

A PROJECT REPORT

On

“SMART BRA DEVICE FOR DETECTING BREAST CANCER”

Submitted in partial fulfilment of the requirements to

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

For the award of the degree

BACHELOR OF TECHNOLOGY

In

COMPUTER SCIENCE & ENGINEERING

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KKR & KSR INSTITUTE OF TECHNOLOGY & SCIENCES

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(Autonomous)

(Approved by A.I.C.T.E New Delhi || Permanently Affiliated to JNTUK, Kakinada) || Accredited with 'A' Grade by NAAC || NBA Accreditation)
Vinjanampadu (V), Vatticherukuru (M), Guntur (Dt), A.P-522017.

www.kitsguntur.ac.in

October-2022

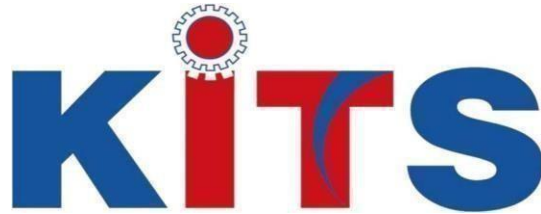
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Vinjanampadu (Vil), Vatticherukuru (Md), Guntur (DT), A.P-522017.



CERTIFICATE

This is to certify that this project work titled “**SMART BRA DEVICE FOR DETECTING BREAST CANCER**” is the bonafide work of **Bommisetty Jayalakshmi (19JR1A0510)**, **Gadiparthi Manasa(19JR1A0525)**, **Divya kunku(19JR1A0523)**, **Chatrathi Kalyani Sree(19JR1A0516)** who carried out the work under supervision of and submitted in the partial fulfillment of the requirements for the award of the degree of **BACHELOR OF TECHNOLOGY in COMPUTER SCIENCE & ENGINEERING** by **JNTUK** during the academic year 2022-2023.

HEAD OF THE DEPARTMENT

PROJECT GUIDE

EXTERNAL EXAMINER

DECLARATION

We hereby inform that this main project entitled “**SMART BRA DEVICE FOR DETECTING BREAST CANCER**” has been carried out and submitted in partial fulfilment for the award to the degree of **Bachelor of Technology in Computer Science & Engineering** to **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA** under the guidance of Dr.P.G.K.Sirisha M.Tech, Ph.D., Dept. of Computer Science & Engineering . The work embodied in this project work is original and has not been submitted in part or full for any degree of this or any degree of any other university.

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ACKNOWLEDGEMENT

We would like to express our profound gratitude towards Dr. Chittineni Aruna Professor & **Head-Administration**, Dept. of COMPUTER SCIENCE AND ENGINEERING, who played a supervisory role to utmost perfection, enabled us to seek through our B.Tech IV-2 project - 2 and for guiding as an internal guide methodically and meticulously.

We express our gratitude towards all the faculty members and non-teaching faculty members, Department of COMPUTER SCIENCE AND ENGINEERING.

We are highly indebted to **Prof. R. RAMESH, Head of the Department**, Computer Science and Engineering for providing us all the necessary support.

We render our deep sense of gratitude to **Dr. P. BABU, Principal**, for permitting us to carry out our main project works.

We express our heartfelt thanks to **Dr K HARIBABU, Director**, for allowing us to complete our project work without any obstacles.

We are very much thankful to the **college management** for their continuous support and facilities provided.

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INSTITUTE VISION AND MISSION

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To produce eminent and ethical Engineers and Managers for society by imparting quality professional education with emphasis on human values and holistic excellence.

INSTITUTION MISSION

- To incorporate benchmarked teaching and learning pedagogies in curriculum.
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- To provide higher/continued education and researched opportunities to the employees of the institution.

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- Strengthen the core competence with vibrant technological education in a congenial environment.
- Promote innovate research and development for the economic, social and environment.
- Inculcate professional behaviour, strong ethical values to meet the challenges in collaboration and lifelong learning.

Program Specific Outcomes (PSOs)

PSO1: Application Development

Able to develop the business solutions through Latest Software Techniques and tools for real time Applications.

PSO2: Professional and Leadership

Able to practice the profession with ethical leadership as an entrepreneur through participation in various events like Ideathon, Hackathon, project expos and workshops.

PSO3: Computing Paradigms

Ability to identify the evolutionary changes in computing using Data Sciences, Apps, Cloud computing and IoT.

Program Educational Objectives (PEOs)

Graduate of Computer Science and Engineering shall

PEO 1:

Domain Knowledge: Have a strong foundation in areas like mathematics, science and engineering fundamentals so as to enable them to solve and analyse engineering problems and prepare them to careers, R&D and studies of higher level.

PEO 2:

Professional Employment: Have an ability to analyse and understand the requirements of software, technical specifications required and provide novel engineering solutions to the problems associated with hardware and software.

PEO 3:

Higher Degrees: Have exposure to cutting edge technologies thereby making them to achieve excellence in the areas of their studies.

PEO 4:

Engineering Citizenship: Work in teams on multi-disciplinary projects with effective communication skills and leadership qualities.

PEO 5:

Lifelong Learning: Have a successful career wherein they strike a balance between ethical values and commercial values.

PROGRAM OUTCOMES (POS)

1. Engineering knowledge:

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis:

Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions:

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage:

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society:

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work:

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication:

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance:

Demonstrate knowledge and understanding of the engineering and management principles and

apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning:

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes (COS)

CO425.1: Analyse the System of Examinations and identify the problem.

CO425.2: Identify and classify the requirements.

CO425.3: Review the related Literature.

CO425.4: Design and modularize the project.

CO425.5: Construct, integrate, test and implement the project.

CO425.6: Prepare the project Documentation and present the report using appropriate method.

Course Outcomes – Program Outcome correlation

	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO425.1	2	3		2		2							3		
CO425.2				3	2		2						3		2
CO425.3		3				2			3	3		1	2		1
CO425.4			2		3	2	2	2			1	2	3		2
CO425.5		2			2				2	2				2	
CO425.6	1					2		2	2	2	2			3	

3: High 2: Medium 1: Low

Program Educational Objectives – Program Specific Outcomes correlation

	PSO1	PSO2	PSO3
PEO1	2	1	3
PEO2		3	2
PEO3	1	2	3
PEO4	3		2
PEO5	1	3	2

3: High 2: Medium 1: Low

CO-PO Mapping with Reasons:

1. CO425.1 is mapped with PO1, PO2 and PO4, PO6, PO7 as basic knowledge of Engineering and problem Analysis activities are highly essential to conduct examinations on existing systems which have been using in industries as a part of and to define the problem of proposed system.
2. CO425.2 is mapped with PO1, PO2, PO4 and PO6, PO9, PO10, PO11 as for identification, gathering analysis and classification of requirements for the proposed system, basic knowledge of engineering and Analysis steps along with complex problem analysis through the efforts of teamwork in order to meet the specific needs of the customer.
3. CO425.3 is mapped with PO2, PO5 and PO12 as to conduct the literature review and to examine the relevant systems to understand and identify the merits and demerits of each to enhance and develop the proposed as per the need.
4. CO425.4 is mapped with PO1, PO2, PO3, PO4, PO5 and PO7, PO8, PO9, PO10 because modularization and design of the project is needed after requirements elicitation. For modularization and design of the project, Basic knowledge of Engineering, Analysis capabilities, Design skills and communication is needed between team members as different modules are designed individually before integration.
5. CO425.5 is mapped with PO3, PO5, PO7, PO9, PO11 and PO12 as to construct the project latest technologies are needed. The development of project is done individually and in groups with well-defined communication by using the engineering and management principles.
6. CO425.6 is mapped with PO6, PO10 and PO12 because during and after completion of the project, documentation is needed along with proper methods of presentation through understanding and application of engineering and management principles, which in turn needs well defined communication between the team members with all the ethical values. Even the project development team defines the future enhancements as a part of the project development after identifying the scope of the project

CO-PSOs Mapping
with Reasons:

1. CO425.1 is mapped with PSO1 as examining of existing systems and identification of the problem is a part of Application Development activity and identification of evolutionary changes in latest technologies.
2. CO425.2 is mapped with PSO1, PSO2 and PSO3 as identifying and classifying the requirements is a part of Application development and evolutionary computing changes and also follows ethical principles.
3. CO425.3 is mapped with PSO1, PSO3 as review of literature is a part of application development activity by recognizing the computing technologies and their evolutionary changes.
4. CO425.4 is mapped with PSO1, PSO3 because modularization and logical design is also a part of Application development and follows computing changes using Internet of Things(IoT).
5. CO425.5 is mapped with PSO1, PSO2 as Testing, Development and Integration of project activities are part of Application development and follows ethical principles.
6. CO425.6 is mapped with PSO2 as for project documentation and presentation; the project team members apply the professional and leadership qualities.

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ABSTRACT

Breast cancer is the most common malignancy in women worldwide including cancers in young patients. As compared to tumours arising in older patients, breast cancers in young women tend to be diagnosed at more advanced stages. Young age at breast cancer diagnosis has been historically considered a poor prognostic factor particularly in the case of breast cancers. Smart-Bra is used to detect the breast cancer at an earlier stage without using any scans like CT, MRI scans etc. In this smart-bra technology, we use temperature sensor and symptoms of a person can detect breast cancer. Unlike mammograms, which use low energy X-rays, the Smart Bra uses sensors which does not produce any harmful radiation effect. Smart Bra is non-invasive and painless method comparing to mammogram screening. Doctor suggests mammogram screening for only women older than 50 years. Smart Bra is completely safe and comfortable for the women.

UNIT - 1

INTRODUCTION

1.1 INTRODUCTION OF THE PROJECT

The main theme of our project is increasing survival rate by detecting breast cancer at an early stage. Lack of awareness also makes difficult for the treatment. Due to lack of awareness and late detection breast cancer is the most common cancer among women.

1.1.1 About Breast Cancer

Breast cancer is one of the most common cancer in women and the second leading cause of women's cancer death. Breast-cancer is among the most serious illnesses/diseases in India, causing many deaths in the current situation. An Indian woman is diagnosed with breast cancer in every four minutes. Breast cancer is a disease that occurs but when a woman or a man is aware of this symptom, it immediately goes beyond its original stage. Breast cancer is a common and dangerous disease in women, cancer is the creation of abnormal cells that come into these cells genetically and mutated. Spreads throughout the body, leading to death in diagnosis and treatment.

1.1.2 Cause of Breast Cancer

Breast Cancer is due to changes in food and lifestyle, the number of cancer cases in women is increasing day by day. It is the second most common cause of death in women in the world. Breast cancer can occur in women and rarely in men. Despite the lack of effective treatment, the low accuracy of diagnosis is also a major cause of the high incidence and mortality of breast cancer. Mammography is a traditional method used for diagnosing breast cancer. Many cases such as doctor's negligence or incompetence in addition to a mammography error may also result in a late diagnosis or misdiagnosis, which can be considered a cause of breast cancer death. In the long term, early-stage diagnosis could significantly increase the survival rate of breast cancer, therefore, it is important to improve the accuracy of breast cancer diagnosis. Breast Cancer is one of the most common cancers that affects women, but other types of cancer and those who are affected by them can be treated greatly, according to a government survey, when compared to breast cancer. The various phases of breast cancer are identified via proper treatment and detailing. If we do not provide proper therapy to our patients, it will result in

their death. A number of methods for establishing an accurate diagnosis of breast cancer have been presented.

1.1.3 Types of Breast Cancer

There are two types of breast cancer, Malignant and Benign. The first is classified as harmful has the ability to infect other organs and is cancerous, Benign is classified as non-cancerous. This disease infects the women's chest and specifically glands and milk ducts, the spread of breast cancer to other organs is frequent and could be through the bloodstream.

1.1.4 Societal effect of Breast Cancer

Cancer in women always has a huge incidence rate and mortality rate. Breast cancer alone is estimated to account for 25% of all new cancer diagnoses worldwide and 15% of cancer deaths in women worldwide, according to the latest cancer statistics. Every 1 in 8 Women in USA develop breast cancer in her lifetime. In case of any sign or symptom, people usually visit a doctor immediately, who may refer you to an doctor's for help. A doctor can diagnose breast cancer by: Examining the patient's medical history thoroughly, examining both breasts, and even checking for swelling or hardening of any lymph nodes in the armpits. Here in this project, we have to use the Smart Bra for detecting breast cancer and with the dataset we have used machine learning algorithms to predict whether a patient has breast cancer or not.

1.1.5 Approach for detection of Breast Cancer

Smart Bra produces the result to the phone or tablet by giving guidance to the women to consult doctors. By which many women detect breast cancer at an early stage. The smart bra uses temperature sensors for detecting temperature specifically in the breasts. Our model predicted the possibility of differentiation of cancerous breasts from healthy breasts by significantly different skin temperature variation. The variation is based on distance of tumour from skin surface and its size.

Smart Bra brings awareness to the women about the early signs and diagnosis of the disease. Mammogram screening is not possible for women above 40 can undertake the screening. Smart Bra is extremely cheap compared to mammogram.

The life-sharing bra has sensors like temperature sensor. Temperature sensor is used as the cancer cells have a high metabolic rate, and so, have a higher temperature than normal cells. If there is an abnormality it shows up a temperature difference.

Blood flow is normal in healthy women. But if a body is holding cancer then there is change in the flow of blood. As there is cancer in the breast, there are tumours with a large number of vessels then those tumours will be having high mass. Then the breast with cancer will have more blood flow than breast with healthy person. All these sensors produce the result very accurately. If Smart Bra detects any suspicious mass, it will alert the wearer so they can follow up with a specialist by giving result to the phone or tablet. Smart Bra uses Arduino and machine learning technology. Smart Bra also addresses privacy concerns unlike the mammogram screening where women are not allowed to wear anything. One can wear clothes over it during the test. Even young girls can wear it of age 15 or 20 years can use wearable device.

Smart Bra uses Arduino and machine learning technology. Smart Bra also addresses privacy concerns unlike the mammogram screening where women are not allowed to wear anything. One can wear clothes over it during the test. Early detection is a way to control the breast cancer. There are many cases that are handled by the early detection and decrease the death rate. Many research works have been done on the breast cancer. The Most common technique that is used in research is machine learning. There are many previous researches that conducted through the machine learning. We are developing a new technique to detect breast cancer is by using Smart Bra. Smart Bra is a device used to detect breast cancer at an early stage of everyone's life.

Smart Bra doesn't release any harmful radiations and it doesn't affects the body at all. And another main important thing is that Smart Bra doesn't use any scans like CT scan, MRI scan. Because of those scans the person who is taking that scanning may get affected in future.

Nowadays Technology is well developed and new technologies were getting more accurate results than older ones. Machine learning is part of Artificial Intelligence which allows systems to learn automatically based on machine learning algorithms and improve the performance of the system without any programming.

The bra is worn for 15 to 20 minutes, the bra captures and alerts the women for the doctor guidance. This bra is completely safe and also convenient method comparing to mammogram. Health care professional can easily carry them easily in their bags during field visits hence it is portable device. The symptoms can go undiagnosed until the cancer reaches a fatal stage.

Smart Bra is an intelligent device to detect breast cancer at an early stage. It doesn't release any harmful radiations and it doesn't affects the body at all. Smart Bra is very protective and safe to everyone and completely harmless to the person who wear it.

1.1.6 Risk Factors

1.1.6.1 Age

The chance of getting breast cancer increases as women age. Nearly 80 percent of breast cancers are found in women over the age of 50.

1.1.6.2 Personal History of Breast Cancer

A woman who has had breast cancer in one breast is at an increased risk of developing cancer in her other breast.

1.1.6.3 Family History of Breast Cancer

A woman has a higher risk of breast cancer if her mother, sister or daughter had breast cancer, especially at a young age (before 40). Having other relatives with breast cancer may also raise the risk.

1.1.6.4 Genetic Factors

Women with certain genetic mutations, including changes to the genes, are at higher risk of developing breast cancer during their lifetime. Other gene changes may raise breast cancer risk as well.

1.1.6.5 Child Bearing and Menstrual history

The older a woman is when she has her first child, the greater her risk of breast cancer. Also at higher risk are:

1. Women who menstruate for the first time at an early age.
2. Women who go through menopause late.

Menopause can happen in between age of 40 or 50, but the average age is 51. If it is getting then the women may get a chance to affect by breast cancer.

3. Women who've never had children.

These are the situations or factors for breast cancer. It is important to talk with your doctor if your family has experienced any of the above situations. It could be a sign that your family carries an inherited breast cancer genetic mutation.

Among different cancers, the most invasive and menacing cancer in women is breast cancer. So, earlier detection of this is a blessing in disguise because it increases the chances of successful treatment by providing care at the possible stage. The above idea Smart Bra is the motive for this project. The implementation of this project is done by using Machine learning techniques on data means the symptoms of a person.

Many women in India does not have access to hospitals. Many does not afford the price of a mammogram. It makes prevention possible before cure. The device will reach the market through medical stores by interacting with doctors and benefit every single woman. That was the sole reason why we immediately put out the device for commercialization as soon as it fulfilled the clinical trials.

1.2 EXISTING SYSTEMS

The following are the existing systems for detecting Breast Cancer,

1.2.1 Mammography Technique for detecting Breast Cancer

Mammography is specialized medical imaging for scanning the breasts. A Mammogram helps in the early detection and diagnosis of breast cancer. Mammogram image segmentation is useful in detecting the breast cancer regions, hence, better diagnosis. In existing system for detection of breast cancer mammogram concept is used. Mammogram is a risk process and releases harmful radiations that affects the body. And main important thing is that doctors also suggest mammogram is supported only for the people older than 50 years of age. It is not helpful to young girls.

1.2.2 Breast Ultrasound

Ultrasound screening is one of the technique of breast cancer detection where sound waves are transmitted through a transducer, which sends pulses into the breast and detects echoes from inside the breast; these echoes are used to form ultrasound images.

1.2.3 Magnetic Resonance Imaging

MRI scanning is one of the technique for breast cancer detection. MRI is used widely both for screening women who are at increased risk of breast cancer and for treatment selection. Prospective studies confirm that MRI screening of women with known or suspected genetic mutation results in a higher sensitivity for cancer detection than does mammography. In women with breast cancer, MRI detects cancer not identified with other types of screening. In two

randomised trials, this increased sensitivity did not translate into improved selection of surgical treatment or a reduction in the number of operations.

1.2.4 Breast Examination

Breast Examinations is one of the technique, where we take the blood samples of the patient.

If we find the cancer cells in the tumour of breast, it tests positive.

Problems of Existing Systems

- False -negative results in mammograms.
- Mammograms might not be helpful for all women.
- Mammography is Expensive.
- Many cancers are not visible in Breast Ultrasound.
- Breast Examinations increases cause anxiety.

The main problems with the existing systems are,

The techniques like mammograms and ultra sound are expensive and it releases harmful radiations in to the body. And it may no helpful to all age groups. Because of harmful radiations the person may affected and get dangerous and the patients may feel uncomfortable with the process taking place when detecting.

1.2 PROPOSED SYSTEM

Smart Bra is our proposed system which can be used for detection of breast cancer at an early stage. The life-sharing bra has sensors like temperature sensor. Temperature sensor is used as the cancer cells have a high metabolic rate, and so, have a higher temperature than normal cells. If there is an abnormality it shows up a temperature difference. This bra is completely safe and also convenient method comparing to mammogram. Health care professional can easily carry them easily in their bags during field visits hence it is portable device.

We came up with the solution of Smart Bra which is an intelligent device is used to detect the breast cancer at an early stage of life.

Smart Bra Produces the result to the phone or tablet by giving guidance to the women to consult doctors. By which many women detect breast cancer at an early stage. The smart bra uses temperature sensors for detecting temperature specifically in the breasts.

In proposed system we came up with the new solution which the Smart Bra includes Temperature sensors and through symptoms. This Smart Bra is applicable to any age group

whereas in existing systems it is not like that. It is applicable to particular age group. This is one of the biggest advantage in our proposed system.

Advantages of Proposed System

- Smart Bra doesn't release any harmful radiations in to the body.
- Smart Bra is used to detect breast cancer at an early stage.
- Reduces the cost compared with other techniques for detection of breast cancer.
- Increases survival rate.
- Gives privacy.

Smart Bra also addresses privacy concerns one can wear clothes over it during the test. Even young girls can wear it of age 15 or 20 years can use wearable device.

1.4 POTENTIAL USERS

The Smart Bra will initially be sold to women who have already been diagnosed with cancer, so that they can monitor their condition on a daily basis. Then the target market will be expanded to include women with a genetic predisposition to developing cancer. Eventually the Smart Bra will be marketed to all women.

Smart Bra also addresses privacy concerns unlike the mammogram screening where women are not allowed to wear anything. One can wear clothes over it during the test. Even young girls can wear it of age 15 or 20 years can use wearable device.

- Every women is a consumer.
- Market our product to hospitals then doctor is a consumer.
- Consumer can take our product from medical stores, so shopkeepers are also one of our user.

1.5 UNIQUE FEATURES OF THE SYSTEM

The uniqueness of our project is to detect breast cancer at an early stage by using a device called Smart Bra. It is an intelligent device for detection of breast cancer. Smart Bra provides many advantages than existing systems. Our proposed system provides many advantages also.

- No harmful radiations

- Reduces cost
- Gives privacy
- Available at any time
- Early-Stage detection
- Increases survival rate

As compared to all existing systems our project uniquely determines the detection of breast cancer at an early stage of life as it doesn't release any harmful radiations in to body when we wear it. Cost is also reduced as compared to other existing systems. This will helps the women to get recovery as early as possible.

UNIT – 2

ANALYSIS

2.1 LITERATURE REVIEW

[1] Early Breast Cancer Detection and Screening was the idea put out by Cathy Coleman. Breast cancer is still a difficult, diverse condition. The best way to identify early-stage disease and reduce mortality is through serial mammography screening. Although structured mammography screening programmes may be hindered by politics and economics in many nations, skilled clinical and self-breast examination can also detect tiny tumours when used sensibly.

[2] The study "Breast cancer diagnosis by mammogram segmentation" by Badawy, Samir M. Hefnawy, Alaa A. Zidan, and Hassan E. explains that mammography is a specialised form of medical imaging used to scan the breasts. Breast cancer is easier to identify and diagnose early when using a mammogram. Breast cancer regions can be found using mammogram image segmentation, improving diagnosis. They used an improved double thresholding-based strategy in this research to segment mammogram images. Also, scientists overlaid the final segmented image's borders as a contour to the original image, making it simpler for doctors to find breast cancer in various Mammograms. The end outcome is an improved smart influence on mammography' ability to identify breast cancer.

[3] According to the "Breast cancer detection via deep learning" proposal by Priyanka and Kumar Sanjeev, deep learning is a branch of machine learning. Deep learning is an unsupervised method that gains knowledge from data. Convolution Neural Network is utilised to classify the breast cancer dataset. To classify the photos, a convolutional neural network is employed. The dataset of breast cancer picture inputs is used. The photos are provided to CNN along with the corresponding weights as input. To reduce mistake and improve performance, the weights are changed.

[4] Maged The idea of "Microwave imaging for Breast cancer detection" was put forth by A Aldhaeebi, Khawla Alzoubi. The use of microwave-based detection techniques has a number of benefits over other types of detection, including the fact that they are affordable, non-invasive, non-ionizing, and pleasant. While they are based on the difference of electrical characteristics between normal and tumorous breast tissues, MI methods also offer improved sensitivity and the capacity to detect tiny breast tumours. These detection methods are

predicated on the idea that, in the microwave band, the permittivity and conductivity of cancerous breast tissues are different from those of healthy breast tissues. For microwave-based breast detection, three modalities have been researched in the literature.

[5] "Ultrasound Imaging Technology for Breast Cancer Diagnosis and Management" was the idea put forth by Rongrong Guo and Baowei Fei. Breast cancer screening and diagnosis frequently employ ultrasonic imaging. We sum up ultrasound imaging technologies and their therapeutic uses for the treatment of patients with breast cancer in this study.

[6] Pre-Trained Convolutional Neural Networks for Breast Cancer Identification Using Ultrasound Imagery was the idea put out by Mehedi Masud and M Shamim. In this study, pre-trained convolutional neural network-based models for breast cancer detection utilising ultrasound pictures are implemented. With a classifier on the top layer, we specifically optimised the pre-trained models for extracting important information from ultrasound images. Using fivefold cross validation, we evaluated the accuracy of seven well-known, cutting-edge pre-trained models employing various optimizers and hyper-parameters. To further analyse how successfully the models extract crucial information from the ultrasound pictures to diagnose tumours, we take into account Grad-CAM and occlusion mapping techniques.

[7] Breast Cancer Detection Using Infrared Thermal Imaging and a Deep Learning Model was the idea put forth by Sebastien Jean. Infrared digital imaging, which assumes that a basic thermal comparison between a healthy breast and a breast with cancer always shows an increase in thermal activity in the precancerous tissues and the areas around developing breast cancer, was the first area of research we looked at in our review of the literature. Also, via our research, we came to the conclusion that a model like the well-known hemispheric model was necessary for a Computer - Assisted Diagnostic (CAD) process using infrared image processing. The creation of a comparative analysis of several breast cancer detection methods is the paper's original contribution.

[8] Amuels Maar and Dianna "Detection of Cancer DNA in Plasma of Patients with Early-Stage Breast Cancer" was a proposal made by Leslie Cope. Studies have shown that, particularly in patients with metastatic disease, it is possible to accurately identify and measure circulating cell-free cancer DNA and RNA. This is based on the idea that somatic mutations, or DNA modifications exclusive to cancer cells and absent in normal cells, exist in cancer DNA. It is believed that both healthy and cancerous cells shed or release DNA into the bloodstream.

[9] Y. Ireaneus The study "Early Diagnosis of Breast Cancer Using SVM Classifier Method" was proposed by Anna Rejani and S. Thamarai Selvi. An algorithm for tumour detection using mammograms is presented in this work. Two problems are the main emphasis of the suggested system. One is learning how to identify tumours as suspicious areas that contrast extremely weakly with their surroundings, and the other is learning how to extract attributes that classify tumours.

[10] The Pre-Processing Methods for Breast Cancer Identification in Mammography Images was proposed by R. Ramani and S. Valarmathy. Due to the low quality of the mammogram images that were acquired, pre-processing is the most crucial phase in the mammography analysis. To rectify and alter the mammography image for further analysis and processing, pre-processing is crucial. There are various filtering methods that can be used for pre-processing.

[11] "MRI for breast cancer screening, diagnosis, and treatment," according to professor Monica Morrow MRIs are frequently utilised for both therapy selection and screening of women with a higher risk of breast cancer. Prospective studies have shown that MRI screening is more sensitive than mammography at detecting cancer in women with known or suspected genetic mutations.

Data on survival, however, are not available. MRI finds malignancy in breast cancer patients that conventional screening methods miss.

2.1.1 REVIEW FINDINGS

1. Breast cancer detection with mammography

Mammography is a type of medical imaging specifically used to scan the breasts. Breast cancer is easier to identify and diagnose early when using a mammogram. Breast cancer regions can be found using mammogram image segmentation, improving diagnosis. Mammogram idea is employed in the current breast cancer diagnostic system. The mammogram procedure is risky and emits dangerous radiation that has an impact on the body. The most significant point is that doctors advise against mammograms for anyone under the age of 50. Little girls cannot benefit from it.

2. Breast Imaging

One method for detecting breast cancer is ultrasound screening, which uses a transducer to transmit sound waves into the breast and detect echoes from within it. These echoes are utilised to create ultrasound images.

3. Magnetic Resonance Imaging

One method for finding breast cancer is MRI scanning. MRIs are frequently utilised for both therapy selection and screening of women with a higher risk of breast cancer. Prospective studies have shown that MRI screening is more sensitive than mammography at detecting cancer in women with known or suspected genetic mutations. MRI finds malignancy in breast cancer patients that conventional screening methods miss. MRI finds malignancy in breast cancer patients that conventional screening methods miss. This greater sensitivity did not result in better surgical treatment selection or a decrease in the number of operations in two randomised studies.

4. Breast Examination

One of the procedure we use to draw blood from patients is the breast examination. Test results are positive if cancer cells are discovered in breast tumours. Several issues with the current systems have been found.

2.1.2 OBJECTIVES OF THE SYSTEM

The main objective of our project is early detection of breast cancer using Smart Bra. Unlike mammograms, which use low-energy X-rays, the Smart Bra uses sensors which does not include any rays. Due to Lack of awareness and late detection breast cancer is the most common cancer among women. Smart Bra brings awareness to the women about the early signs and diagnosis of the disease. Smart Bra is extremely cheap compared to mammogram. Even young girls can wear it of age 15 or 20 years can use wearable device.

Smart Bra is non-invasive and painless method comparing to mammogram screening. If Smart Bra detects any suspicious mass, it will alert the wearer so they can follow up with a specialist by giving result to the phone or tablet. Smart Bra uses Arduino and machine learning technology. Smart Bra also addresses privacy concerns unlike the mammogram screening where women are not allowed to wear anything. One can wear clothes over it during the test. This bra is completely safe and also convenient method comparing to mammogram. Health care professional can easily carry them easily in their bags during field visits hence it is portable device. The symptoms can go undiagnosed until the cancer reaches a fatal stage. Many women in India does not have access to hospitals. Many does not afford the price of a mammogram. The device will reach the market through medical stores by interacting with doctors and benefit every single woman. It makes prevention possible before cure. By which Smart Bra increases

the survival rate of the country. Smart Bra is non-invasive and painless method comparing to mammogram screening. Doctor suggests mammogram screening for only women older than 50 years. Smart Bra is completely safe and comfortable for the women and it is applicable for any age group.

2.2 REQUIREMENTS ANALYSIS

Requirements analysis, also called requirements engineering. It is the process of identifying the user expectations for a new or modified product. These features called requirements must be quantifiable, relevant and detailed.

Requirements analysis involves frequent communication with system users to determine specific feature expectations, resolution of conflict or ambiguity in requirements as demanded by the various users or groups, avoidance of feature creep and documentation of all aspects of the project development process from start to finish. It is a team effort that demands a combination of hardware, software and human factors engineering expertise as well as skills in dealing with people.

Requirements are generally defined as the expectations or the needs of a user who is going to use the system that is being developed. It plays an important role in determining the quality attributes and also if the requirements are correctly gathered, system can be developed in a way that it can meet the expectations of end user. Requirements analysis is critical to the success or failure of a systems or software project.

These requirements can be further classified into

- Functional Requirements
- Non-Functional Requirements
- User Requirements
- System Requirements

2.2.1 FUNCTIONAL REQUIREMENTS ANALYSIS

It is a useful document which describes functions, appearance, purpose and requested outputs of the software. It allows you to structure all the information regarding an application. Functional requirements define what a product must do, what its features and functions are. It describes a software system or its component. A function is nothing but inputs to the software system, its behaviour, and outputs. It can be a calculation, data manipulation, business process,

user interaction, or any other specific functionality which defines what function a system is likely to perform. Functional Requirements are often called functional specifications requirements analysis is an important aspect of project management. To identify Functional Requirements first we have to identify the functions what we are performing the functions in our project.

As our project is Smart Bra device for detecting Breast cancer the following functions performed are listed as below:

- Take the Bra.
- Place the temperature sensor inside the Bra.
- Predicting the temperature.
- Display the temperature in mobile application.
- If temperature is abnormal that means too high or too low then immediately it displays the alert message in the mobile application.
- The user have to enter the temperature value whether it is abnormal and also mention the values of symptoms manually in the website.
- Finally detect whether the person is suffering from Breast cancer or not.

2.2.2 USER REQUIREMENTS

Users

The Smart Bra will initially be sold to women who have already been diagnosed with cancer, so that they can monitor their condition on a daily basis. Then the target market will be expanded to include women with a genetic predisposition to developing cancer. Eventually the Smart Bra will be marketed to all women.

- Every women is a consumer.
- Market our product to hospitals.
- Consumer can take our product from medical stores.

Role of User

The role of user is to enter the symptoms details in webpage manually. To view the temperature in the mobile application first we have to login into the mobile application with correct

credentials. After login there it displays the temperature if it is abnormal then we have to select the symptoms of the user in the website. We have to be careful when selecting the symptoms by the user. After selection of symptoms the details of the user matches with the dataset then we say the person is affected with breast cancer otherwise the person is not affected with breast cancer.

2.2.3 NON-FUNCTIONAL REQUIREMENTS

Non-functional requirements are a set of specifications that describe the system's operation capabilities and constraints and attempt to improve its functionality. These are basically the requirements that outline how well it will operate including things like speed, security, reliability, data integrity, etc. **Non-Functional Requirement** specifies the quality attribute of a software system. They judge the software system based on Responsiveness, Usability, Security, Portability and other non-functional standards that are critical to the success of the software system.

Some of the Non-Functional Requirements are listed as below:

- Safety
- Security
- Flexible
- Maintainability
- Reliability
- Usability
- Portability

Safety: Smart Bra device is safe and comfortable to every woman who wears it. Because it does not use any scans like MRI when detecting. So it doesn't release any radiations and doesn't affect the body also. Smart Bra also addresses privacy concerns unlike the mammogram screening where women are not allowed to wear anything. One can wear clothes over it during the test. This bra is completely safe and also a convenient method.

Security: Smart Bra device provides security to user with the login credentials like username and password when opening into an application. When the user accesses the web application where user needs to enter the credentials, the data must be secured enough as the total monitoring process depends on the data like symptoms selected by user. If we could not

promise security to the data like symptoms selected, then our total system collapses. So we need to ensure that the symptoms which is being selected will be secure enough and also it is interpreted correctly.

Flexible: Smart Bra device is flexible and easy to use. It doesn't involve any complicated process. Once we guide the people it is easy to use and carry from one place to another place.

Maintainability: The ease with which a system or component can be modified to correct faults, improve performance or other attributes, or adapt to a changed environment can be defined as maintainability. We can achieve that by taking some precautions and necessary measures. Once our project is deployed to doctors the complete maintenance is taken by the doctors and the users also trust them about the device.

Reliability: Our device has ability to perform its intended functions and operations in a system without any failure. Whenever we design a system, we need to make sure that our system don't fail and the chances of our system failing must be very low. Our proposed system will provides us the reliability that the sensors we are using doesn't fail at any more.

Usability: It is very easy to use as everyone is familiar with reading the messages that comes to our mobile. Once we guide the users they can easily utilise the device without any help of others. The process taking place during the detection is easy.

Portability: Portability determines how a system can be launched within one environment or another. It usually includes hardware, software, or other usage platform specifications. So we need to make sure that a system is portable. Our system is completely portable, as we only need to move all Hardware devices like sensors and other connections are mobile in nature. Health care professional can easily carry them easily in their bags during field visits hence it is portable device. The device will reach the market through medical stores by interacting with doctors and benefit every single woman. It makes prevention possible before cure. By which Smart Bra increases the survival rate of the country.

2.2.4 SYSTEM REQUIREMENTS

System requirements are the configuration that a system must have in order for a hardware or software application to run smoothly and efficiently. Failure to meet these requirements can result in installation problems or performance problems. System requirements are also known as minimum system requirements. They are broadly classified into 2 categories.

- Software Requirements

- Hardware Requirements

Software Requirements

Software requirements for a system are the description of what the system should do, the service or services that it provides and the constraints on its operation.

Software Requirements of our system are:

- Python Libraries
- Python language
- Html and CSS
- Datasets

Hardware Requirements

- Windows/Linux/Mac etc., any OS can be used and our system is independent of their versions.
- I3 processor version is enough
- Memory size of 1Gb disk is enough
- Ram can be of 2Gb
- Sensors like Temperature Sensors
- Microcontroller
- Power bank
- USB cable
- Connecting Wires

Temperature sensor

A temperature sensor is a device that detects and measures hotness and coolness and converts it into an electrical signal.

A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. There are many different types of temperature sensors. Some temperature sensors require direct contact with the physical object that is being monitored (contact temperature sensors), while others indirectly measure the temperature of an object (non-contact temperature

sensors). Temperature sensors are used in automobiles, medical devices, computers, cooking appliances, and other types of machinery.

Microcontroller

A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on a single chip. Wi-Fi interface controller as its internal microcontroller unit circuits.

2.3 MODULE DESCRIPTION

A module is a software component or part of a program that contains one or more routines. One or more independently developed modules make up a program. An enterprise-level software application may contain several different modules, and each module serves unique and separate business operations.

When we divide the whole project into smaller modules, it is easier to develop, test and to deploy.

We have divided our project into 4 modules. They are:

1. Predicting the temperature
2. Sending alert message
3. Select and match the symptoms
4. Output module

In first Module,

Women after wearing the smart bra, the temperature sensor predicts the temperature and displays the temperature in mobile application.

In second module,

After predicting the temperature, check the temperature and if it is abnormal that means too high/low the it immediately sends an alert message to the mobile.

In third module,

After alert message, then the user opens the website and select the symptoms that the end user have.

In fourth module,

After selecting the symptoms and check the symptoms matches with dataset or not by using machine learning technology. If it is matches then displays whether the person is suffering with breast cancer or not.

2.4 FEASIBILITY STUDY

Feasibility study can help you determine whether or not you should proceed with your project. It is essential to evaluate cost and benefit. It is essential to evaluate cost and benefit of the proposed system.

A feasibility study is a study usually done by engineers, which establishes whether conditions are right to implement a particular project. Feasibility studies can be done for many purposes, and are sometimes done in IT in order to look at feasibility for new hardware and software setups sometimes a feasibility study is done as part of a systems development life cycle, in order to drive precision for the implementation of technologies.

Feasibility Study can be broadly classified into three categories. They are

- Technical Feasibility
- Economic Feasibility
- Operational or Behavioural Feasibility

2.4.1 Technical Feasibility

Technical feasibility tells about how technically project will be feasible. It includes finding out technologies for the project, both hardware and software. The technologies we are using feasible or not we have to verify it in technical feasibility. The requirements we are using here are open source and available at anywhere. It will be obtained at reasonable cost only. It requires less training for the people for the usage of our device. Once we guide the people they can easily catch the process and can do by their own without help of others. Here we are not using any complicated technologies just machine learning for matching with data set and python programming language.

2.4.2 Economic Feasibility

Here, we find the total cost and benefit of the proposed system over current system. Comparing with existing system like mammography technique and breast ultrasound imaging technique Smart Bra device is economically feasible. Proposed system is completely a less cost when

compared with existing system. Because it doesn't any scans like MRI scan and it doesn't use any imaging technique also. So by considering all existing systems we conclude that the proposed system is completely economically feasible. It is available at affordable price which is available at lower cost.

2.4.3 Operational Feasibility

It is the ease and simplicity of operation of proposed system. System does not require any special skill set for users to operate it. In fact, it is designed to be used by almost everyone once we guide to them. Users can simply wear the smart bra and temperature sensor placed inside it and based on the temperature the user have to select the symptoms and if it matches with dataset it detects whether the person is affecting with breast cancer or not. Operational feasibility tells about the lifetime of the product and ease of operating the system.

2.5 SOFTWARE PROCESS MODEL USED

Software processes are the activities for designing, implementing, and testing a software system. The software development process is complicated and involves a lot more than technical knowledge. That's where software process models come in handy. A software process model is an abstract representation of the development process. A software process model is an abstraction of the software development process. The models specify the stages and order of a process. There are different types of Software models in practice. Some of them are Agile Model, Waterfall Model, V model, Spiral Model. Each model has its own structure and different phases. All the models divide the total task of developing a system into a certain number of phases. And each phase will perform a set of certain tasks. Generally the phases are Requirements, Planning, Modelling, Construction, Testing, Deployment. Each phase is interlinked with other phases. And only after completing the prior phases, we can reach to next phases.

A model will define the following:

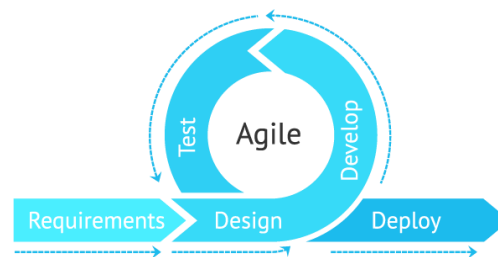
- The tasks to be performed
- The input and output of each task
- The pre and post conditions for each task
- The flow and sequence of each task

We are using Agile process model

- Agile methods breaks tasks into smaller iterations or parts do not directly involve long term planning.
- The division of the entire project into smaller parts helps to minimize the project risk and to reduce the overall project delivery time requirements.
- In agile model, each phase is independent to each other, i.e., if any error occurs in any phase it does not effect the other phase.

Phases of Agile Model

- Requirements gathering
- Designing
- Developing
- Testing
- Deployment



2.6 HARDWARE AND SOFTWARE REQUIREMENTS

Software Requirements

Software requirements for a system are the description of what the system should do, the service or services that it provides and the constraints on its operation.

Software Requirements of our system are:

- Python Libraries
- Python language
- Html and CSS
- Datasets

Hardware Requirements

- Windows/Linux/Mac etc., any OS can be used and our system is independent of their versions.
- I3 processor version is enough
- Memory size of 1Gb disk is enough

- Ram can be of 2Gb
- Sensors like Temperature Sensors
- Microcontroller
- Power bank
- USB cable
- Connecting Wires

2.7 SRS SPECIFICATION

A software requirements specification (SRS) is a description of a software system to be developed. It lays out functional and non-functional requirements, and may include a set of use cases that describe user interactions that the software must provide.

Benefits of a good SRS:

- You save time and money.
- You have better cooperation with the development team

An SRS is an organization and understanding of a client and system requirements and dependencies at a particular point in time. The SRS document itself states in precise and explicit language those functions and capabilities a software system must provide, as well as states any required constraints by which the system must abide.

The main requirement in our system is Temperature Sensor to predict the temperature whether it is normal or abnormal. Based on that temperature the user is going to select the symptoms manually in website.

UNIT – 3

DESIGN PHASE

3.1 DESIGN CONCEPTS & CONSTRAINTS

The design Phase is an early phase of the project lifecycle where ideas, processes, resources, and deliverables are planned out. A Design Phase comes before a project plan as it's a broad overview whereas a project plan includes more detailed information.

Abstraction

Environment at the highest-level abstraction.

The lower level of abstraction provides a more detailed description of the solution.

A sequence of instruction that contains a specific and limited function refers to a procedural abstraction.

Architecture

The complete structure of the software is known as software architecture.

Structure provides conceptual integrity for a system.

The architecture is the structure of program modules.

The software design aims to obtain an architectural framework of a system

Patterns

A design pattern describes a design structure that solves a particular design problem in a specified context.

Modularity

Software is separately divided into name and addressable components; they are called modules which makes design easy.

Modularity is the single attribute of software that permits a program to be managed easily.

Information hiding

Modules must be specified and designed so that the information like algorithm and data presented in a module is not accessible for other modules which do not require that information.

Design Concepts of our project are

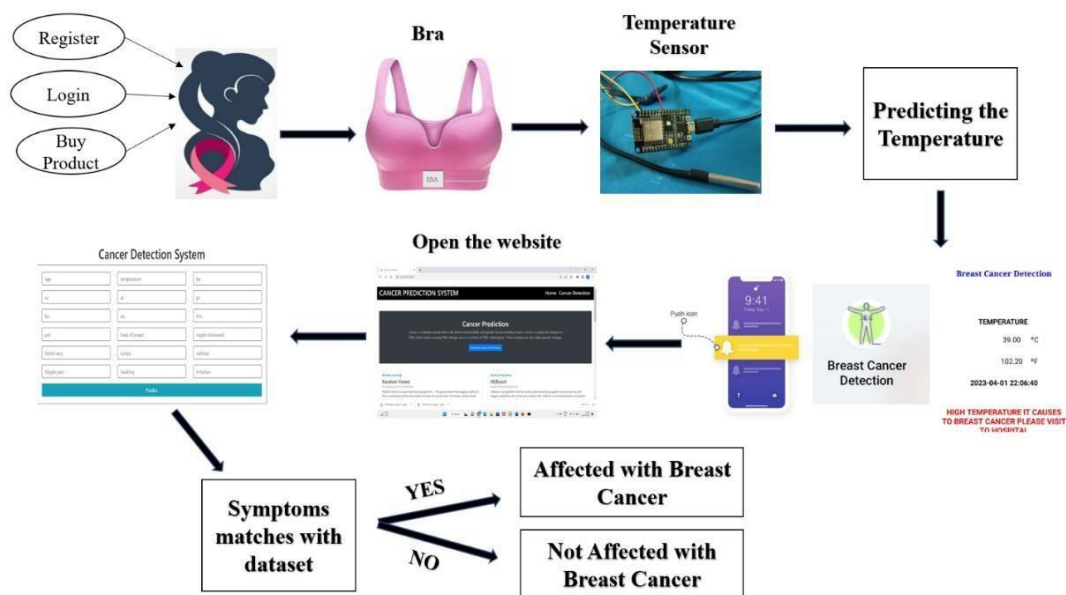
Abstraction: As the user's data is hidden with the password protected only, he/she can be seen when it is opened.

Modularity: As the project is divided into different modules, it is a modular design approach that we follow to develop.

Information Hiding: As the user data is protected with a password i.e., the symptoms data is only seen by the user.

Architecture: The project follows program modules and provides conceptual integrity of the system.

3.2 DESIGN DIAGRAM OF THE SYSTEM



3.3 CONCEPTUAL DESIGN

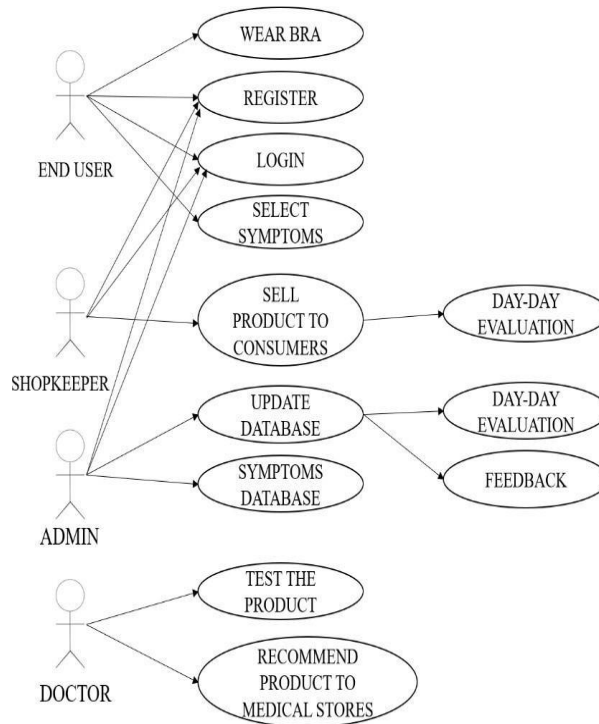
Conceptual design is an early phase of the design process, in which the broad outlines of function and form of something are articulated. It includes the design of interactions, experiences, processes, and strategies. It involves an understanding of people's needs and how to meet them with products, services, and processes. Common artifacts of conceptual design are concept sketches and models.

Conceptual design diagrams are

- Use Case Diagram
- Activity Diagram
- Sequence Diagram

Use Case Diagram

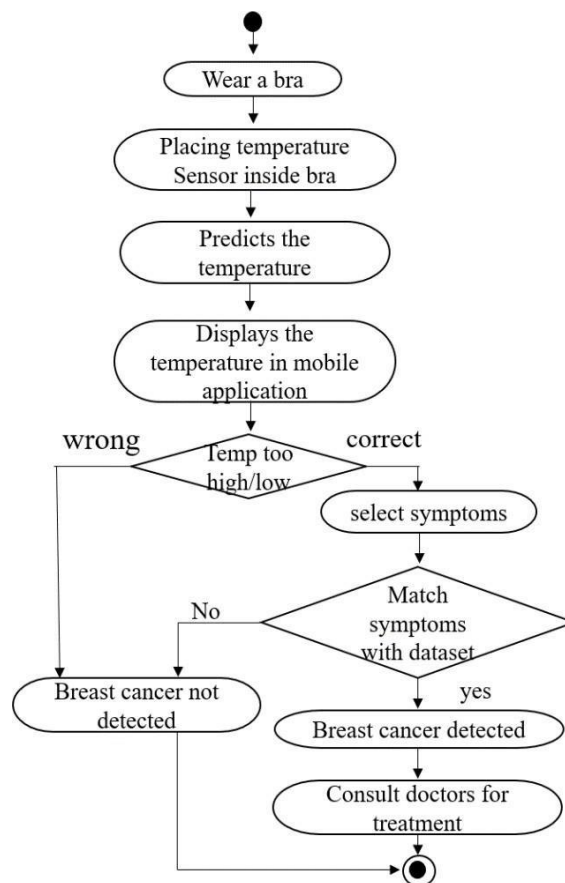
The main purpose of the use-case diagram is to help development teams visualize the functional requirements of a system, including the relationship of "actors" (human beings) to essential processes, as well as the relationships among different use cases.



3.3.1 Use case

Activity Diagram

Activity diagrams show the procedural flow of control between two or more class objects while processing an activity. Activity diagrams can be used to model higher level business processes at the business unit level or to model low-level internal class actions.

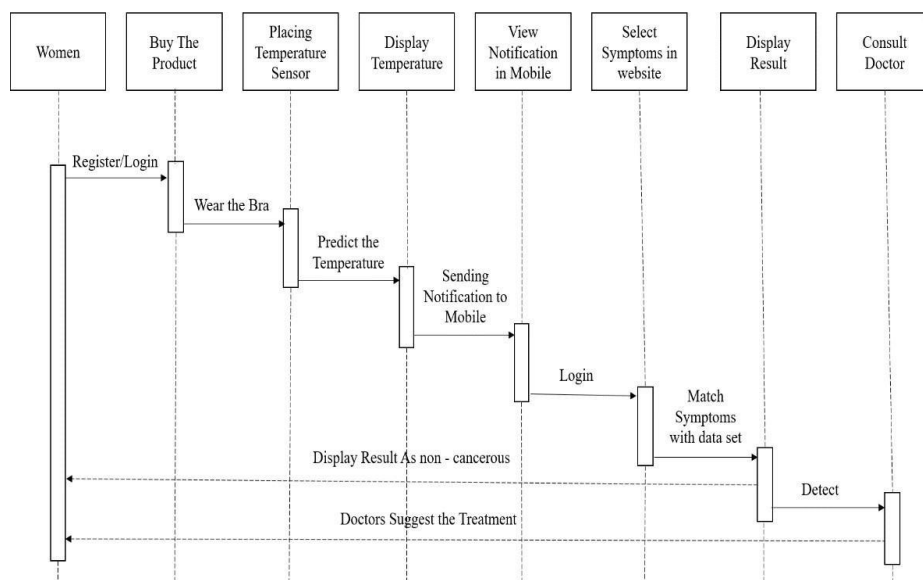


3.3.2

Activity

Sequence Diagram

Sequence diagrams show a detailed flow for a specific use case or even just part of a specific use case. They are almost self-explanatory, they show the calls between the different objects in their sequence and can show, at a detailed level, different calls to different objects.



3.3.3 Sequence

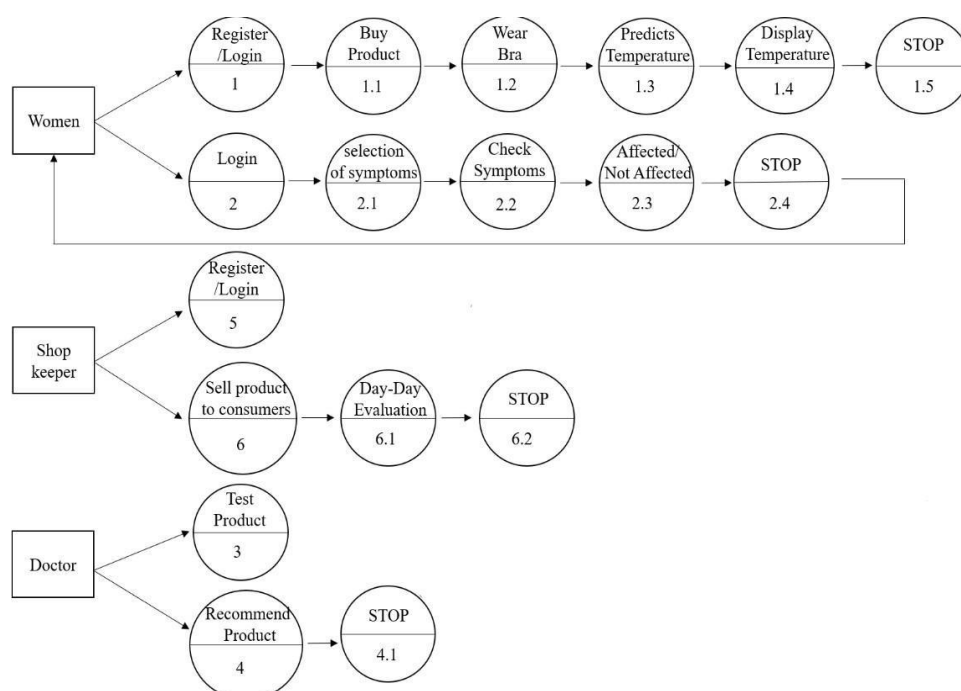
3.4 LOGICAL DESIGN

A logical design is a conceptual, abstract design. you deal only with defining the types of information that you need. The process of logical design involves arranging data into a series of logical relationships called entities and attributes. An entity represents a chunk of information. In relational databases, an entity often maps to a table. An attribute is a component of an entity and helps define the uniqueness of the entity. In relational databases, an attribute maps to a column. You can create the logical design using a pen and paper, or you can use a design tool such as Oracle Warehouse Builder or Oracle Designer While entity relationship diagramming has traditionally been associated with highly normalized models such as online transaction processing (OLTP) applications, the techniques still useful in dimensional modelling.

As a part of logical design we are drawing DFD diagram,

DFD Diagram

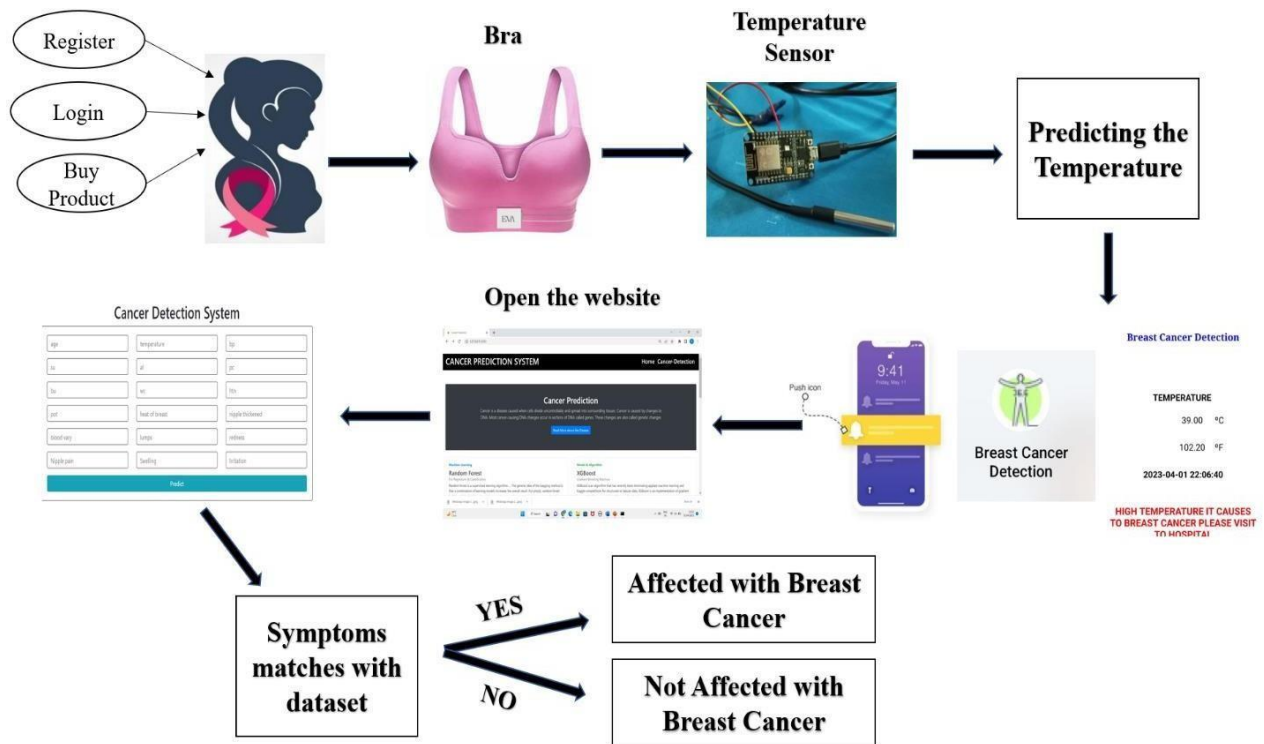
A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles, and arrows, plus short text labels, to show data inputs, outputs, storage points, and the routes between each destination. Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how the data is handled. They can be used to analyse an existing system or model a new one.



3.5 ARCHITECTURAL DESIGN

Requirements of the software should be transformed into an architecture that describes the software's top-level structure and identifies its components. This is accomplished through architectural design (also called system design), which acts as a preliminary 'blueprint' from which software can be developed. IEEE defines architectural design as 'the process of defining a collection of hardware and software components and their interfaces to establish the framework for the development of a computer system'. This framework is established by examining the software requirements document and designing a model for providing implementation details. These details are used to specify the components of the system along with their inputs, outputs, functions, and the interaction between them. A system architecture diagram abstracts the relationships, restrictions, and boundaries between components of a software system. It's a crucial tool that provides a comprehensive overview of the software system's physical deployment and development roadmap. An architectural diagram must perform a variety of tasks. It has to convey information about a system design so that pertinent users can comprehend and utilize it as a guide when making decisions.

The architectural diagram tells that the user wear the Bra. Inside the bra we are placing the temperature sensor. The temperature sensor going to predict the temperature. And the temperature displays in mobile application named as Breast Cancer Detection. In that application we are able to see temperature. If temperature is abnormal then immediately sends the notification to mobile and the user have to open the website and select the symptoms manually then the project going to detect whether the person is suffering from Breast cancer or not.



3.5.1 Architectural diagram

3.6 ALGORITHMS DESIGN

An algorithm is a series of instructions, often referred to as a “process,” which is to be followed when solving a particular problem. While technically not restricted by definition, the word is almost invariably associated with computers since computer-processed algorithms can tackle much larger problems than a human, much more quickly. Since modern computing uses algorithms much more frequently than at any other point in human history, a field has grown up around their design, analysis, and refinement. The field of algorithm design requires a strong mathematical background, with computer science degrees being particularly sought-after qualifications.

Step 1: Start

Step 2: Wear the Smart Bra.

Step 3: Inside the Bra we are placing temperature Sensor. Sensor is going to predict the temperature.

Step 4: Then the temperature get displayed in mobile application namely Breast cancer detection app.

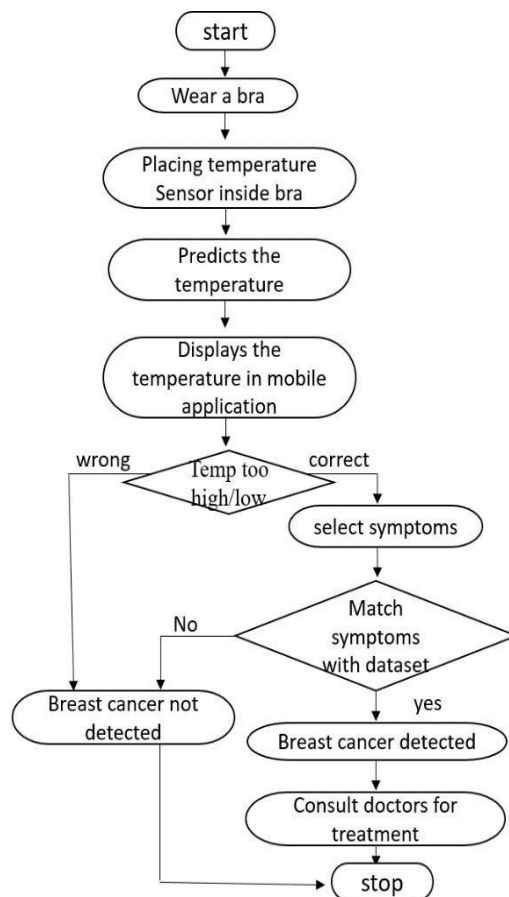
Step 5: If the temperature is abnormal (too high/low) then immediately sends notification through message and voice.

Step 6: Then the user have to open the website and select symptoms and enter necessary values manually.

Step 7: Then the user have to click the predict button then finally detect whether the person is suffering with Breast cancer or not.

Step 8: Detecting the breast cancer by using machine learning of Random Forest algorithm.

Step 9: Stop



3.6.1 Flowchart

3.7 DATABASE DESIGN

Database Design is a collection of processes that facilitate the designing, development, implementation, and maintenance of enterprise data management systems. It helps produce database systems:

- That meets the requirements of the users and has high performance The main objectives of database designing are to produce logical and physical designs models of the proposed database system.
- The logical model concentrates on the data requirements and the data to be stored independent of physical considerations It does not concern itself with how the data will be stored or where it will be stored physically.
- The physical data design model involves translating the logical design of the database onto physical media using hardware resources and software systems such as database management systems (DBMS).
- Database designing is crucial to high-performance database systems Apart from improving performance, properly designed databases are easy to maintain, improve data consistency and are cost-effective in terms of disk storage space Note, the genius of a database is in its design Data operations using SQL are relatively simple.

3.8 MODULE DESIGN SPECIFICATIONS

Module design which is also called "low-level design" has to consider the programming language which shall be used for implementation This will determine the kind of interfaces you can use and several other subjects. Some crucial principles for a successful design are the following:

We have divided our project into 4 modules. They are:

1. Predicting the temperature
2. Sending alert message
3. Select and match the symptoms
4. Output module

In first Module,

Women after wearing the smart bra, the temperature sensor predicts the temperature and displays the temperature in mobile application.

In second module,

After predicting the temperature, check the temperature and if it is abnormal that means too high/low the it immediately sends an alert message to the mobile.

In third module,

After alert message, then the user opens the website and select the symptoms that the end user have.

In fourth module,

After selecting the symptoms and check the symptoms matches with dataset or not by using machine learning technology. If it is matches then displays whether the person is suffering with breast cancer or not.

UNIT – 4

CODING & OUTPUT SCREENS

4.1 SAMPLE CODING

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns

import warnings
warnings.filterwarnings('ignore')
kidney=pd.read_csv('kidney_disease.csv')
kidney.shape
kidney.head()
kidney.info()
kidney.describe()
columns=pd.read_csv("data_description.txt",sep='-')
columns=columns.reset_index()
columns.columns=['cols','abb_col_names']
columns
kidney.head()
kidney.columns=columns['abb_col_names'].values
kidney.head()
kidney.describe().T
def convert_dtype(kidney,feature):
    kidney[feature]=pd.to_numeric(kidney[feature],errors='coerce')
features=['packed cell volume','white blood cell count','red blood cell count']
for i in features:
    convert_dtype(kidney,i)
kidney.dtypes
kidney.drop('id',inplace=True,axis=1)
cat_col,num_col=extract_cat_num(kidney)
cat_col
num_col
for col in cat_col:
    print('{} has {} values'.format(col,kidney[col].unique()))
    print("\n")
kidney['diabetes mellitus'].replace(to_replace={'\tno':'no','\tyes':'yes'},inplace=True)
kidney['coronary artery disease'].replace(to_replace={'\tno':'no'},inplace=True)
kidney['class'].replace(to_replace={'ckd\t':'ckd'},inplace=True)
for col in cat_col:
    print('{} has {} values'.format(col,kidney[col].unique()))
    print("\n")
```

```

len(num_col)
plt.figure(figsize=(30,30))
for i,feature in enumerate(num_col):
    plt.subplot(5,3,i+1) # 5 rows and 3 columns
    kidney[feature].hist()
    plt.title(feature)
len(cat_col)
plt.figure(figsize=(20,20))

for i,feature in enumerate(cat_col):
    plt.subplot(4,3,i+1)
    sns.countplot(kidney[feature])
plt.figure(figsize=(20,20))

for i,feature in enumerate(cat_col):
    plt.subplot(4,3,i+1)
    sns.countplot(kidney[feature],hue=kidney['class'])
sns.countplot(kidney['class'])
kidney.corr()
plt.figure(figsize=(12,12))
sns.heatmap(kidney.corr(method='pearson'),cbar=True,cmap='BuPu',annot=True)
kidney.groupby(['red blood cells','class'])['red blood cell
count'].agg(['count','mean','median','min','max'])
plt.figure(figsize=(10,10))
plt.scatter(x=kidney.haemoglobin,y=kidney['packed cell volume'])
plt.xlabel('Haemoglobin')
plt.ylabel('packed cell volume')
plt.title('Relationship between haemoglobin and packed cell volume')
grid=sns.FacetGrid(kidney,hue='class',aspect=2)
grid.map(sns.kdeplot,'red blood cell count')
grid.add_legend()
grid=sns.FacetGrid(kidney,hue='class',aspect=2)
grid.map(sns.kdeplot,'haemoglobin')
grid.add_legend()
plt.figure(figsize=(12,10))
sns.scatterplot(x=kidney['red blood cell count'],y=kidney['packed cell
volume'],hue=kidney['class'])
plt.xlabel('red blood cell count')
plt.ylabel('packed cell volume')
plt.title('Relationship between red blood cell count and packed cell volume')
plt.figure(figsize=(12,10))
sns.scatterplot(x=kidney['red blood cell count'],y=kidney['haemoglobin'],hue=kidney['class'])
plt.xlabel('red blood cell count')
plt.ylabel('haemoglobin')
plt.title('Relationship between haemoglobin and red blood cell count')
kidney.isnull().sum()
kidney.isnull().sum().sort_values(ascending=False)

```



```

plt.subplot(1,2,1)
sns.boxplot(x=kidney['class'],y=kidney['age'])
list(enumerate(cat_col))
plt.figure(figsize=(15,15))
for i in enumerate(num_col):
    plt.subplot(4,4,i[0]+1)
    sns.boxplot(x=kidney['class'],y=i[1],data=kidney.reset_index())
np.mean(kidney)
kidney.isnull().sum()
for i in num_col:
    kidney[i].fillna(kidney[i].median(),inplace=True)
kidney.isnull().sum()
kidney.describe()
kidney['red blood cells'].isnull().sum()
random_sample=kidney['red blood cells'].dropna().sample(152)
random_sample
random_sample.index
random_sample.index=kidney[kidney['red blood cells'].isnull()].index
random_sample.index
kidney.loc[kidney['red blood cells'].isnull(),'red blood cells']=random_sample
kidney.head()
kidney['red blood cells'].isnull().sum()
sns.countplot(kidney['red blood cells'])
def Random_value_Imputation(feature):
    random_sample=kidney[feature].dropna().sample(kidney[feature].isnull().sum
    ())
    random_sample.index=kidney[kidney[feature].isnull()].index
    kidney.loc[kidney[feature].isnull(),feature]=random_sample
Random_value_Imputation(' pus cell')
kidney.isnull().sum()
def impute_mode(feature):
    mode=kidney[feature].mode()[0]
    kidney[feature]=kidney[feature].fillna(mode)
for col in cat_col:
    impute_mode(col)
kidney[cat_col].isnull().sum()
kidney.isnull().sum()
for col in cat_col:
    print('{} has {} categories'.format(col,kidney[col].nunique()))
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
for col in cat_col:
    kidney[col]=le.fit_transform(kidney[col])
kidney.head()
from sklearn.feature_selection import SelectKBest
from sklearn.feature_selection import chi2
ind_col=[col for col in kidney.columns if col!='class']

```

```

dep_col='class'
X=kidney[ind_col]
y=kidney[dep_col]
X.head()
imp_features=SelectKBest(score_func=chi2,k=20)
imp_features=imp_features.fit(X,y)
imp_features
imp_features.scores_
datascore=pd.DataFrame(imp_features.scores_,columns=['Score'])
datascore
X.columns
dfcols=pd.DataFrame(X.columns)
dfcols
features_rank=pd.concat([dfcols,datascore],axis=1)
features_rank
features_rank.columns=['features','score']
features_rank
features_rank.nlargest(10,'score')
selected=features_rank.nlargest(10,'score')['features'].values
selected
X_new=kidney[selected]
X_new.head()
len(X_new)
X_new.shape
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(X_new,y,random_state=0,test_size=0.3)
X_train.shape
y_train.value_counts()
from xgboost import XGBClassifier
params={'learning_rate':[0,0.5,0.20,0.25],
        'max_depth':[5,8,10],
        'min_child_weight':[1,3,5,7],
        'gamma':[0.0,0.1,0.2,0.4],
        'colsample_bytree':[0.3,0.4,0.7]}
from sklearn.model_selection import RandomizedSearchCV
classifier=XGBClassifier()
random_search=RandomizedSearchCV(classifier,param_distributions=params,n_iter=5,scoring='roc_auc',n_jobs=-1,cv=5,verbose=3)
random_search.fit(X_train,y_train)
random_search.best_estimator_
random_search.best_params_
classifier.fit(X_train,y_train)
y_pred=classifier.predict(X_test)
y_pred
from sklearn.metrics import confusion_matrix,accuracy_score
confusion_matrix(y_test,y_pred)

```

```
accuracy_score(y_test,y_pred)
```

For Website:

HOME page:

```
{% extends 'main.html' %}
{% block content %}
{% if message %}
    <div class="alert alert-danger">{{ message }}</div>
{% endif %}

<html lang="en">
  <head>
    <meta charset="utf-8">
    <meta name="viewport" content="width=device-width, initial-scale=1,
shrink-to-fit=no">
    <meta name="description" content="">
    <meta name="author" content="">

    <title>Cancer Prediction</title>

    <link rel="canonical"
href="https://getbootstrap.com/docs/4.0/examples/carousel/">

    <!-- Bootstrap core CSS -->
    <link href="../../dist/css/bootstrap.min.css" rel="stylesheet">

  </head>
  <body>

    <main role="main">

      <section class="jumbotron p-3 p-md-5 text-white rounded bg-dark text-
center">
        <div class="container">
          <h1 class="jumbotron-heading">Cancer Prediction</h1>
          <p class="lead">Cancer is a disease caused when cells divide
uncontrollably and spread into surrounding tissues. Cancer is caused by
changes to DNA. Most cancer-causing DNA changes occur in sections of DNA
called genes. These changes are also called genetic changes</p>
          <p>
            <a href="https://www.mayoclinic.org/diseases-
conditions/cancer/symptoms-causes/syc-20370588" class="btn btn-primary my-
2">Read More about the Disease</a>
          </p>
        </div>
      </section>
```

```

<div class="row mb-2">
  <div class="col-md-6">
    <div class="card flex-md-row mb-4 box-shadow h-md-250">
      <div class="card-body d-flex flex-column align-items-start">
        <strong class="d-inline-block mb-2 text-primary">Machine
Learning</strong>
        <h3 class="mb-0">
          <a class="text-dark" href="#">Random Forest</a>
        </h3>
        <div class="mb-1 text-muted">For Regression &
Classification</div>
        <p class="card-text mb-auto">Random forest is a supervised
learning algorithm. ... The general idea of the bagging method is that a
combination of learning models increases the overall result. Put simply:
random forest builds multiple decision trees and merges them together to get a
more accurate and stable prediction.</p>
        <a href="#">Continue reading</a>
      </div>
    </div>
  </div>
  <div class="col-md-6">
    <div class="card flex-md-row mb-4 box-shadow h-md-250">
      <div class="card-body d-flex flex-column align-items-start">
        <strong class="d-inline-block mb-2 text-success">Model &
Algorithm</strong>
        <h3 class="mb-0">
          <a class="text-dark" href="#">XGBoost</a>
        </h3>
        <div class="mb-1 text-muted">Gradient Boosting Machine</div>
        <p class="card-text mb-auto">XGBoost is an algorithm that has
recently been dominating applied machine learning and Kaggle competitions for
structured or tabular data. XGBoost is an implementation of gradient boosted
decision trees designed for speed and performance.</p>
        <a href="#">Continue reading</a>
      </div>
    </div>
  </div>
</div>
<!-- Marketing messaging and featurettes
===== -->
<!-- Wrap the rest of the page in another container to center all the
content. -->

<div class="container marketing">

```

```

<div class="row">
  <div class="col-lg-4">
    
    <h2>Data-Set</h2>
    <p>We have used the data set available in Kaggle - Chronic-Kidney
Disease Prediction. After Classifying the data, Preprocessin and performed the
Exploratory Data Analysis. This data set contains about 1338 records of data
in various categories.</p>
    <p><a class="btn btn-secondary" href="#" role="button">View
details &raquo;</a></p>
  </div><!-- /.col-lg-4 -->
  <div class="col-lg-4">
    
    <h2>Algorithm</h2>
    <p>Random Forest is a popular machine learning algorithm that
belongs to the supervised learning technique. It can be used for both
Classification and Regression problems in ML. It is based on the concept of
ensemble learning to improve the performance of the model.</p>
    <p><a class="btn btn-secondary" href="#" role="button">View
details &raquo;</a></p>
  </div><!-- /.col-lg-4 -->
  <div class="col-lg-4">
    
    <h2>Accuracy</h2>
    <p>XGBoost is a decision-tree-based ensemble Machine Learning
algorithm that uses a gradient boosting framework. In prediction problems
involving unstructured data. After modelling our data, the Accuracy is
<b>98%.</b> So far we achieved a Good accuracy. </p>
    <p><a class="btn btn-secondary" href="#" role="button">View
details &raquo;</a></p>
  </div><!-- /.col-lg-4 -->
</div><!-- /.row -->

<!-- START THE FEATURETTES -->

<hr class="featurette-divider">

<div class="row featurette">

```

```

    <div class="col-md-12">
        <h2 class="featurette-heading">How it will work</h2>
        <p class="lead">This prediction will be used in healthcare
Applications. As it was very important to predict whether the patient was
having any chances of getting this Kidney Disease. This project comprises with
the deployment too. We can deploy this project by means of Python web servers
available in the market.</p>
    </div>
</div>

<hr class="featurette-divider">

<div class="row featurette">
    <div class="col-md-12">
        <h2 class="featurette-heading">Conflicts & Modifications</h2>
        <p class="lead">Since, we deployed our model in Flask - Framework.
As, this was a simple classification and regression analysis. There might be
some problems arise during the installation of TensorFlow & Python Versions.
We must make sure of installing the same versions. In order to avoid this, We
must ensure to install the correct dependencies - before running this
project.</p>
    </div>
</div>

<hr class="featurette-divider">

<div class="row featurette">
    <div class="col-md-12">
        <h2 class="featurette-heading">Future implementations</h2>
        <p class="lead">Django - Framework will be more suitable for the
deployment at any case. At the same, adding the feature - Upload image and
process the X-Ray image and predict for any chances of getting the
disease.</p>
    </div>
</div>

<hr class="featurette-divider">

<!-- /END THE FEATURETTES -->

</div><!-- /.container -->
<section class="jumbotron p-3 p-md-5 text-white rounded bg-dark text-
center">
    <div class="container">
        <h1 class="jumbotron-heading">Cancer Prediction</h1>
        <p class="lead">Cancer is a disease caused when cells divide
uncontrollably and spread into surrounding tissues. Cancer is caused by

```

```

changes to DNA. Most cancer-causing DNA changes occur in sections of DNA
called genes. These changes are also called genetic changes.</p>
    <p>
        <a href="{{ url_for('kidneyPage') }}" class="btn btn-primary my-
2">Check out the Project</a>
    </p>
</div>
</section>

</main>

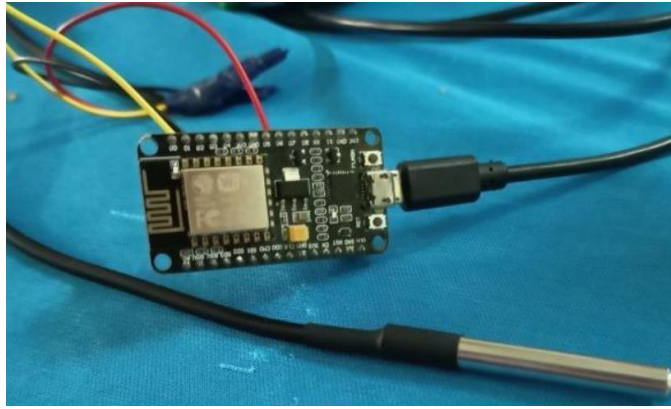
<!-- Bootstrap core JavaScript
===== -->
<!-- Placed at the end of the document so the pages load faster -->
<script src="https://code.jquery.com/jquery-3.2.1.slim.min.js"
integrity="sha384-
KJ3o2DKtIkvYIK3UENzmM7KCKRr/rE9/Qpg6aAZGJwFDMVNA/GpGFF93hXpG5KkN"
crossorigin="anonymous"></script>
    <script>window.jQuery || document.write('<script
src="../../assets/js/vendor/jquery-slim.min.js"><\script>')</script>
    <script src="../../assets/js/vendor/popper.min.js"></script>
    <script src="../../dist/js/bootstrap.min.js"></script>
    <!-- Just to make our placeholder images work. Don't actually copy the
next line! -->
    <script src="../../assets/js/vendor/holder.min.js"></script>
</body>
</html>

{% endblock %}

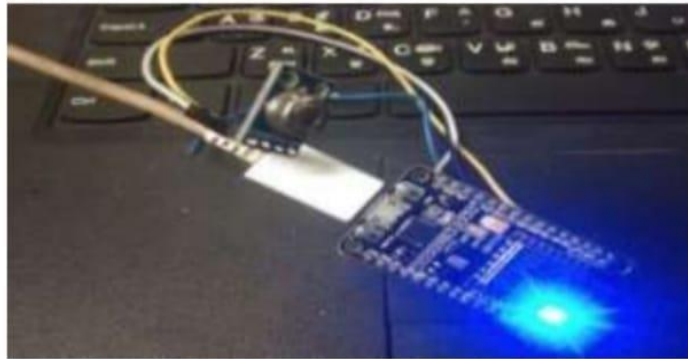
```

4.2 OUTPUT SCREENS

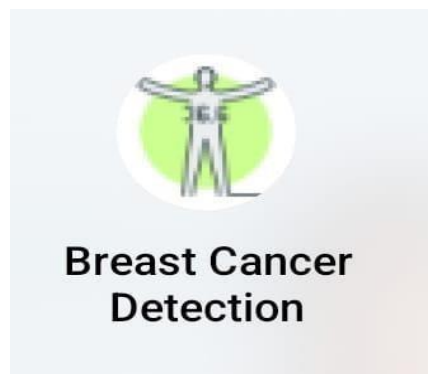




Temperature Sensor after connecting USB to microcontroller



Open the application



Temperature is normal

Breast Cancer Detection

TEMPERATURE

33.50 °C

92.30 °F

2023-04-01 22:25:26

Temperature is abnormal

Breast Cancer Detection

TEMPERATURE

39.00 °C

102.20 °F

2023-04-01 22:06:40

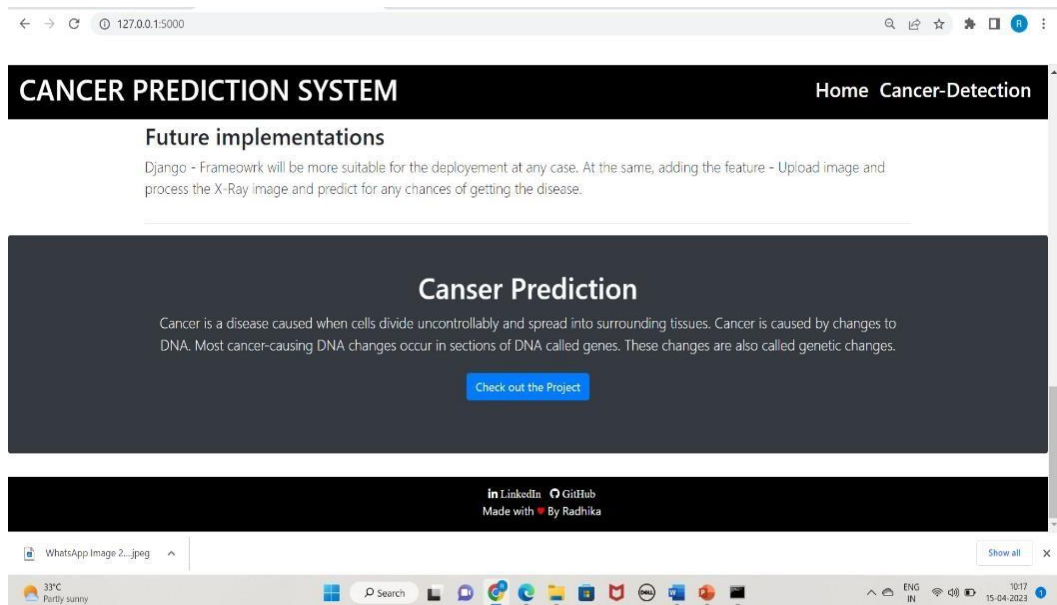
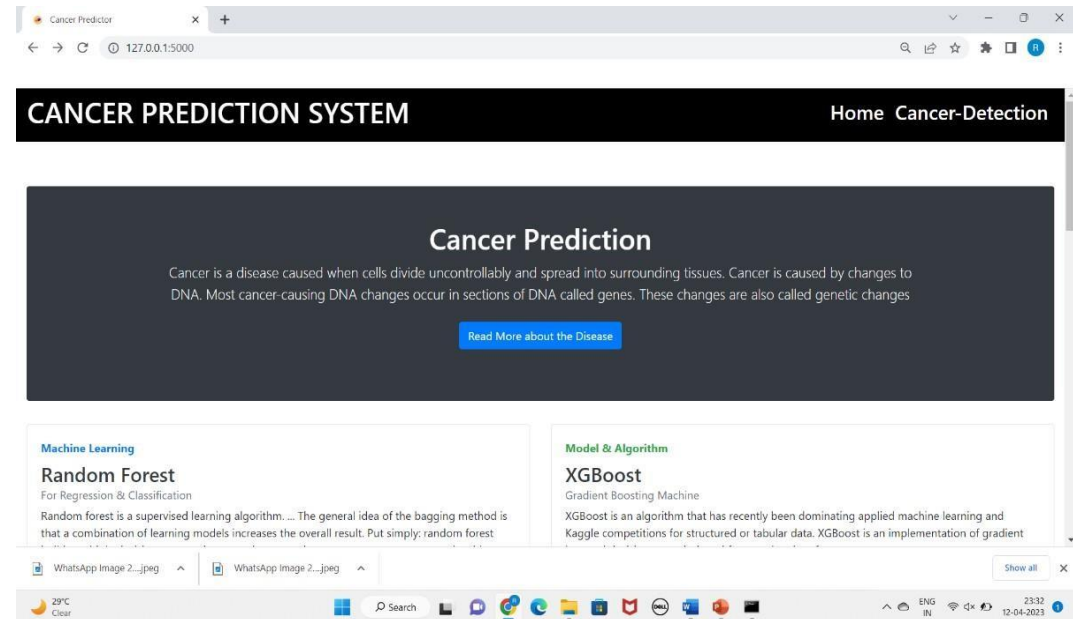
**HIGH TEMPERATURE IT CAUSES
TO BREAST CANCER PLEASE VISIT
TO HOSPITAL**

☐ Move Task To Back

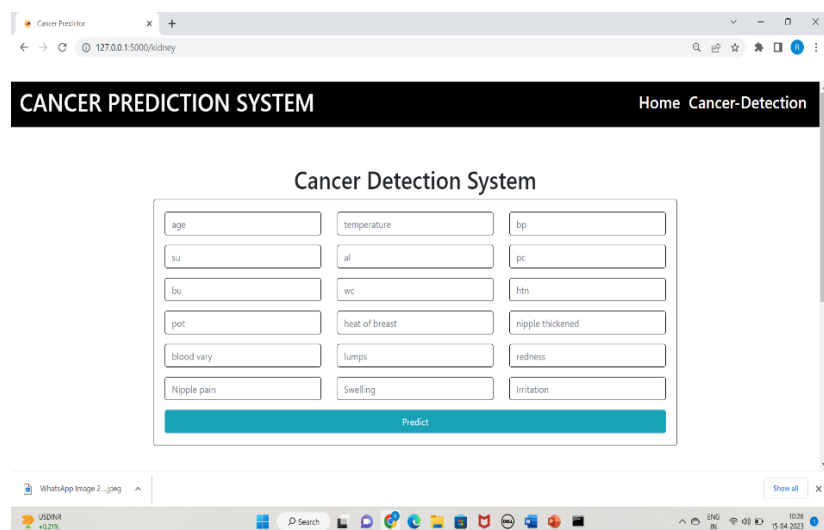
If Temperature is abnormal then opens the website, by executing the command in command prompt

```
Select C:\Windows\System32\cmd.exe - python app.py
Microsoft Windows [Version 10.0.22000.1574]
(c) Microsoft Corporation. All rights reserved.

C:\Users\DELL\Downloads\canser-ditection\canser-ditection>python app.py
* Serving Flask app 'app'
* Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on http://127.0.0.1:5000
Press CTRL+C to quit
* Restarting with stat
* Debugger is active!
* Debugger PIN: 982-455-699
```



Then click on check out the project,



Then have to enter symptoms values manually,

Cancer Detection System

48	102	100
0	1	1
60	11000	1
4.9	0	1
1	0	0
1	0	1

Predict

Finally click the predict button, then the output is displayed whether the person having disease or healthy

Cancer Prediction System

Nipple pain Swelling Irritation

Predict

Sample-Inputs in the Data Set

age	bp	al	su	temperature	pc	pcc	ba	bgr	bu	sc	pot	wc	htn	dm	cad	pe	ane	Disease
24	100	2	0	1	0	1	0	136	60	1.9	3.7	9600	1	1	0	0	1	Present
68	80	3	0	0	1	0	0	157	162	9.6	4.9	11000	0	1	0	0	1	Present
51	0	0	0	1	0	0	0	121	27	0.8	3.7	8300	0	0	0	0	0	Healthy

Disease

Present

Present

Healthy

UNIT – 5

TESTING

5.1 INTRODUCTION TO TESTING

Software testing is the process of evaluating and verifying that a software product or application does what it is supposed to do. The benefits of testing include preventing bugs, reducing development costs and improving performance.

- Meets the software and technical requirements that guided its design and development.
- Works as expected.
- Can be implemented with the same characteristics.

Software testing is an investigation conducted to provide stock holders with information about the quality of the software product or services under test. Software testing can also provide an objective independent view of the software to allow the business to appreciate and understand the risk of software implementation. Test techniques include the process of executing a program or application with the intent of finding software bugs (errors or other defects), and verifying that the software product is fit for use. Software testing involves the execution of a software component or system component to evaluate one or more properties of interest, in general, these properties indicate the extent to which the component or system under test :

- To meet the requirements that guided its design and development.
- It responds correctly to all kinds of inputs.
- It performs its functions within an acceptable time.
- It is sufficiently usable.
- It can be installed and run in its intended environments and to achieve the general, result of its stockholder's desire.

As the number of possible tests for even simple software components is practically infinite, all software using uses some strategy to select tests that are feasible for the available time and resources. As a result, software testing typically attempts to execute a program or application with the intent of finding software bugs. The job of testing is an iterative process as when one bug is fixed.

- Software testing is defined as an activity to check whether the actual results match the expected results and to ensure that the software system is defect free.
- It involves the execution of a software component or system component or system component to evaluate one or more properties of interest.
- Software testing also helps to identify errors, gaps, or missing requirements contrary to the natural requirements.
- It can be either done manually or using automated tools.
- Some prefer saying software testing as a white box and black box testing.

5.2 TYPES OF TESTING

Unit Testing

It focuses on smallest unit of software design. In this we test an individual unit or group of interrelated units. It is often done by programmer by using sample input and observing its corresponding outputs.

Integration Testing

The objective is to take unit tested components and build a program structure that has been dictated by design. Integration testing is testing in which a group of components are combined to produce output.

Integration testing are of two types:

1. Top down
2. Bottom up

System Testing

This software is tested such that it works fine for different operating system. It is covered under the black box testing technique. In this we just focus on required input and output without focusing on internal working. In this we have security testing, recovery testing, stress testing and performance testing.

Acceptance Testing

Formal testing is conducted to determine whether or not a system satisfies its acceptance criteria and to enable the customer to determine whether or not to accept the system It is usually performed by the customer.

Alpha Testing

Type of testing a software product or system conducted at the developer's site. Usually, it is performed by the end users.

Beta Testing

The beta test is conducted at one or more customer sites by the end-user of the software. This version is released for the limited number of users for testing in real time environment.

Accessibility Testing

Type of testing which determines the usability of a product to people having disabilities (deaf, blind, mentally disabled etc). The evaluation process is conducted by persons having disabilities.

Backend Testing

Backend testing is defined as a type of testing that checks the server side or Database. It is also known as Database Testing. The data entered in the front end will be stored in the back-end database.

5.3 TEST CASES AND TEST REPORTS

Test Case 1:

Test	Checking if Temperature sensor is working or not
Test Data	High temperature and low temperature
Test environment	Temperature sensor, Microcontroller, connecting wires and power bank and USB cable
Action	The user must wear the Bra having temperature sensor and microcontroller connected inside the Bra.
Expected	Green light is displayed at the end if it is working
Error	Sensor is working correctly, so no Error

Test pass/Fail	Pass
----------------	------

Test Case 2:

Test	Checking if Application we designed named as Breast cancer detection working or not
Test Data	Temperature sensor detected the temperature and have to display in the app
Test environment	Application named as Breast cancer detection
Action	The user have to install the application in their respective mobiles.
Expected	Temperature data have to be displayed
Error	No Error
Test pass/Fail	Pass

Test Case 3:

Test	Checking if Temperature is normal then displaying the temperature details or not
Test Data	Temperature sensor detected the temperature and have to display in the app with date and time
Test environment	Temperature sensor, Microcontroller, connecting wires and power bank and USB cable and Application

Action	The user must wear the Bra having temperature sensor and microcontroller connected inside the Bra.
Expected	Temperature values are to be displayed
Error	No Error
Test pass/Fail	Pass

Test Case 4:

Test	Checking if Temperature is abnormal then displaying the temperature details or not and also displaying notification or not
Test Data	Temperature sensor detected the temperature and have to display in the app with date and time
Test environment	Temperature sensor, Microcontroller, connecting wires and power bank and USB cable and Application
Action	The user must wear the Bra having temperature sensor and microcontroller connected inside the Bra.
Expected	Temperature values are to be displayed and also the notification to visit hospital if it is abnormal
Error	No Error
Test pass/Fail	Pass

Test Case 5:

Test	Checking if website is working properly working or not
Test Data	Temperature sensor detected the temperature and have to display in the app with date and time and if it is abnormal then have to opens the website
Test environment	A PC with Internet and Input data
Action	The user have to execute the python file and have to opens the website.
Expected	After opens the website the symptoms are to be to enter the values manually
Error	No Error
Test pass/Fail	Pass

Test Case 6:

Test	Checking after entering the symptoms predicting breast cancer or not
Test Data	The data requires the symptoms of a person to detect whether the person is healthy or suffering with disease.

Test environment	A PC with Internet and Input data
Action	The user have to enter the symptoms values manually in the website
Expected	Displays the result as present or healthy if person is suffering with breast cancer then displays as present
Error	No Error
Test pass/Fail	Pass

UNIT – 6

IMPLEMENTATION

6.1 IMPLEMENTATION INTRODUCTION

Implementation is the stage where theoretical design turned into a working system. Implementation is planned carefully to propose system to avoid unanticipated problems. Many preparations are involved before and during the implementation of proposed system. The system needed a smart phone with internet connectivity and a well-developed user interface to give or receive inputs and outputs to the application/website respectively.

An implementation plan is a project management tool that outlines the steps to achieve a goal or objective. The plan sets the course for implementation, taking a project from an idea to realized goal.

Implementation plans may differ depending on the product, but they generally include the following elements:

- **Goal**
This is the end result in a project aims to achieve.
- **Objectives**
These steps, activities, and milestones must be achieved to reach the goal.
- **Success criteria**
Stakeholders, project managers, and policymakers use these criteria to determine whether a project is complete and satisfactory.
- **Scope statement**
The project scope outlines project boundaries and explains what the team will or will not do. A statement of work document is often used to define the project scope.
- **Resource plan**
This outlines what the team will need to carry out implementation.
- **Risk analysis**
Implementation teams use risk analysis to identify potential problems.
- **Timeline**
A timeline lists targeted completion times and deadlines for each milestone. Project management tools like a Gantt chart can help render this.

- **Roles and responsibilities**

A description of team roles and responsibilities of all team members and stakeholders.

The people who need to detect the breast cancer are using temperature sensor and microcontroller and displays the temperature in the mobile application also check the symptoms whether matches with dataset or not in the website, if it matches then the person is suffering with breast cancer or else not. It also provides security to each user, who is using our website/application.

6.2 IMPLEMENTATION PROCEDURE & STEPS

Let's look at the major steps associated with implementation.

Prepare Infrastructure

This strategy includes a review of hardware, software, communications etc. In our example above, the prototype hardware we require infrastructure like Bra, temperature sensor, microcontroller and connecting wire and power bank for power supply to microcontroller.

Designing the Application

In designing the application and making it perfect to work we are ready with our research and development team who will always check whether the application is running perfectly and correctly and if any unusual activities are performed by the application, then they will immediately react and solve the problem.

Using the Application

On installing the application and women have to wear the bra and connect the hotspot settings with the hardware and temperature sensor inside the bra predicts and displays the temperature in mobile application. Just the user work is use to wear the bra and if it is abnormal then it sends the alert message through text and voice. The application namely Breast cancer detection is user friendly.

Coordinate with the Team involved in the Implementation

This may be as simple as wearing the bra and selecting the symptoms in the website. These team members might actually have a role in getting the solution successfully employed by coordinating with each other in every aspect of implementation.

The implementation procedure are explained step by step as follows:

Step 1: Start

Step 2: Connect the mobile hotspot and change the settings like hotspot name and password which it will connects to the hardware, Then the hardware device connects to the mobile.

Step 3: After connecting the device, the user have to install the application namely Breast Cancer Detection.

Step 4: Wear the Smart Bra, Inside the bra having temperature sensor and microcontroller with connecting wires.

Step 5: Then the temperature sensor inside the bra predicts the temperature and user have to open the application and the temperature displayed in the mobile application.

Step 6: If the temperature is abnormal that means too high/low then immediately it sends the alert message through text and voice.

Step 7: Then the user opens the website and enter the temperature value like it is high/low and other symptoms values in the website manually.

Step 8: Previously we collected all the data regarding breast cancer symptoms with the help of hospitals and nursing homes. After entering all the values and click the predict button then the machine learning technology checks the symptoms matches with dataset or not.

Step 9: If it matches with dataset then it displays as detected (ckd) and otherwise it displays as not detected (not ckd).

Step 10: If it is detected then the person immediately consults the doctor for further treatment.

Step 11: Stop

6.3 USER MANUAL

There are several steps to be followed for using this:

- Initially users have to download the application.
- Change the hotspot settings like username and password and mobile hotspot connected to the hardware device.
- Then the user have to the Smart Bra.
- The Bra having temperature Sensor and microcontroller and it predicts the temperature if it is abnormal then it sends the alert message through text/voice.
- Then the user have to opens the website and enter the symptoms values manually.
- And click the predict button and the symptoms matches with dataset then person is suffering with breast cancer otherwise the person is not suffering with breast cancer.

- Finally displays the result in the website.
- Then the user consults doctor for further treatment if the breast cancer is detected.

CHAPTER – 7

CONCLUSION AND FUTURE ENHANCEMENTS

7.1 CONCLUSION

The main theme of our project is increasing survival rate by detecting breast cancer at an early stage by using a Smart Bra. Mostly in breast cancer imaging techniques, microwave sensors and other imaging techniques like deep learning, machine learning are widely used. But in this paper, we suggested a new technique which provides better identification on lumps and cancerous tissue. For analysing the breast cancer Temperature Sensor have been used. And finally, visualization of breast will be processed as alert message to mobile phone.

7.2 FUTURE ENHANCEMENTS

- Very useful and protective to women.
- We ensure that no harmful radiations effect to our body.
- In future we tried to implement on immunotherapy.
- Immunotherapy is appeared for patients with advanced triple-negative cancer which often grows and spreads faster than other types of breast cancer.

CHAPTER – 8

BIBLIOGRAPHY

8.1 BOOKS REFERRED

- Breast cancer screening: Making sense of complex and evolving evidence
- Early diagnosis and treatment of cancer series
- An introduction to microwave imaging for breast cancer detection
- Breast cancer screening: quality issues in detection and diagnosis

8.2 WEBSITES VISITED

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9175124/>
- <https://breast-cancer-research.biomedcentral.com/articles/10.1186/s13058-019-1158-4>
- <https://www.sciencedirect.com/science/article/pii/S2667102621000887>
- <https://www.frontiersin.org/articles/10.3389/fpubh.2022.924432/full>

8.3 REFERENCES

- [1] M. Tahmooresi, A. Afshar, B. Bashari Rad, K.B. Nowshath, M.A. Bamiah, "Early Detection of breast cancer using machine learning techniques, "Journal of Telecommunication, Electronic and Computer Engineering, vol. 10, no. 3-2, pp. 21-27, 2018.
- [2] Puspanjali Mohapatra, Baldev Panda, Samikshya Swain, "Enhancing histopathological Breast cancer image classification using mammography," International Journal of Innovative technology and Exploring Engineering, vol. 8, no. 7, pp. 2024-2032, 2019.
- [3] Shwetha K, Spoorthi M, Sindhu S S, Chaithra D, "Breast cancer detection using deep learning technique," International Journal of Engineering Research & Technology, vol. 6, no. 13, pp. 1-4, 2018.
- [4] Sivapriya J, Aravind Kumar V, Siddarth Sai S, Sriram S, "Breast cancer prediction using Microwave imaging," International Journal of Recent Technology and Engineering, vol. 8, no. 4, pp. 4879-4881, 2019.
- [5] Muhammet Fatih Aslam, Yunus Celik, Kadir Sabanci, Akif Durdu, "Breast cancer diagnosis by different machine learning method using thermal imaging data," International Journal of Intelligent System and Applications in Engineering, vol. 6, no. 4, pp. 289-293, 2018.

- [6] Rossano Girometti & Martina Zanoteli & Viviana Londero & Anna Linda & Michele Lorenzon & Chiara Zuiani, "Automated breast volume scanner in assessing breast cancer size. A comparison with conventional ultrasound and magnetic resonance imaging", European Society of Radiology 2017.
- [7] Muhammet Fatih Aslam, Yunus Celik, Kadir Sabanci, Akif Durdu, "Breast cancer diagnosis by different machine learning method using thermal imaging data," International Journal of Intelligent System and Applications in Engineering, vol. 6, no. 4, pp. 289-293, 2018.
- [8] Bilal Majeed, Hafiz Talha Iqbal, Uzair Khan and Muhammad Awais Bin Altaf, A Portable Thermogram based Non-contact Non-invasive Early Breast-Cancer Screening Device, IEEE-2018.
- [9] Vishal Deshwal, Mukta Sharma, "Breast cancer detection using SVM classifier with grid search techniques," International Journal of Computer Application, vol. 178, no. 31, pp. 18-23, 2019.
- [10] J Malone S Snguon, MA Adams, Breast cancer screening and cancer among black sexual minority women using mammography, A scoping review of the literature from 1990-2017, Journal of women's-2019-Liebertpub.com.