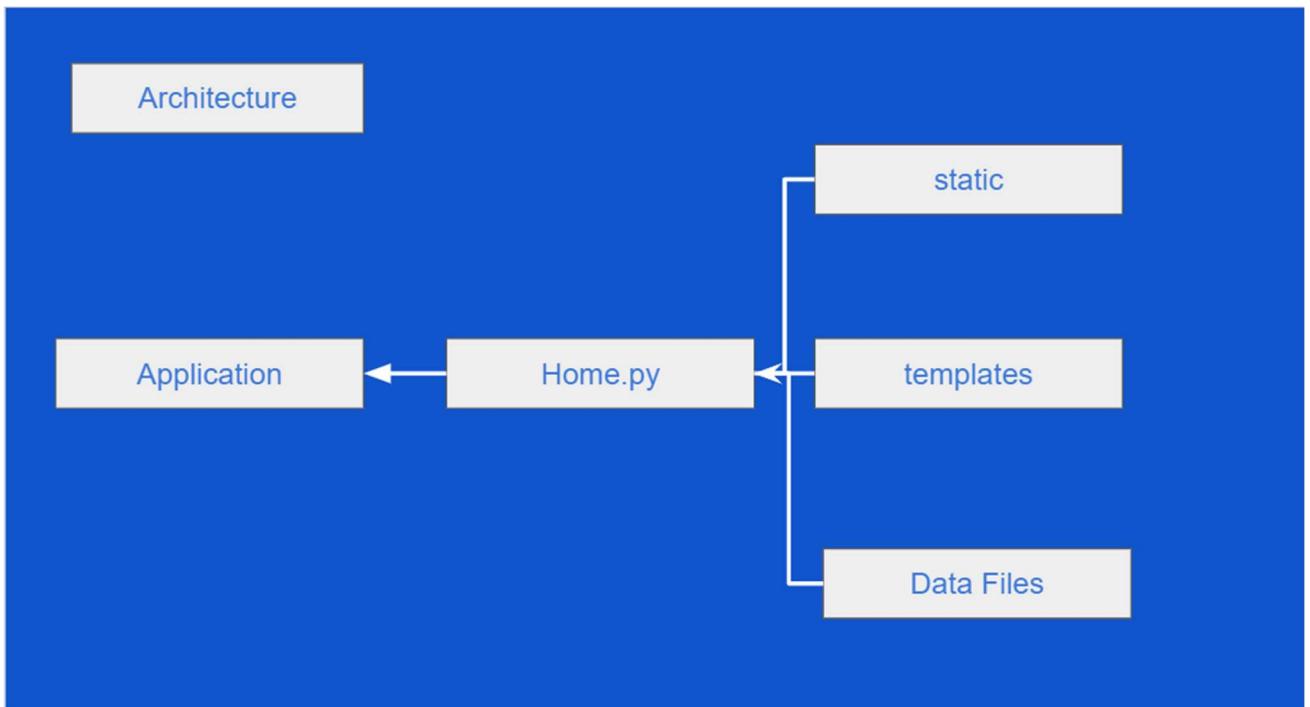
- Same theme as Main page
- An array of questions is arranged
- One by one question will be displayed
- Question purely based on physical health

Final page:

- Same theme as Main page
- Report will be one click away in this page

5.2 SYSTEM ARCHITECTURE:

Fig. 15. System Architecture



- This project entirely runs on 1 python file (Home.py), which starts the web application.
- Home.py is supported by static and template folders and some data files.
- Static and Templates folders contain templates and images.

Static Folder:

It contains all images and CSS.

Templates Folders:

This folder contains 7 html files

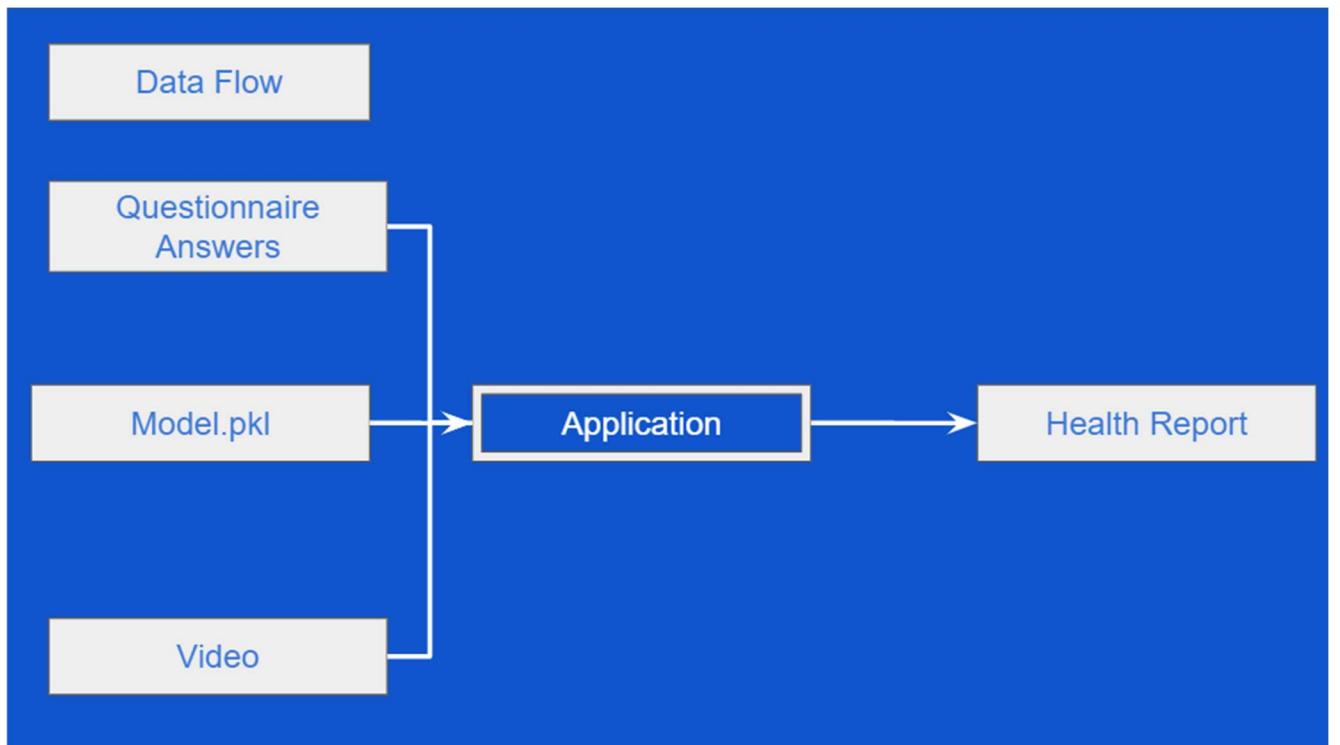
Data Files:

This application is supported by 2 data files

5.3 DATA-FLOW:

Data-flow means it is a path through data passes from the user to the complete application. Data travels from user to the report template and finally, user downloads readied report.

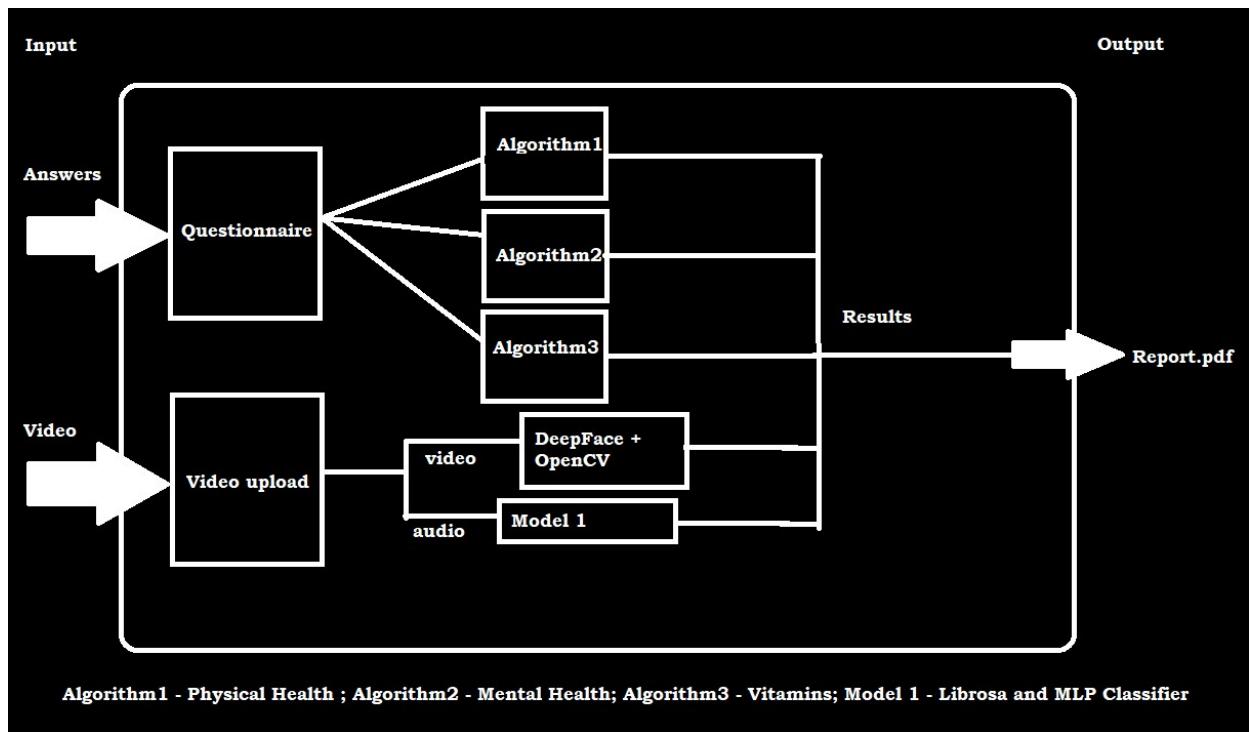
Fig. 16. Data Flow



- Data is collected only from questionnaire.
- All other required data is directly given to the application by the user
- Video is divided into video and audio
- Questionnaire answers are processed into analysis and printed into report
- MLP Classifier is prepared using training data and stored as model.pkl
- Model.pkl is used for audio analysis
- Finally report is generated into the static folder

5.4 HOW IT WORKS:

Fig. 17. Working Model



The main component of the project is the application. Application is wholly developed with Flask. Application can be explained 3 parts i.e., Input, Output and Processing.

Input: -

When the application starts, user will provide inputs through questionnaire. Inputs are categorized into following types:

- MCQ answers
- Video upload
- Fill in the blanks

Processing: -

Processing can be explained in two parts:

Part 1

Questionnaire answers processing -

- User's Questionnaire answers are taken into lists and processed.
- We send collected inputs into three algorithms

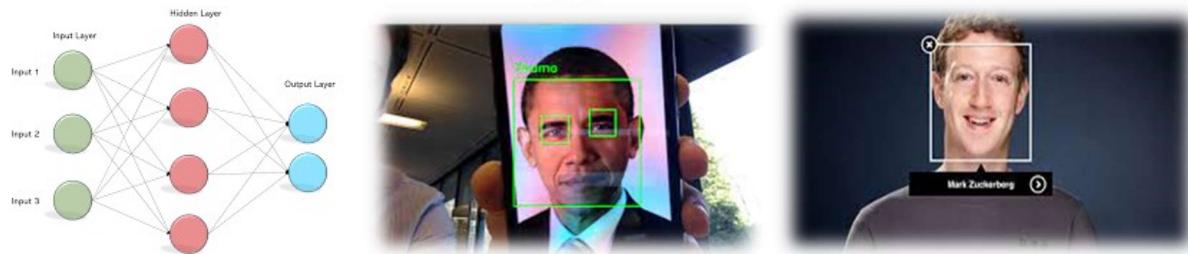
- Algorithm 1: It gives out health problem and score (physical health)
- Algorithm 2: It gives out mental health's a part score and some analysis
- Algorithm 3: It finds vitamin deficiencies

Part 2

Video processing –

- Video is broken into video part and audio part
- Audio is given to the MLP Classifier model which is trained (73% accuracy) and stored in model.pkl file. From audio we generate emotion score. Video will undergo OpenCV program and DeepFace and will generate scores for anxiety and depression w.r.t Video

Fig. 18. Multilayer perceptron Fig. 19. OpenCV detection Fig. 20. DeepFace face detection



Output: -

From generated analysis and score we give out a health report

Finally, we are ready to ahead with the designs which we made.

Table 1 Design checks

Design Requirement	Status
Clarity	Done
Theme	Done
Structure & Idea of contents	Done
Prototype	Done

6. OVERVIEW OF TECHNOLOGIES

Following technologies are used:-

1) Python:

Fig. 21. Python Logo



Python is a high-level programming language that is interpreted, dynamic, object-oriented, and general-purpose. Somewhere in the range of 1985 and 1990, Guido van Rossum planned it. The Python source code is delivered under the GNU General Public License (GPL).

Characteristics:

The features of Python language are as follows:

- Supports structured, functional and OOP methods.
- Scripting language that's been in use since a long time.
- Supports active type checking and has dynamic-datatypes.
- Saves a lot of memory by collecting garbage automatically
- Easy to integrate with other languages

Applications of Python-Language:

Python is one of the most commonly used programming languages on the internet. I'll go over a couple of them now.

- It's easy to pick up
- Simple to read
- Low-maintenance etc

2) HTML & CSS:

Fig. 22. HTML and CSS



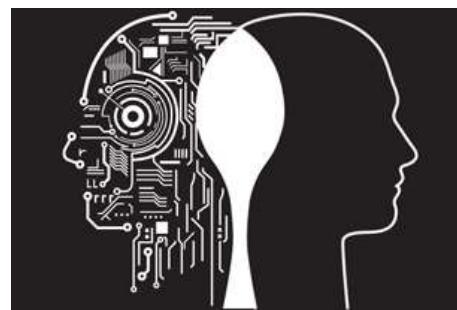
HyperText Markup Language represents HyperText Markup Language. It's a markup language that is utilized to construct site pages. HTML is a markup language that joins hypertext and markup. The expression "hypertext" alludes to the association between pages. The content report inside the label that portrays the design of site pages is depicted utilizing a markup language. This jargon is utilized to explain (add notes to) text with the goal that a program can remember it and change it properly. Most of the markup dialects (like HTML) are comprehensible by people. Labels are utilized in the language to determine what sort of text control is required.

CSS is a basic plan used to make website pages all the more tastefully satisfying. The look and sound of a site page is taken care of by CSS. You may utilize CSS to change the content tone, textual style type, passage separating, how segments are estimated and spread out, what foundation pictures or colors are utilized, interface styles, contrasts in show with different PCs and screen sizes, and a large group of different impacts. CSS is easy to learn and see, however it gives you a great deal of impact over how your HTML record looks. Most usually, CSS is joined with the increase dialects HTML or XHTML.

3) Artificial Intelligence

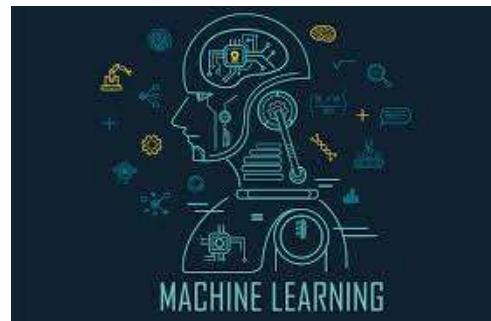
Man-made reasoning/AI is that the imitating of human insight of PCs that are intended to think and keep it up like people. The word may likewise allude to any PC that shows human-like attributes like learning and important thinking.

Fig. 23. Depiction of AI



4) Machine Learning:

Fig. 24. Machine Learning

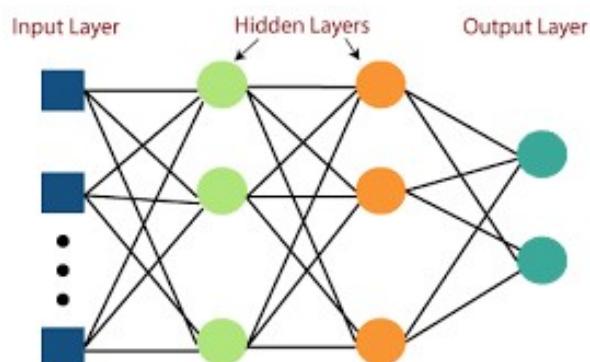


AI is a form of machine learning that gives frameworks the ability to take in and develop data without having to be explicitly customised. The aim of machine learning is to create computer programmes that can access knowledge and use it to solve problems on their own.

5) MLP Classifier:

The multilayer perceptron is a feedforward artificial neural network (MLP). The term MLP is ambiguous, referring to networks that include multiple perceptron layers (with threshold activation) in some cases and some feedforward ANN in others; see Terminology for more details. "Vanilla" neural networks are multilayer perceptrons with only a single hidden layer.

Fig. 25. MLP Classifier



A MLP contains in any occasion three layers of centers: an information layer, a mysterious layer and a yield layer. For preparation, MLP employs a supervised learning technique known as backpropagation. From a direct perceptron, it perceives MLP through its different layers and non-straight activation. It can recognise data that isn't immediately obvious. MLPs are helpful in research for their capacity to tackle issues stochastically, which regularly permits surmised answers for incredibly complex issues like wellness guess.

MLPs are widespread capacity approximators as demonstrated by Cybenko's hypothesis, so they can be utilized to make numerical models by relapse investigation. As arrangement is a specific instance of relapse when the reaction variable is downright, MLPs make great classifier calculations. MLPs were a famous AI arrangement during the 1980s, discovering applications in different fields like discourse acknowledgment, picture acknowledgment, and machine interpretation programming, however from that point confronted solid rivalry from a lot more straightforward help vector machines. Premium in backpropagation networks returned because of the accomplishments of profound learning.

7. IMPLEMENTATION

7.1 CODING:

We have 8 main files. They are:

1. Home.py
2. Index (HTML-file)
3. 1.html
4. 2.html
5. 3.html
6. 4.html
7. 5.html
8. 6.html

Flask Application:

<https://drive.google.com/drive/folders/1sZk-X4Gn05UsjsalWm9r9uFzpfNiKJCY?usp=sharing>

Home.py is a file which contains all methods to run application and generate report. It has some methods to support app routing and others like mhealth, health, audio, pdf_generation etc to generate analysis with report.

HTML-files link --

https://drive.google.com/drive/folders/1xmpgu_M8Q22nbM7fjzSW0lVv3aFNkSL4?usp=sharing

Code – In next page

Screen1 Code Snapshots (8)

Home.py

```
#import required packages
from flask import Flask,render_template,request,redirect,flash
import requests
from bs4 import BeautifulSoup
import pandas as pd
import cv2
from deepface import DeepFace
import cv2, time, pandas,math
from datetime import datetime
import dlib
# import mypsolution as mysp
import moviepy.editor
import librosa
import soundfile
import os, glob, pickle
import numpy as np
from parselmouth.praat import call, run_file
import pandas as pd
import numpy as np
import plotly
import plotly.express as px
from docxtpl import DocxTemplate
import jinja2
import datetime
from docx2pdf import convert
#psutil
BLINK_RATIO_THRESHOLD = 5.0

details=[]
app = Flask(__name__, template_folder='templates')
L1,L2,L3,L4,res=[],[],[],[],[]
Final=dict() # F={"a":2}
Final["tips"]="""
1. Drink A Glass Of Water First Thing In The Morning
2. Take The Stairs
3. Make Half Your Plate Veggies
4. Get A Fitness Tracker + Track Your Steps
5. Switch To Non-toxic Household Cleaning Products
6. Use Non-toxic Skincare + Personal Care Products
7. Take A Probiotic Daily
8. Eat Real Food
9. Stand Up Every 30 Minutes While Working
10. Get Sunlight Every Day
11. Fill Your Home With Houseplants
12. Sweat Every Day
13. Have A Daily Green Smoothie
14. Work Hard + Be Kind
15. Cultivate A Positive Mindset
16. Get Enough Sleep
17. Start Your Day With A Healthy Morning Routine
18. Eat The Rainbow
19. Floss Your Teeth
20. Spend Time Alone
21. Do Things You Enjoy
22. Choose Organic Foods When Possible
23. A Teaspoon Of Apple Cider Vinegar Keeps The Doctor Away
24. Smile Often
25. Work On Overcoming Your Fears
26. Use A Yoga Ball As A Desk Chair
27. Manage Stress With Self-care Activities
28. Intermittent Fasting Can Promote Weight Loss
29. Drink A Glass Of Water After Every Alcoholic Beverage
30. Practice Gratitude
31. A Walk Around The Block Is Better Than No Walk At All"""
@app.route('/')
def Home():
    return render_template('index.html')

@app.route('/physiological', methods =["GET", "POST"])
def data1():
    if request.method == "POST":
        details=[x for x in request.form.values()]
    Final["name"]=details[0]
    Final["age"]=details[1]
    Final["gender"]=details[4]
    Final["phnum"]=details[2]
    Final["email"]=details[3]
    return render_template('1.html')

@app.route('/psychological', methods =["GET", "POST"])

```

```
def data1():
    if request.method == "POST":
        L1=[x for x in request.form.values()]
        health_problems,half=health(L1)
        Final["L1"] = L1
        df=pd.read_csv("Symptoms.csv")
        df.set_index('Problems', inplace=True)
        a121=df.loc[list(health_problems)]
        stra=""
        for i in health_problems:
            a=list(df.loc[i])
            stra+="\n\n"+i+":-"
        \n        Medicine:t"+a[0]+\n        Remedies:\n"+a[1]+\n        Tips:\n"+a[2]+\n"
        half=100-half*100
        print(a121,half)
        if half>=75:
            a="GOOD"
        elif half>50 and half<75:
            a="Okay !"
        else:
            a="Too LOW"
        a1234="\nYour Health Score is "+a+"\n"
        print(L1,len(L1))
        Final['healthprob']=stra
        Final['HSCORE']=int(half)
        Final["Comment1"] = a1234
        return render_template('2.html')

@app.route('/Select', methods =["GET", "POST"])
def data2():
    if request.method == "POST":
        L2=[x for x in request.form.values()]
        ak=[['a Non-Active Person','a Medium active person','a Very Active person'], ['a Hot headed person','a Tensed person','a Cool Person'], ['Mentally weak','-' , 'Mentally Strong'], ['having High level Eating disorders','having Starting level Eating disorders','-' ], ['having Low self esteem','having Casual level confidence','having High level Confident'], ['-','-','-'], ['Absent minded','-' , 'Active mind'], ['Thinking a lot','-' , 'Chill dude type'], ['Stuck with incidents','-' , 'having Clear brain'], ['Too stressed','stressed sometimes','Staying away from stress'], ['-','-','-'], ['having Weak will power','-' , 'having Strong will power'], ['-','-','-' , 'Mind is affecting you a lot'], ['Mind is affecting you Be careful','-' , ['Affected a lot with mood swings','Affected with mood swings','-' ] ]
        print(L2)
        for i in range(len(L2)):
            k=ak[i]
            if k[int(L2[i])-1]!="-":
                res.append("You are "+k[int(L2[i))-1])
        k1,k2,a1,a2,anxi,depr=health(L2)
        print(k1,k2,a1,a2,anxi,depr,res)
        stri=""
        for i in res:
            stri+=i+" "+i+"\n"
        Final['L2']=L2
        Final['AnxiQ']=anxi
        Final['DCate']=a1
        Final['ACate']=a2
        Final['DeprQ']=depr
        Final['Mpoints']=stri
        return render_template('3.html')

@app.route('/type', methods =["GET", "POST"])
def data3():
    if request.method == "POST":
        l3=[int(x) for x in request.form.values()]
        a11=[["A","C","D","E","K","B1","B2","B3","B5","B6","B7","B9","B12"]]
        a1=[[1, 2, 3, 4, 5, 6, 7, 8], [1, 7, 12, 18, 9, 11, 13, 25], [7, 9, 10, 12, 14, 33, 36], [9, 27, 30, 34, 35], [7, 16, 17], [9, 12, 27, 23, 34, 35], [1, 22, 24, 31], [9, 15, 19, 20, 25, 28, 36], [9, 15, 19, 23, 25, 27], [9, 11, 19, 23, 24, 25, 27, 29, 31, 35], [1, 2, 9, 12, 15, 23, 24, 25, 27, 30, 33, 36], [5, 9, 19, 22, 26], [9, 11, 19, 21, 22, 23, 27, 29, 30, 32, 34, 35]]
        a2=[["\nSweet Potato,Carrot,Spinach,Butter,Mango,Cheese,Salmon,Cod Liver Oil,Lamb Liver,Hard Boiled Egg\n"],
```

```

['\nOrange,Strawberries,Papayas,Lychees,Lemons,Broccoli,Parsley,Chili Peppers\n'],
['\nSalmon,Cod liver oil,Egg yolks,Mushrooms,Fortified foods\n'],
['\nSunflower Seeds,Almonds,Sunflower Oil,Almond Oil,Peanuts,Avocado,Red Sweet Pepper,Mango\n'],
['\nSpinach,Broccoli,Chicken,Green Beans,Prunes,Kiwi,Soybean Oil,Hard Cheeses,Avocado,Cabbage\n'],
['\nYeast,Nuts,Whole Grains,Pulses,Cauliflower,Liver,Oranges,Eggs,Potatoes,Asparagus\n'],
['\nTofu,Low Fat Milk,Salmon,Mushrooms,Curd,Spinach,Almonds,Eggs\n'],
['\nLiver,Chicken Breast,Avocado,Peanuts,Whole Grains,Mushrooms,Green Peas,Potatoes\n'],
['\nMushrooms,Liver,Salmon,Tuna,Peanuts,Guava,Potatoes,Avocado,Lentils,Whey Protein,Cheese,Eggs,Yeast\n'],
['\nMilk,Ricotta Cheese,Salmon,Tuna,Eggs,Chicken Liver,Carrots,Spinach,Sweet Potato,Breakfast Cereal,Chickpeas\n'],
['\nEgg Yolks,Legumes,Nuts and Seeds,Liver,Sweet Potatoes,Mushrooms,Broccoli,Banana,Yeast,Avocado\n'],
['\nLegumes,Asparagus,Eggs,Leafy Greens,Beets,Citrus fruits,Broccoli,Nuts and Seeds,Fortified Grains\n'],
['\nAnimal Liver and Kidneys,Clams,Fortified Cereal,Tuna,Salmon,Milk and Dairy Products,Eggs\n']]
b,d=[],[]
c112=""
print(13)
for k in a1:
    count=0
    for i in k:
        if i in l3:
            count+=1
    b.append(count)
for k in range(0,len(b)):
    #print(len(a1[k]),b[k])
    if len(a1[k])/2<=b[k]:
        c112+="\n"+a11[k]+a2[k][0]
print(c112,len(c112))
if len(c112)==0:
    c112+="No Vitamin deficiencies, Please continue having healthy foods"
    Final['Vitamin']=c112
    print(Final['Vitamin'])
return render_template('4.html')

@app.route('/Upload', methods =["GET", "POST"])
def data4():
    if request.method == "POST":
        14=[x for x in request.form.values()]
        print(14)
        a,b=int(14[0]),int(14[1])
        if a==0:
            k1="To Be like this and Enjoy Life Without Diabetics"
        elif a<=100 and a>=100:
            k1="Your Diabetics are in control"
        else:
            k1="Visit Doctor regarding your Diabetics to get medication change"
        if b>=60 and b<=100 :
            k2="Your Heart is safe"
        else:
            k2="Your Heart is not safe, Visit a Doctor"
        Final['HealthPD']="\\n"+k1+"\n"+k2+"\n"
        Final['Heart']=b
        return render_template('5.html')

@app.route('/final', methods =["GET", "POST"])
def data5():
    if request.method == "POST":
        file=request.files['a']
        file.save(os.path.join("static",file.filename))
        a97=anxitrate(file.filename)
        a99=deprate(file.filename)
        a88=audio(file.filename)
        print(a99,a88,a97)
        Final['audio']=a88
        Final['deprV']=a99
        Final['anxit']=a97
        pdf_generation()
        return render_template('6.html')
def midpoint(point1 ,point2):
    return (point1.x + point2.x)/2,(point1.y + point2.y)/2

def euclidean_distance(point1 , point2):
    return math.sqrt((point1[0] - point2[0])**2 + (point1[1] - point2[1])**2)

def get_blink_ratio(eye_points, facial_landmarks):
    corner_left = (facial_landmarks.part(eye_points[0]).x,
                   facial_landmarks.part(eye_points[0]).y)
    corner_right = (facial_landmarks.part(eye_points[3]).x,
                    facial_landmarks.part(eye_points[3]).y)

    center_top = midpoint(facial_landmarks.part(eye_points[1]),
                           facial_landmarks.part(eye_points[2]))
    center_bottom = midpoint(facial_landmarks.part(eye_points[5]),
                             facial_landmarks.part(eye_points[4]))
    horizontal_length = euclidean_distance(corner_left,corner_right)
    vertical_length = euclidean_distance(center_top,center_bottom)

    ratio = horizontal_length / vertical_length

    return ratio

def q1(a):
    if a>=0 and a<5:
        return 1
    elif a>=5 and a<8:
        return 2
    elif a>=8 and a<11:
        return 3
    elif a>=11 and a<14:
        return 4
    else:
        return 5

def q2(a):
    if a>=0 and a<5:
        return 1
    elif a>=5 and a<8:
        return 2
    elif a>=8 and a<11:
        return 3
    elif a>=11 and a<14:
        return 4
    else:
        return 5

def q3(a):
    if a>=0 and a<4:
        return 1
    elif a>=4 and a<10:
        return 2
    elif a>=10 and a<16:
        return 3
    elif a>=16 and a<22:
        return 4
    else:
        return 5

def q4(a,b,c):
    return ((a+b+c)/15)*100

def anxitrate(b1):
    static_back,a = None,0
    a1=0
    motion_list = [ None, None ]
    time = []
    ds_factor = 0.69
    b="static/"+b1
    df = pandas.DataFrame(columns = ["Start", "End"])
    detector = dlib.get_frontal_face_detector()
    predictor = dlib.shape_predictor("shape_predictor_68_face_landmarks.dat")
    mouth_cascade = cv2.CascadeClassifier('static/haarcascade_mcs_mouth.xml')
    left_eye_landmarks = [36, 37, 38, 39, 40, 41]
    right_eye_landmarks = [42, 43, 44, 45, 46, 47]
    video = cv2.VideoCapture(b)
    a2=0
    k=0
    while True:
        k=k+1
        check, frame = video.read()
        if check:
            motion = 0

```

```

gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
gray = cv2.GaussianBlur(gray, (21, 21), 0)
if static_back is None:
    static_back = gray
    continue
diff_frame = cv2.absdiff(static_back, gray)
thresh_frame = cv2.threshold(diff_frame, 30, 255, cv2.THRESH_BINARY)[1]
thresh_frame = cv2.dilate(thresh_frame, None, iterations = 2)
frame1 = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
frame2 = cv2.resize(frame, None, fx=ds_factor, fy=ds_factor,
interpolation=cv2.INTER_AREA)
gray1 = cv2.cvtColor(frame2, cv2.COLOR_BGR2GRAY)
faces, _ = detector.run(image = frame1, upsample_num_times
= 0, adjust_threshold = 0.0)
mouth_rects = mouth_cascade.detectMultiScale(gray1, 1.7, 11)
cnts,_ = cv2.findContours(thresh_frame.copy(),cv2.RETR_EXTERNAL,
cv2.CHAIN_APPROX_SIMPLE)
for contour in cnts:
    if cv2.contourArea(contour) < 10000:
        continue
    motion = 1
    (x, y, w, h) = cv2.boundingRect(contour)
    cv2.rectangle(frame, (x, y), (x + w, y + h), (0, 255, 0),
, 3)
    for face in faces:
        landmarks = predictor(frame1, face)
        left_eye_ratio = get_blink_ratio(left_eye_landmarks, la
ndmarks)
        right_eye_ratio = get_blink_ratio(right_eye_landmarks, l
andmarks)
        blink_ratio = (left_eye_ratio + right_eye_ratio) / 2
        if blink_ratio > BLINK_RATIO_THRESHOLD:
            cv2.putText(frame1,"BLINKING", (10,50), cv2.FONT_HERSHEY_SIMPLEX, 2,(255,255,255),2,cv2.LINE_AA)
            a1=a1+1
        for (x,y,w,h) in mouth_rects:
            y = int(y - 0.15*h)
            cv2.rectangle(frame2, (x,y), (x+w,y+h), (0,255,0), 3)
            a2=a2+1
            break
        motion_list.append(motion)
        motion_list,a = motion_list[-2:],a+1
        if motion_list[-1] == 1 and motion_list[-2] == 0:
            time.append(datetime.now())
        if motion_list[-1] == 0 and motion_list[-2] == 1:
            time.append(datetime.now())
        key = cv2.waitKey(1)
        if key == ord('q'):
            if motion == 1:
                time.append(datetime.now())
            break
        else:
            break
#print(time,len(time))
for i in range(0, len(time)-1, 2):
    df = df.append({"Start":time[i], "End":time[i + 1]}, ignore_inde
x = True)
df.to_csv("Time_of_movements.csv")
print(df,k,a,a1,a2)
video.release()
cv2.destroyAllWindows()
if k-90>a:
    k1=k-90
else:
    k1=k
mp=q1(((k1-a2)/k1)*100)
ep=q2(100-((k-a1)/k)*100)
movp=q3(len(df))
anxiety=q4(mp,ep,movp)
return anxiety

def health(a):
    df=pd.read_csv('DATA.csv')
    df.loc[0:26, 'Fever':'Result']
    result=[]
    a=[int(x) for x in a] # converting elements into int
    b=[]
    for i in range(0,27):
        a1=df.loc[i, 'Fever':'pains']
        b.append([i==j for i, j in zip(a1, a)].count(True))

    a1=max(b)
    if a1==13:
        b1=[i for i in range(len(b)) if a1==b[i] and i!=21]
        p=[]
        for i in range(len(a)):
            if a[i]==1:
                k=[]
                for j in range(len(a)):
                    if j==i:
                        k.append(1)
                    else:
                        k.append(0)
                p.append(k)
            else:
                continue
        for k in p:
            b2=[]
            for j in range(0,27):
                a1=df.loc[j, 'Fever':'pains']
                b2.append([i==j for i, j in zip(a1, k)].count(True))
            result.append(b2.index(13))
        if len(b1)!=0:
            for i in b1:
                if i not in result:
                    result.append(i)
        else:
            result.append(b.index(a1))

    f=[]
    for i in result:
        f.append(df.loc[i,'Result'])
    k=sum(a)/len(a)
    return set(f),k

def mhealth(k):
    k=[int(x) for x in k]
    k1=sum(k[0:9])
    k2=sum(k[6:1])
    if k1>9 and k1<=11:
        a1="Advised to see a doctor"
    elif k1>=12 and k1<=14:
        a1="High signs of Depression"
    elif k1>=15 and k1<=21:
        a1="Moderate signs of Depression"
    else:
        a1="Very less or no signs of Depression"
    if k2>9 and k2<=12:
        a2="Advised to see a doctor"
    elif k2>=13 and k2<=17:
        a2="High signs of Anxiety"
    elif k2>=18 and k2<=22:
        a2="Moderate signs of Anxiety"
    else:
        a2="Very less or no signs of Anxiety"
    anxi=100-(((k2-9)*100)/18)
    depr=100-(((k1-9)*100)/18)
    return k1,k2,a1,a2,anxi,depr

def deprate(a1):
    a="static/"+"a1"
    cap = cv2.VideoCapture(a)
    total_frame = int(cap.get(cv2.CAP_PROP_FRAME_COUNT))
    seconds = 10
    fps = cap.get(cv2.CAP_PROP_FPS)
    multiplier = fps * seconds
    if (cap.isOpened()== False):
        print("Error opening video stream or file")
        return 0
    frame_counter = 1
    b=[]
    while frame_counter <= total_frame:
        cap.set(cv2.CAP_PROP_POS_FRAMES, frame_counter)
        ret, frame = cap.read()
        p=DeepFace.analyze(frame)
        if p['dominant_emotion'] in ['fear','angry','disgust','sad']:
            b.append([p['emotion']['fear']+p['emotion']['angry']+p['emotion']['disgust']+p['emotion']['sad'])/4)
            frame_counter += multiplier
    cap.release()
    return (sum(b)/len(b))

x1=[]
def feature(file_name, mfcc, chroma, mel):

```

```

audioData, sample_rate = librosa.load(file_name)
if chroma:
    stft=np.abs(librosa.stft(audioData))
result=np.array([])
if mfcc:
    mfccs=np.mean(librosa.feature.mfcc(y=audioData, sr=sample_rate,
n_mfcc=40).T, axis=0)
    result=np.hstack((result, mfccs))
if chroma:
    chroma=np.mean(librosa.feature.chroma_stft(S=stft, sr=sample_rate).T, axis=0)
    result=np.hstack((result, chroma))
if mel:
    mel=np.mean(librosa.feature.melspectrogram(audioData, sr=sample_rate).T, axis=0)
    result=np.hstack((result, mel))
return result

def audio(x):
    a="static/" + x
    video = moviepy.editor.VideoFileClip(a)
    audio = video.audio
    audio.write_audiofile(r"static\sample.wav")
    for file in glob.glob('static/*.wav'):
        f=feature(file, mfcc=True, chroma=True, mel=True)
        x1.append(f)
    model=pickle.load(open("model.pkl","rb"))
    y_pred=model.predict(np.array(x1))
    k={ 'neutral':10, 'calm':10, 'happy':5, 'sad':50, 'angry':40, 'fearful':45, 'disgust':45, 'surprised':5}
    a1=k[y_pred[0]]
    m="sample"
    p=r"C:\Users\MANTHRI BHARADWAJ\Desktop\FINAL DEPLOYMENT\static"
    sound=p+ "/" + m + ".wav"
    sourcerun=p+ "/myspsolution.praat"
    path=p+ "/"
    objects= run_file(sourcerun, -20, 2, 0.3, "yes", sound, path, 80, 400, 0.01, capture_output=True)
    z1=str( objects[1])
    z2=z1.strip().split()
    z3=np.array(z2)
    z4=np.array(z3)[np.newaxis]
    z5=z4.T
    dataset=pd.DataFrame({"number_ of syllables":z5[0,:],"number_of_pauses":z5[1,:],"rate_of_speech":z5[2,:],"articulation_rate":z5[3,:],"speaking_duration":z5[4,:],
                           "original_duration":z5[5,:],"balance":z5[6,:],"f0_mean":z5[7,:],"f0_std":z5[8,:],"f0_median":z5[9,:],"f0_min":z5[10,:],"f0_max":z5[11,:],
                           "f0_quantile25":z5[12,:],"f0_quan75":z5[13,:]}) 
    l1=dataset.T.index.tolist()
    l2=dataset.T.values.tolist()
    l2=[float(j) for i in l2 for j in i]
    dic=dict(zip(l1,l2))
    a2 = (dic['number_of_pauses'])/(dic['rate_of_speech']*(dic['speaking_duration']/6))*25
    a3 = (dic['number_ of syllables'])/(dic['rate_of_speech']*(dic['speaking_duration']))*25
    return a1+a2+a3

def pdf_generation():
    Final['DA']=str(datetime.datetime.now())
    doc= DocxTemplate('static/HealthReporttep.docx')
    Final['ASCORE']=int((Final['audio']+Final['anxiV']+Final['AnxiQ'])/3)
    Final['DSCORE']=int((Final['audio']+Final['deprV']+Final['DeprQ'])/3)
    doc.render(Final)
    b1=Final["Heart"]
    if b1>=60 and b1<=100 :
        heart=1
    else:
        heart=0
    a=["Lungs", "Heart", "Stomach", "Eyes", "Ears", "Nose", "Throat"]
    K1=[int(x) for x in Final["L1"]]
    K2=[int(x) for x in Final["L2"]]
    print(K1,len(K1))
    b=[int((1-K1[0]+1-K1[5]+1-K1[8])/3),heart,int(2-K1[9]+K1[10]/2),1-K1[3],1-K1[4],1-K1[5],1-K1[7]]
    c=["Depression", "Anxiety", "Stress", "Sleep issues", "Fears"]
    d=[Final['DSCORE'],Final['ASCORE'],((4*4)-(K2[9]+K2[8]+K2[4]+K2[2]))*100/16,(4-K2[1])*100/4,(4-K2[11])*100/4]

```

```

fig = px.bar(x = a, y = b)
fig1 = px.bar(x = c, y = d)
plotly.io.write_image(fig, 'static/a.png', format='png')
plotly.io.write_image(fig1, 'static/b.png', format='png')
doc.replace_media('static/Word Art.png','static/b.png')
doc.replace_media('static/images.jfif','static/a.png')
doc.save('static/D.docx')
convert("static/D.docx","static/Report.pdf")

```

```

if __name__ == '__main__':
    app.run(debug=False)

```

Index.html

```

<!DOCTYPE HTML>
<html>
<head>
<title>Mine</title>
<meta charset="utf-8" />
<meta name="viewport" content="width=device-width, initial-scale=1" />
<style>
<link href="1.css" type="style/css">
</style>
</head>
<body>
<header id="header" class="alt">
<div class="Logo" style="font-size: xx-large; color: #FFF; ">MiniDoctor <span>A Personal Health Assessment Web-Based Application </span></div>
</header>

<section class="banner full" >
<article>

<div class="inner">
<headers >
<marquee style="background-color: #000; color: white;">>WELCOME</marquee>
<section id="one" class="wrapper style2">
<div class="grid-style">
<div>
<div class="content">
<p style="color: black; justify-content: center; text-align: justify; padding-left: 20px;">Greetings!<br>

```

This is a Personal Health Assessment that is developed to provide a one-stop health portal to analyze your mental and physical well-being. The motivation behind this application is to make instant medical evaluation accessible to everyone.

This interactive application evaluates your health status based on several aspects to identify problems and provide a diagnosis of ailments.

On completion of the diagnosis, you are recommended certain precautions or remedies based on your results.

It is always best to stay on top of things especially when it comes to health because a healthy mind and body hold a healthy soul.

```

<blockquote style="color: black; justify-content: center; text-align: justify; padding-left: 20px;">> "Health Care is a Right Not a Privilege!" </blockquote>
</p>
</div>
</div>
<div class="box">
<div class="content">
<header class="align-center">
<center><p style="color: black;">Start Here</p></center>
</header>
<form action="/physiological" method="POST">
<div>
<label>Name *</label>
<input type="text" name="Name" required>
</div>
<br>
<div>
<label>Age *</label>
<input type="text" name="Age" required>
</div>
<br>
<div>
<label>Phone Number *</label>
<input type="text" name="PhoneNumber" required>
</div>
<br>
<div>
<label>Email *</label>
<input type="email" name="Email" required>

```

```

</div>
<br>
<div >
<label>Gender (M/F) *</label>
<input type="text" name="Gender" required>
</div>
<br>
<br>
<input type="submit" value="Submit" style="color: black;">
</form>
</div>
</div>
</div>

</div>
</div>
<footer id="footer" style="height: 0px;">
<div class="copyright">
Developed by CSEBNM_M07
</div>
</footer>
</section>
</header>
</div>
</article>
</section>

<script src="assets/js/jquery.min.js"></script>
<script src="assets/js/jquery.scrolllex.min.js"></script>
<script src="assets/js/skel.min.js"></script>
<script src="assets/js/util.js"></script>
<script src="assets/js/main.js"></script>

</body>
</html>

```

1.Html

```

<!DOCTYPE HTML>
<html>
<head>
<title>Mine</title>
<meta charset="utf-0" />
<meta name="viewport" content="width=device-width, initial-scale=1" />
<style>
<link href="1.css" type="style/css">
</style>
</head>
<body>
<body style="background-image: url('static/740143.jpg'); background-repeat: round;">

<!-- Header -->
<header id="header" class="alt">
<div class="logo" style="color: white;">MiniDoctor <span>A Personal Health Assesment Web-Based Application </span></div>
</header>

<!-- Banner -->
<section class="banner full">
<div class="inner">
<div class="transbox" style="align-items: center; color: #fffff;">
<form action="/psychological" method="POST" style="padding-top: 5;">
<h3 id="a1">Are you having Cough/Cold?</h3>
<input id="a1" type="radio" name="1" value="1" required> <label for="a1" style="color: #fffff;">Yes</label>
<input id="b1" type="radio" name="1" value="0" ><label for="b1" style="color: #fffff;">No</label>
<br>
<br>
<br>
<h3 id="a2">Are you having Fever?</h3>
<input id="a2" type="radio" name="2" value="1" required> <label for="a2" style="color: #fffff;">Yes</label>
<input id="b2" type="radio" name="2" value="0" ><label for="b2" style="color: #fffff;">No</label>
<br>
<br>
<br>
<h3 id="a3">Do you frequently get headache?</h3>
<input id="a3" type="radio" name="3" value="1" required> <label for="a3" style="color: #fffff;">Yes</label>
<input id="b3" type="radio" name="3" value="0" ><label for="b3" style="color: #fffff;">No</label>
<br>
<br>
<br>
<h3 id="a4">Do you feel pain or irritation in eyes?</h3>

```

```

<input id="a4" type="radio" name="4" value="1" required> <label for="a4" style="color: #fffff;">Yes</label>
<input id="a4" type="radio" name="4" value="0" ><label for="b4" style="color: #fffff;">No</label>
<br>
<br>
<br>
<h3 id="a5">Are your Ears having some Ears Problem? (pain, hearing problem)</h3>
<input id="a5" type="radio" name="5" value="1" required> <label for="a5" style="color: #fffff;">Yes</label>
<input id="b5" type="radio" name="5" value="0" ><label for="b5" style="color: #fffff;">No</label>
<br>
<br>
<br>
<h3 id="a6">Are you suffering with running nose or nose block any breathing issue? just breathe in and breathe out 5 times and tell me</h3>
<input id="a6" type="radio" name="6" value="1" required> <label for="a6" style="color: #fffff;">Yes</label>
<input id="b6" type="radio" name="6" value="0" ><label for="b6" style="color: #fffff;">No</label>
<br>
<br>
<br>
<h3 id="a7">Do you get tooth pain regularly?</h3>
<input id="a7" type="radio" name="7" value="1" required> <label for="a7" style="color: #fffff;">Yes</label>
<input id="b7" type="radio" name="7" value="0" ><label for="b7" style="color: #fffff;">No</label>
<br>
<br>
<br>
<h3 id="a8">Is your throat having some problem?</h3>
<input id="a8" type="radio" name="8" value="1" required> <label for="a8" style="color: #fffff;">Yes</label>
<input id="b8" type="radio" name="8" value="0" ><label for="b8" style="color: #fffff;">No</label>
<br>
<br>
<br>
<h3 id="a9">Inhale and exhale with your mouth strongly. Any difficulty in lungs or any problem?</h3>
<input id="a9" type="radio" name="9" value="1" required> <label for="a9" style="color: #fffff;">Yes</label>
<input id="b9" type="radio" name="9" value="0" ><label for="b9" style="color: #fffff;">No</label>
<br>
<br>
<br>
<h3 id="a10">Do you often feel no hunger or Your digestion system is weak?</h3>
<input id="a10" type="radio" name="10" value="1" required> <label for="a10" style="color: #fffff;">Yes</label>
<input id="b10" type="radio" name="10" value="0" ><label for="b10" style="color: #fffff;">No</label>
<br>
<br>
<br>
<h3 id="a11">Do you get stomach pain regularly?</h3>
<input id="a11" type="radio" name="11" value="1" required> <label for="a11" style="color: #fffff;">Yes</label>
<input id="b11" type="radio" name="11" value="0" ><label for="b11" style="color: #fffff;">No</label>
<br>
<br>
<br>
<h3 id="a12">Do you feel pain in legs or hands? Just wave them strongly and let me know...?</h3>
<input id="a12" type="radio" name="12" value="1" required> <label for="a12" style="color: #fffff;">Yes</label>
<input id="b12" type="radio" name="12" value="0" ><label for="b12" style="color: #fffff;">No</label>
<br>
<br>
<br>
<h3 id="a13">Do you feel any pains regularly in your body?</h3>
<input id="a13" type="radio" name="13" value="1" required> <label for="a13" style="color: #fffff;">Yes</label>
<input id="b13" type="radio" name="13" value="0" ><label for="b13" style="color: #fffff;">No</label>
<br>
<br>
<br>
<input type="submit" value="Submit" style="color: black;">
<p id="demo"></p>
</form>
</div>
</div>
</section>

<footer id="footez">
<div class="copyright">
Developed by CSEBNM_M07

```

```

</div>
</footer>

<!-- Scripts -->
<script src="assets/js/jquery.min.js"></script>
<script src="assets/js/jquery.scrollEx.min.js"></script>
<script src="assets/js/skel.min.js"></script>
<script src="assets/js/util.js"></script>
<script src="assets/js/main.js"></script>
</body>
</html>

2.html
<!DOCTYPE HTML>
<html>
<head>
<title>Mine</title>
<meta charset="utf-8" />
<meta name="viewport" content="width=device-width, initial-scale=1" />
<style>
<link href="1.css" type="style/css">
</style>
</head>
<body style="background-image: url('static/740143.jpg'); background-repeat: round;">

<!-- Header -->
<header id="header" class="alt">
<div class="logo" style="color: white;">MiniDoctor <span>A Personal Health Assessment Web-Based Application </span></div>
</header>

<!-- Banner -->
<section class="banner full" >
<div class="inner">
<div class="transbox" style="align-items: center; color: #fffff;">
<form action="/Select" method="POST" style="padding-top: 5%; ">
<h3 id="a1">Little interest or pleasure in doing daily activities</h3>
<input id="d1" type="radio" name="1" value="1" required> <label for="d1" style="color: #fffff;">Yes, Little interest slow downs my daily activities</label> <br>
<input id="c1" type="radio" name="1" value="2" ><label for="c1" style="color: #fffff;">Sometimes</label> <br>
<input id="b1" type="radio" name="1" value="3" ><label for="b1" style="color: #fffff;">Not often</label> <br>
<br>
<br>
<br>
<h3 id="a2">How often do you have sleep issues/ insomnia?</h3>
<input id="d2" type="radio" name="2" value="1" required> <label for="d2" style="color: #fffff;">Most nights</label> <br>
<input id="b2" type="radio" name="2" value="2" ><label for="b2" style="color: #fffff;">Some days</label> <br>
<input id="c2" type="radio" name="2" value="3" ><label for="c2" style="color: #fffff;">Very rare</label> <br>
<br>
<br>
<br>
<h3 id="a3">How often do you find yourself feeling tired or having little/no energy?</h3>
<input id="d3" type="radio" name="3" value="1" required> <label for="d3" style="color: #fffff;">Very often, it interrupts everyday activities</label> <br>
<input id="b3" type="radio" name="3" value="2" ><label for="b3" style="color: #fffff;">Some days I feel tired</label> <br>
<input id="c3" type="radio" name="3" value="3" ><label for="c3" style="color: #fffff;">Rarely</label> <br>
<br>
<br>
<br>
<h3 id="a4">Did you notice poor appetite or overeating in your eating pattern?</h3>
<input id="d4" type="radio" name="4" value="1" required> <label for="d4" style="color: #fffff;">Overeating/ Loss of appetite on most days</label> <br>
<input id="b4" type="radio" name="4" value="2" ><label for="b4" style="color: #fffff;">Sometimes, it depends on my mood</label> <br>
<input id="c4" type="radio" name="4" value="3" ><label for="c4" style="color: #fffff;">No, I have a consistent eating pattern</label> <br>
<br>
<br>
<br>
<h3 id="a5">Do you doubt yourself?</h3>
<input id="d5" type="radio" name="5" value="1" required> <label for="d5" style="color: #fffff;">Yes, I often doubt my capacities or worth</label> <br>

```

```

<input id="fc13" type="radio" name="f13" value="3" ><label for="fc13"
style="color: #fffff;">Almost never</label><br>
<br>
<br>
<br>
<h3 id="fa14">Digestive or gastrointestinal problems such as
diarrhea or constipation?</h3>
<input id="d14" type="radio" name="f14" value="1" required> <label
for="d14" style="color: #fffff;">Very often</label><br>
<input id="b14" type="radio" name="f14" value="2" ><label for="b14"
style="color: #fffff;">Sometimes</label> <br>
<input id="c14" type="radio" name="f14" value="3" ><label for="c14"
style="color: #fffff;">Almost never</label><br>
<br>
<br>
<br>
<h3 id="fa15">Do you often find yourself performing certain
behaviors over and over again?</h3>
<input id="g15" type="radio" name="f15" value="1" required> <label
for="g15" style="color: #fffff;">Very often</label><br>
<input id="b15" type="radio" name="f15" value="2" ><label for="b15"
style="color: #fffff;">Sometimes</label> <br>
<input id="c15" type="radio" name="f15" value="3" ><label for="c15"
style="color: #fffff;">Almost never</label><br>
<br>
<br>
<br>
<br>
<input type="submit" value="Submit" style="color: black;">
<p id="demo"></p>
</form>
</div>
</div>
</section>

<footer id="footer">
<div class="copyright">
Developed by CSEBNM_M07
</div>
</footer>


<script src="assets/js/jquery.min.js"></script>
<script src="assets/js/jquery.scrolllex.min.js"></script>
<script src="assets/js/skel.min.js"></script>
<script src="assets/js/util.js"></script>
<script src="assets/js/main.js"></script>
</body>
</html>

3.html
<!DOCTYPE HTML>
<html>
<head>
<title>Mine</title>
<meta charset="utf-8" />
<meta name="viewport" content="width=device-width, initial-
scale=1" />
<style>
<link href="1.css" type="style/css" />
</style>
</head>
<body style="background-image: url('static/740143.jpg');
background-repeat: round;">


<header id="header" class="alt">
<div class="logo" style="color: white;">MiniDoctor <span>A
Personal Health Assessment Web-Based Application </span>
</div>


<section class="banner full">
<div class="inner">
<div class="transbox" style="align-items: center; color:
#fffff;">
<form action="/type" method="POST" style="padding-top: 5%;"
<h3>Select all problems which you have: </h3> <br>
<table>
<tr>
<td><input type="checkbox" id="1" name="1" value="1" ><label
for="1">Dry Skin</label></td>
<td><input type="checkbox" id="2" name="2" value="2" ><label
for="2">Dry Eyes</label></td>
<td><input type="checkbox" id="3" name="3" value="3" ><label
for="3">Night Blindness</label></td>
<td><input type="checkbox" id="4" name="4" value="4" ><label
for="4">Infertility</label></td>
<td><input type="checkbox" id="5" name="5" value="5" ><label
for="5">Delayed Growth</label></td>
</tr>
<tr><td><input type="checkbox" id="6" name="6" value="6" ><label
for="6">Throat and Chest Infections</label></td>
</tr>
<tr><td><input type="checkbox" id="7" name="7" value="7" ><label
for="7">Poor Wound Healing</label></td>
<td><input type="checkbox" id="8" name="8" value="8" ><label
for="8">Acne</label></td>
<td><input type="checkbox" id="9" name="9" value="9" ><label
for="9">Fatigue</label></td>
<td><input type="checkbox" id="10" name="10" value="10" ><label
for="10">Excessive Sweating</label></td>
<td><input type="checkbox" id="11" name="11" value="11" ><label
for="11">Mood Swings</label></td>
<td><input type="checkbox" id="12" name="12" value="12" ><label
for="12">Joint Pain</label></td>
</tr>
<tr>
<td><input type="checkbox" id="13" name="13" value="13" ><label
for="13">Overweight</label></td>
<td><input type="checkbox" id="14" name="14" value="14" ><label
for="14">High BP</label></td>
<td><input type="checkbox" id="15" name="15" value="15" ><label
for="15">Digestion Problems</label></td>
<td><input type="checkbox" id="16" name="16" value="16" ><label
for="16">Bleeding(excessive)</label></td>
<td><input type="checkbox" id="17" name="17" value="17" ><label
for="17">Slow blood Coagulation</label></td>
<td><input type="checkbox" id="18" name="18" value="18" ><label
for="18">Weak bones</label></td>
</tr>
<tr>
<td><input type="checkbox" id="19" name="19" value="19" ><label
for="19">Dizziness</label></td>
<td><input type="checkbox" id="20" name="20" value="20" ><label
for="20">Memory Impairment</label></td>
<td><input type="checkbox" id="21" name="21" value="21" ><label
for="21">Weight Loss</label></td>
<td><input type="checkbox" id="22" name="22" value="22" ><label
for="22">Mouth ulcers</label></td>
<td><input type="checkbox" id="23" name="23" value="23" ><label
for="23">Tingling Feet</label></td>
<td><input type="checkbox" id="24" name="24" value="24" ><label
for="24">Dermatitis with cheilosis (scaling on the lips and cracks
at the corners of the
mouth)</label></td>
</tr>
<tr>
<td><input type="checkbox" id="25" name="25" value="25" ><label
for="25">Skin rashes</label></td>
<td><input type="checkbox" id="26" name="26" value="26" ><label
for="26">Swollen tongue</label></td>
<td><input type="checkbox" id="27" name="27" value="27" ><label
for="27">Ringling</label></td>
<td><input type="checkbox" id="28" name="28" value="28" ><label
for="28">Vomiting</label></td>
<td><input type="checkbox" id="29" name="29" value="29" ><label
for="29">Swollen mouth</label></td>
<td><input type="checkbox" id="30" name="30" value="30" ><label
for="30">Disorientation</label></td>
</tr>
<tr>
<td><input type="checkbox" id="31" name="31" value="31" ><label
for="31">Sore throat</label></td>
<td><input type="checkbox" id="32" name="32" value="32" ><label
for="32">Balance problems</label></td>
<td><input type="checkbox" id="33" name="33" value="33" ><label
for="33">Hair Loss</label></td>
<td><input type="checkbox" id="34" name="34" value="34" ><label
for="34">Blurry Vision</label></td>
<td><input type="checkbox" id="35" name="35" value="35" ><label
for="35">Sensation of pins and needles</label></td>
<td><input type="checkbox" id="36" name="36" value="36" ><label
for="36">Depression</label></td>
</tr>
<tr>
<td><input type="submit" value="Submit" style="color: black;">
<p id="demo"></p>
</form>
</div>
</div>
</section>

<footer id="footer">
<div class="copyright">
Developed by CSEBNM_M07
</div>
</footer>


<script src="assets/js/jquery.min.js"></script>
<script src="assets/js/jquery.scrolllex.min.js"></script>
<script src="assets/js/skel.min.js"></script>
<script src="assets/js/util.js"></script>

```

```

<script src="assets/js/main.js"></script>
</body>
</html>

4.html

<!DOCTYPE HTML>
<html>
<head>
<title>Mine</title>
<meta charset="utf-8" />
<meta name="viewport" content="width=device-width, initial-scale=1" />
<style>
<link href="1.css" type="style/css">
</style>
</head>
<body style="background-image: url('static/740143.jpg'); background-repeat: round;">

<!-- Header -->
<header id="header" class="alt">
<div class="logo" style="color: white;">MiniDoctor <span>A Personal Health Assesment Web-Based Application </div>
</header>

<!-- Banner -->
<section class="banner full" >
<div class="inner">
<div class="transbox" style="align-items: center; color: #fffff;">
<form action="/Upload" method="POST" style="padding-top: 5%;>
<h3>Please Fill the Following: </h3> <br>
<br>
<br>
<label for="sugar">Write your sugar level (if you are not diabetic, then write 0)</label> <br>
<input type="number" id="sugar" name="sugar" required>
<br><br>
<label for="pulse">Write your Pulse rate (Please calculate it)</label> <br>
<input type="number" id="pulse" name="pulse" required>
<br><br>
<input type="submit" value="Submit" style="color: black;">
<p id="demo"></p>
</form>
</div>
</div>
</section>

<footer id="footer">
<div class="copyright">
Developed by CSEBNM_M07
</div>
</footer>

<!-- Scripts -->
<script src="assets/js/jquery.min.js"></script>
<script src="assets/js/jquery.scrolllex.min.js"></script>
<script src="assets/js/skel.min.js"></script>
<script src="assets/js/util.js"></script>
<script src="assets/js/main.js"></script>
</body>
</html>

6.html

<!DOCTYPE HTML>
<html>
<head>
<title>Mine</title>
<meta charset="utf-8" />
<meta name="viewport" content="width=device-width, initial-scale=1" />
<style>
<link href="1.css" type="style/css">
</style>
</head>
<body style="background-image: url('static/740143.jpg'); background-repeat: round;">

<!-- Header -->
<header id="header" class="alt">
<div class="logo" style="color: white;">MiniDoctor <span>A Personal Health Assesment Web-Based Application </div>
</header>

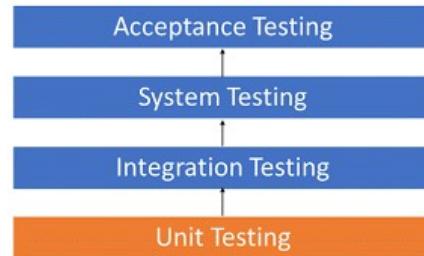
<!-- Banner -->
<section class="banner full" >
<div class="inner">
<div class="transbox" style="align-items: center; color: #fffff;">
<center> <h1 style="color: white; padding-top: 250px;">Your health report is ready download it now..... </h1> <button class="button"><a style="color: black;" href="static/Report.pdf">Click Here</a></button> </center>
</div>
</div>
</section>
<footer id="footer">
<div class="copyright">
Developed by CSEBNM_M07
</div>
</footer>
<!-- Scripts -->
<script src="assets/js/jquery.min.js"></script>
<script src="assets/js/jquery.scrolllex.min.js"></script>
<script src="assets/js/skel.min.js"></script>
<script src="assets/js/util.js"></script>
<script src="assets/js/main.js"></script>
</body>
</html>

```

7.2 TESTING & VALIDATION

The test begins when the encoding is complete and the modules are released for testing. At this stage, the advanced software is thoroughly tested and any defects found are given to the developers to fix. While using the modules / dashboard we detected some errors. All errors corrected. To find and correct all errors we have used: -

Fig. 26. Testing



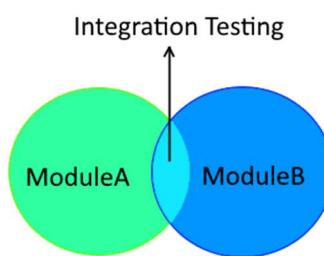
Unit testing: The trial of a specific piece of programming or module is known as a unit test.

Fig. 27. Unit Testing



Integration Test: Testing of all incorporated modules to guarantee coordinated execution after combination is called integration testing.

Fig. 28. Integration-Testing



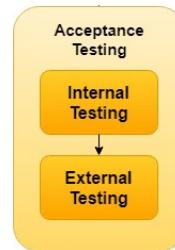
System testing: Framework testing is a norm of testing that guarantees a total and completely coordinated programming item.

Fig. 29. System Testing



Acceptance testing: Acceptance testing is the degree of programming testing where the framework is tried for acknowledgment.

Fig. 30. Acceptance Testing

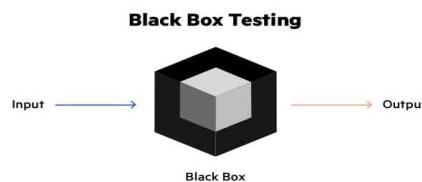


Internal (Alpha) Testing: Alpha testing is a test on the developer's site, which takes place before bringing the product to customers for approval.

External (Beta) Testing: The second phase of acceptance testing, which takes place on a user's site, usually follows an ad-hoc test where users start using the product in their actual location.

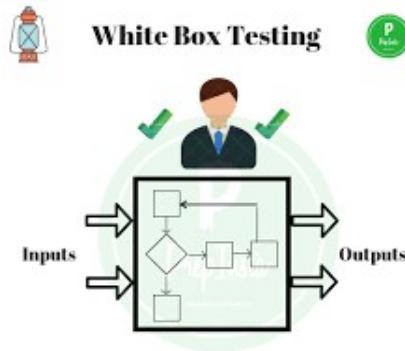
Black box testing: It is a way of testing a software in which software applications work without knowing the internal code structure, launch details, and internal methods.

Fig. 31. Black Box Testing



White box testing: White Box Testing is a software test program that tests internal configuration, configuration, and encoding of software to ensure input output andt to improve design, functionality and security.

Fig. 32. White Box Testing



Results of all testing:

- **Unit testing:**

Tested all components. "NO ERROR"

- **Integration testing:**

Tested all integrated modules. "NO ERRORS FOUND"

- **System testing:-**

The whole system was put to the test. "NO ERRORS FOUND"

- **Acceptance testing:-**

"100.00% Acceptable"

- **Alpha testing:-**

Success

- **Beta testing:-**

Success

- **Black box and White box testing:-**

Table 2 Black box and White box testing

INPUT	ACTUAL OUTPUT	EXPECTED OUTPUT
[‘Name’, ‘age’, ‘email’, ‘gender’, ‘phonenumbers’] [‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’] [‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’, ‘1’] [1,2,3,4,6] [0,75] Video	Report 100% results matched	Report

"NO ERRORS SUCCESSFULLY TESTED"

Validation:

Validation → Are we building the right product?

Table 3 Validation

<u>Features</u>	<u>Check</u>
Graphs	Done
Scores	Done
Report generation	Done
Analysis	Done

8. RESULTS & DISCUSSIONS

Application Screens:

Screen 2. General Information Page

MiniDoctor A Personal Health Assessment Web-Based Application

WELCOME

Greetings!

This is a Personal Health Assessment that is developed to provide a one-stop health portal to analyze your mental and physical well-being. The motivation behind this application is to make instant medical evaluation accessible to everyone. This interactive application evaluates your health status based on several aspects to identify problems and provide a diagnosis of ailments. On completion of the diagnosis, you are recommended certain precautions or remedies based on your results. It is always best to stay on top of things especially when it comes to health because a healthy mind and body hold a healthy soul.

"Health Care is a Right Not a Privilege!"

START HERE

Name *

Dummy

Age *

18

Phone Number *

12123133

Email *

a@gmail.com

Gender(M/F) *

M

SUBMIT

Developed by CSEBNU_M07

Screen 3. Physiological questions page

MiniDoctor A Personal Health Assessment Web-Based Application

Are you having Cough/Cold?
● Yes ○ No

Are you having Fever?
● Yes ○ No

Do you frequently get headache?
● Yes ○ No

Do you feel pain or irritation in eyes?
● Yes ○ No

Are your Ears having some Ears Problem? (pain, hearing problem)
● Yes ○ No

Are you suffering with running nose or nose block any breathing issue? just breathe in and breathe out 5 times and tell me
● Yes ○ No

Do you get tooth pain regularly?
● Yes ○ No

Screen 4. Psychological questions page

MiniDoctor A Personal Health Assessment Web-Based Application

Little interest or pleasure in doing daily activities
● Yes, Little interest slow downs my daily activities
● Sometimes
○ Not often

How often do you have sleep issues/ insomnia?
● Most nights
● Some days
○ Very rare

How often do you find yourself feeling tired or having little/no energy?
● Very often, it interrupts everyday activities
● Some days I feel tired
○ Rarely

Did you notice poor appetite or overeating in your eating pattern?
● Overeating/ Loss of appetite on most days
● Sometimes, it depends on my mood
○ No, I have a consistent eating pattern

Screen 5. Vitamin deficiencies page

MiniDoctor A Personal Health Assessment Web-Based Application

Select all problems which you have:

<input checked="" type="checkbox"/> Dry Skin	<input checked="" type="checkbox"/> Dry Eyes	<input checked="" type="checkbox"/> Night Blindness	<input type="checkbox"/> Infertility	<input checked="" type="checkbox"/> Delayed Growth	<input checked="" type="checkbox"/> Throat and Chest Infections
<input checked="" type="checkbox"/> Poor Wound Healing	<input checked="" type="checkbox"/> Acne	<input checked="" type="checkbox"/> Fatigue	<input type="checkbox"/> Excessive Sweating	<input type="checkbox"/> Mood Swings	<input type="checkbox"/> Joint Pain
<input type="checkbox"/> Overweight	<input type="checkbox"/> High BP	<input type="checkbox"/> Digestion Problems	<input type="checkbox"/> Bleeding(excessive)	<input type="checkbox"/> Slow blood Coagulation	<input type="checkbox"/> Weak bones
<input type="checkbox"/> Dizziness	<input type="checkbox"/> Memory impairment	<input type="checkbox"/> Weight Loss	<input type="checkbox"/> Mouth ulcers	<input type="checkbox"/> Tingling Feet	<input type="checkbox"/> Dermatitis with cheilosis (scaling on the lips and cracks at the corners of the mouth)
<input type="checkbox"/> Skin rashes	<input type="checkbox"/> Swollen tongue	<input type="checkbox"/> Tingling	<input type="checkbox"/> Vomiting	<input type="checkbox"/> Swollen mouth	<input type="checkbox"/> Disorientation
<input type="checkbox"/> Sore throat	<input type="checkbox"/> Balance problems	<input type="checkbox"/> Hair Loss	<input type="checkbox"/> Blurry Vision	<input type="checkbox"/> Sensation of pins and needles	<input type="checkbox"/> Depression

Screen 6. Typing questions page

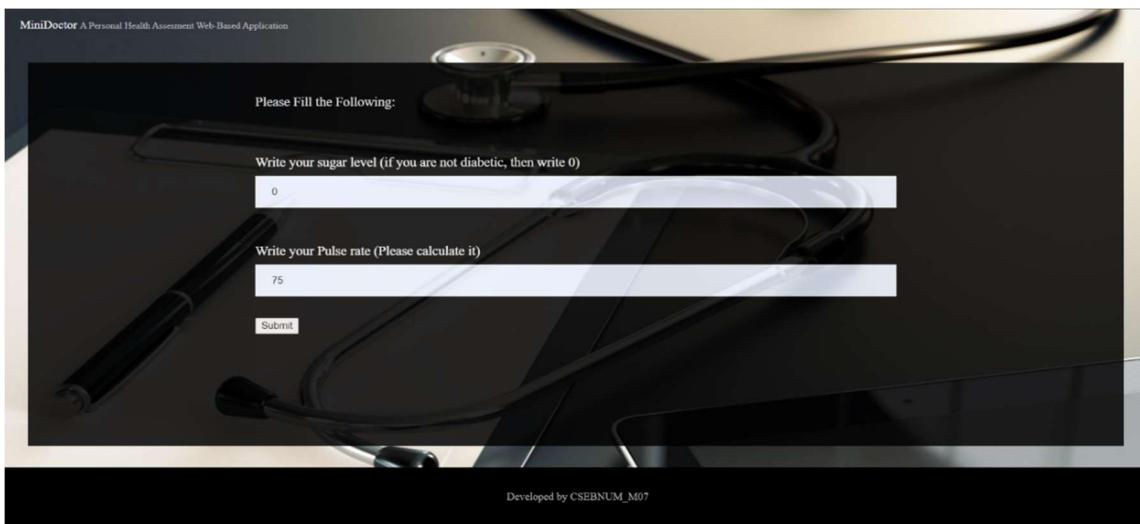
MiniDoctor A Personal Health Assessment Web-Based Application

Please Fill the Following:

Write your sugar level (if you are not diabetic, then write 0)

Write your Pulse rate (Please calculate it)

Developed by CSEBNU_M07



Screen 7. Video upload page

MiniDoctor A Personal Health Assessment Web-Based Application

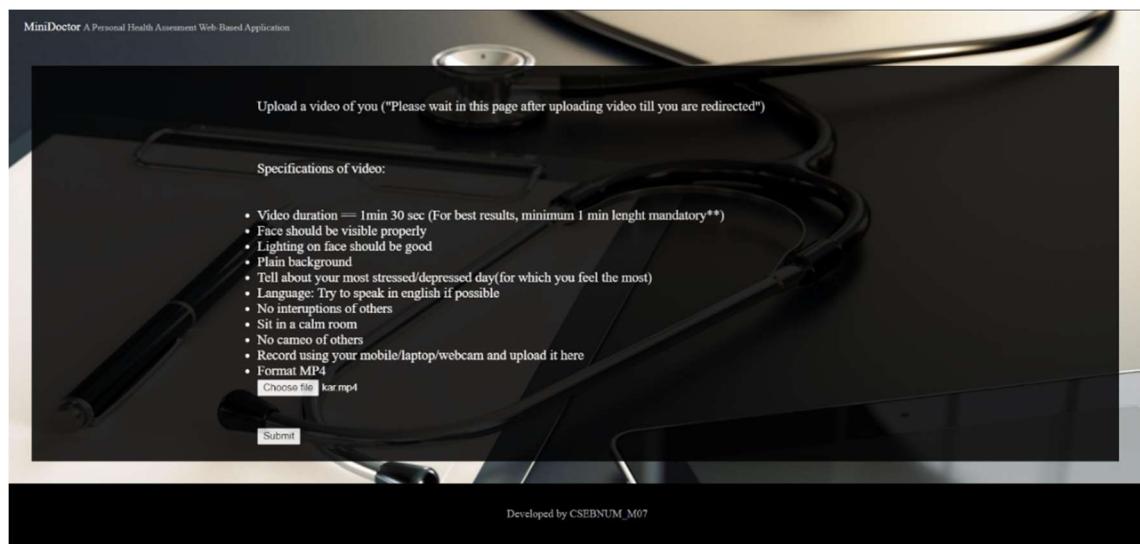
Upload a video of you ("Please wait in this page after uploading video till you are redirected")

Specifications of video:

- Video duration — 1min 30 sec (For best results, minimum 1 min lenght mandatory**)
- Face should be visible properly
- Lighting on face should be good
- Plain background
- Tell about your most stressed/depressed day(for which you feel the most)
- Language: Try to speak in english if possible
- No interruptions of others
- Sit in a calm room
- No cameo of others
- Record using your mobile/laptop/webcam and upload it here
- Format MP4

kar.mp4

Developed by CSEBNU_M07

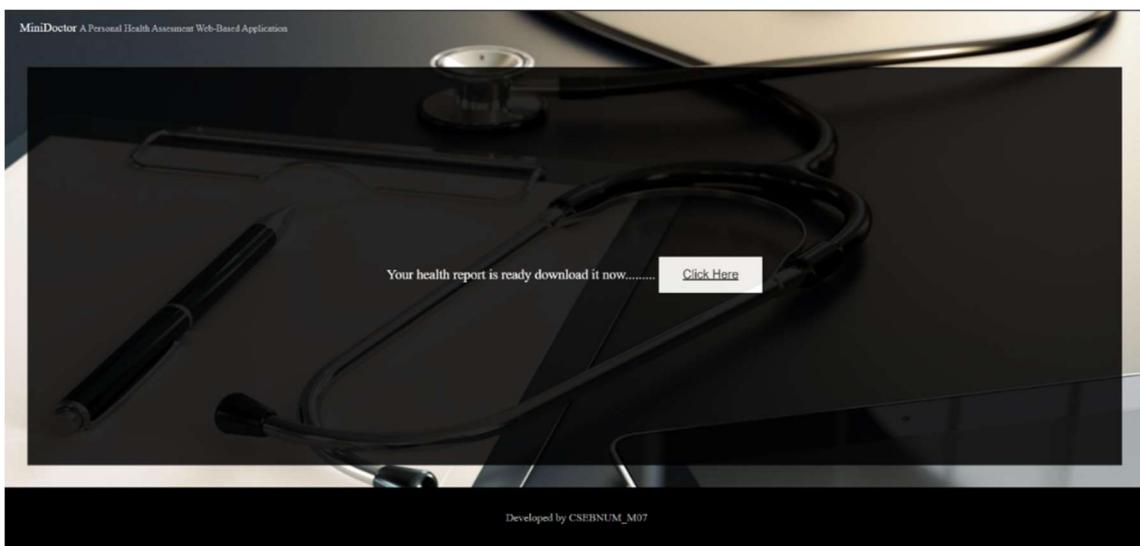


Screen 8. Report generation page

MiniDoctor A Personal Health Assessment Web-Based Application

Your health report is ready download it now..... [Click Here](#)

Developed by CSEBNU_M07



Report Snapshots:

Screen 9. Output- report pages

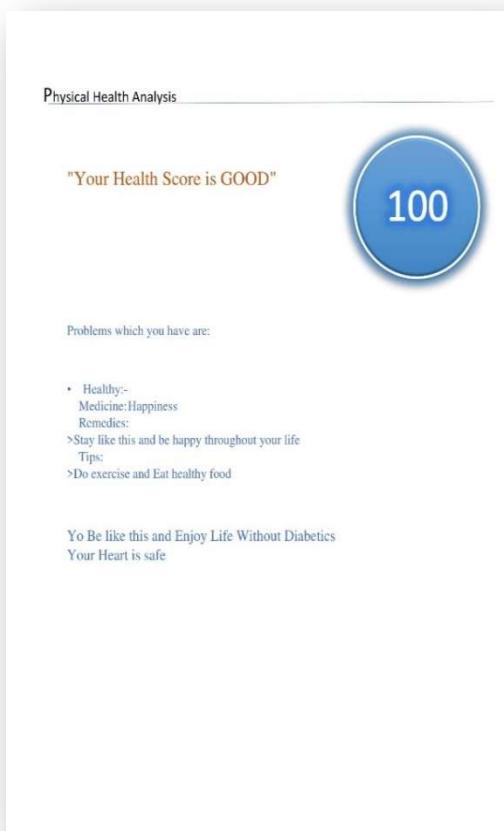


Personal Details

Name:	Dummy
Age:	18
Gender:	M
Phone Number:	12123133
Email Id:	a@gmail.com

Aspects which you are going to see:-

- 1) Physical Health Analysis
- 2) Mental Health Analysis
- 3) Vitamin Deficiencies
- 4) Health Visualization
- 5) Health Tips

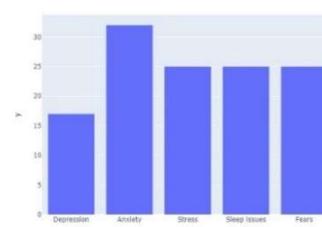
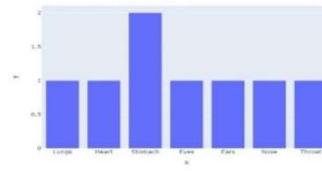


Vitamin Deficiency

You have following Vitamin Deficiencies

- *A
Sweet Potato,Carrot,Spinach,Butter,Mango,Cheese,Salmon,Cod Liver Oil,Lamb Liver,Hard Boiled Egg

Visualizations of Health Analysis



Health Tips

1. Drink A Glass Of Water First Thing In The Morning
2. Take The Stairs
3. Make Half Your Plate Veggies
4. Get A Fitness Tracker + Track Your Steps
5. Switch To Non-toxic Household Cleaning Products
6. Use Non-toxic Skincare + Personal Care Products
7. Take A Probiotic Daily
8. Eat Real Food
9. Stand Up Every 30 Minutes While Working
10. Get Sunlight Every Day
11. Fill Your Home With Houseplants
12. Sweat Every Day
13. Have A Daily Green Smoothie
14. Work Hard + Be Kind
15. Cultivate A Positive Mindset
16. Get Enough Sleep
17. Start Your Day With A Healthy Morning Routine
18. Eat The Rainbow
19. Floss Your Teeth
20. Spend Time Alone
21. Do Things You Enjoy
22. Choose Organic Foods When Possible
23. A Teaspoon Of Apple Cider Vinegar Keeps The Doctor Away
24. Smile Often
25. Work On Overcoming Your Fears
26. Use A Yoga Ball As A Desk Chair
27. Manage Stress With Self-care Activities
28. Intermittent Fasting Can Promote Weight Loss
29. Drink A Glass Of Water After Every Alcoholic Beverage
30. Practice Gratitude
31. A Walk Around The Block Is Better Than No Walk At All

9. CONCLUSION & FUTURE SCOPE

This application is perfect to get a regular health check by ourselves. We can say that based on the report generated, we can take a call whether we have to visit a doctor or not. This backed by doctor's analysis techniques and some of the trending techniques like audio analysis, face recognition. This is just a small basic version of doctor. This is very useful when you are worried about any problem or when you want to whether consulting a doctor is required or not.

This proposed model is very much effective till what it is assigned. But the major improvement, which is essential is gender. Based on gender, the health reports will face minute changes. To make this better, we need to improve the question's clarity and many other aspects.

10. REFERENCES

A. Journals/Articles

1. Pampouchidou, A., Pediaditis, M., Kazantzaki, E., Sfakianakis, S., Apostolaki, I.A., Argyraki, K., Manousos, D., Meriaudeau, F., Marias, K., Yang, F. and Tsiknakis, M., 2020. Automated facial video-based recognition of depression and anxiety symptom severity: cross-corpus validation. *Machine Vision and Applications*, 31(4), pp.1-19.
2. Pampouchidou, A., Simos, P.G., Marias, K., Meriaudeau, F., Yang, F., Pediaditis, M. and Tsiknakis, M., 2017. Automatic assessment of depression based on visual cues: A systematic review. *IEEE Transactions on Affective Computing*, 10(4), pp.445-470.
3. Girard, J.M. and Cohn, J.F., 2015. Automated audiovisual depression analysis. *Current opinion in psychology*, 4, pp.75-79.

B. E-Sites

4. Medicine's History, <https://www.britannica.com/science/history-of-medicine>
5. Python, HTML, CSS, <https://www.tutorialspoint.com/index.htm>
6. Project Management, <https://www.projectmanagement-training.net/>
7. Types Of Software Testing, <https://www.softwaretestinghelp.com/types-of-software-testing/>
8. System Testing, <https://www.guru99.com/system-testing.html>
9. Software Testings, <https://codedec.com/tutorials/levels-of-testing-in-software-testing/>
10. Acceptance Testing, <https://softwaretestingfundamentals.com/acceptance-testing/>
11. Acceptance Testing, <https://www.tutorialcup.com/testing/types-of-testing/acceptance-testing.htm>
12. Black Box Testing, <https://medium.com/dev-genius/black-box-testing-93373a6ec6f3>
13. Design Phases, <https://pmhut.com/the-six-phases-of-project-management-design-phase>
14. Importance of Software Design , <https://www.mindbowser.com/why-software-design-is-important/>
15. Artificial Neural Networks (ANN), <https://www.slideshare.net/AliAlWaeli1/performance-prediction-of-pv-pvt-systems-using-artificial-neural-networks-ann>