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Prognosis of Breast Cancer using Machine Learning Techniques and Analyzing Food Habits of Pakistani Women

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ABSTRACT

Breast cancer is easily occurred in all women due to poor eating habits. The present study examined food risk factors for breast cancer, their association with quality of life and changes in eating habits. The research included 200 women data with histological confirmed invasive breast cancer. This research data consists of different food types of This study uses different Machine learning algorithms like LR, SVM, CNN, Perceptron, GB, ADA Boost, DT, RF, and Multi-perceptron are used. Everyone has different accuracy we analyzed the ADA Boost classifier has the highest accuracy which is 87.5% due to the low quantity of our data set.

INTRODUCTION

A human body consists of multiple cells, every cell is given special instructions/commands to our whole body, and how to divide and grow cells[1]. These commands are specified in the shape of genes in DNA[2]. These cells divide every time, every cell passes its DNA to novel cells[3]. Most of the time commands in cells' DNA order it when to divide and stop growing[4]. The starting point of cancer is when a cell has transformations in the parts of DNA and also gives commands to stop growing[5]. Cancer can occur anywhere in the human body and the human blood[6]. A tumour is made when any cell divides out of control and makes a clump of cells[7]. Sometimes benign tumour starts when any tumour grows in one place in the human body[8]. Tumours that banquet rapidly to other parts of the human body[8]. The more harmful tumour is the Malignant tumour because it can feast throughout the body and can distress your health in many ways[9]. Different types of breast cancer, but in our study, we analyse breast cancer in Pakistani women[10]. There are four types of cancer is are follows:

A. CARCINOMA

This kind of cancer affects the organs and glands of the human body and disturbs the lungs, breast, pancreas, and skin [11].

B. SARCOMA

This type of cancer starts in conjunction with tissues. These connected tissues are supportive tissues of the human body like tendons, bones fibrous, cartilage, and supportive organs[12].

C. MELANOMA

Melanoma cancer affects the plasma cells of the body. It is also called white blood cells. They harvest antibodies that help to fight all types of infections[12]. These cells can develop abnormally and out of control, so it is not made properly antibodies[13].

D. LYMPHOMA

This kind of cancer developed in the lymph glands of the human body. These cells travel throughout our body, so cancer starts anywhere in the body[13]. It also affects the white blood cells of the body, when white cells start and divide in an unethical way cancer tumours were developed[14].

E. LEUKEMIA

This type of cancer affects the blood or blood cells of humans. When this type of cancer attacks humans then blood cells are not working properly and are not fully formed[14]. It is not a common type of cancer. The overall ratio of this type of cancer patient is 3 out of 1 patient

[15].The graphical representation of the cancer types. The below diagram shows the graphical representation of cancer types.

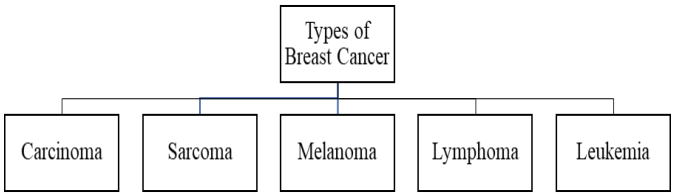

FIGURE 1: TYPES OF CANCER

II. BREAST CANCER

Breast Cancer (BC) is the most communal type of cancer after skin cancer[16]. BC is cancer , which is formulated in the breast cells [16]. It happens when breast cells grow and divide in an unrestrained way, fashioning a mass of tissue called a tumour[15]. When we feel a lump in our breast, it is a sign of start breast cancer[17]. BC instigates in your breast tissue. BC can attack and raise into the tissue nearby our breast, like other cancers[15]. Due to travelling of cancer tumours, it also affects the other body parts[17]. BC is one of the utmost communal cancers amongst women, after skin cancer[16]. The most affected duration of age is 50 years. Nowadays breast cancer is diagnosed in both men and women, but it is more common in women.

Around, 2600 men are affected every year with BC in the USA (United States of America)[18]. Transgender women are more affected by the BC, as compared to cisgender men. Moreover, t affects the organs and glands of the human body and disturbs the lungs, breast, pancreas, and skin second most identified cancer in the universe and the principal cause of cancer death in women secretarial, correspondingly, for 2,088,849 million new identities and over 625,000 deaths yearly[19]. Despite the progression of anticancer surgical and pharmacologic treatments, both breast cancer rates and death rates have remained almost unchanged throughout the last 40 years [19].

III. RISK FACTORS OF BREAST CANCER

Many factors are involved in the increase in the cancer ratio in our bodies. Most breast cancer patients have 50 years of age[20]. Sometimes women will be affected by BC without any risk factor, also if we have a risk factor does not mean we will come to the disease[21]. Most of the time women have some risk factors, but most women do not become BC[21]. There are two types of risk factors are follows:

A. NON-PREVENTABLE

Nowadays many risk factors for breast cancer, like gender, age, genetic factors, and family history. These factors are very important because women are most effective by BC men are also affected but the ratio is very low. It is also called a non-modified risk factor[22].

B. PREVENTABLE

BC inhibition starts with healthy activities like as overweight, alcohol, smoking, and hormone replacement. In these factors, when women have left physical activities then most of the chance they are affected by BC. Some researchers also said, alcoholic women, are also affected[22]. The below diagram represents the graphical representation of the risk factors.

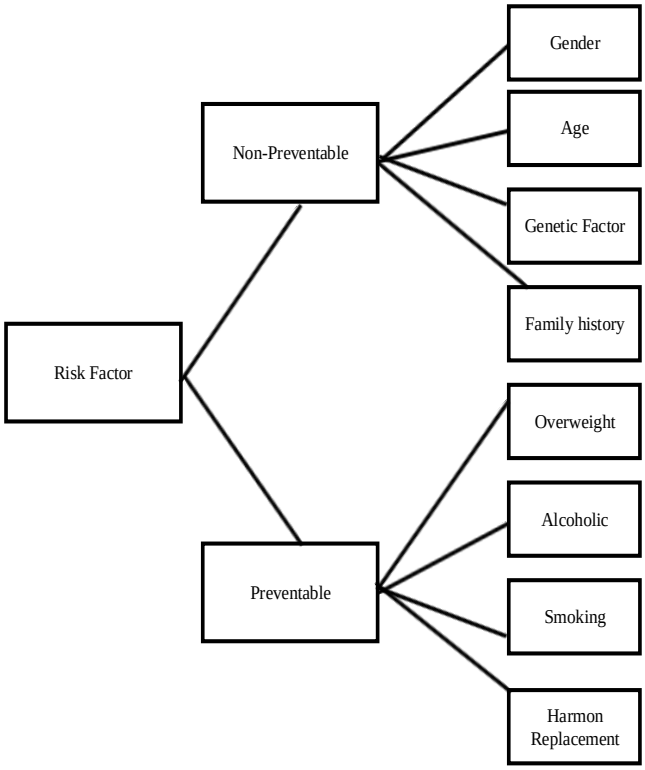

FIGURE 2:RISK FACTORS OF BREAST CANCER

IV. BREAST CANCER DECREASE RISKS

Due to the advancement of technology, we can treat breast cancer, but if we adopt good and healthy activities, then we can decrease the risk factors[23]. Nowadays different types of methods control or decree the risk factors[23]. The decreased risks factor is first pregnancy before age 25, one or two pregnancies, breastfeeding for 15 months, breast self-exam, menopause before age 50, Health food, healthy weight, and exercising[24].

V. BREAST CANCER IN PAKISTANI WOMEN

Every single minute, anywhere in the world, a woman expires from BC. The total amount of these women is 1400. BC occurs when breast cells are not grown properly[25]. World Health Organization (WHO) and some other cancer medical institutes are helping to control BC[26]. In the south Asia region, Pakistan is the most affected country which is affected by BC[27]. The number of affected women with BS is 1 out of 9[28]. This ratio is a very terrible situation for our country[27]. In the era of 2018, one of the medical institutions' research projects diagnosed cancer patients, I am very worried about these stats a total of 34066 cases of breast cancer were reported in 2018[29].

The main reason for increased the ratio of diagnosed cancer is less facility and awareness of BC[30]. Another reason for the increase in the ratio is the late diagnosis of BC in Pakistani women patients. If the BC is diagnosed in the early stage, most of the chance is to recover the BC[30]. If BC is diagnosed at the last stage, then very low chances of survival. The treatment facilities are also the reason for spread the of BC in our society[31]. The expenditure on treatment is very high that's why most women are not ready for routine check-ups of the breast. Very rush in the Govt hospital for the treatment of BC, its main reason is Increased the population of Pakistan. So, Govt needs to provide more facilities for Pakistani women and spread public awareness in the country[32].

VI. ANALYSE THE FOOD HABITS OF BC PATIENTS IN PAKISTAN

BC is a worldwide issue, and most of the researchers are focused on the breast cancer diagnosed, but we are especially analysing the food habits of BC patients in Pakistan[32]. Due to the fewer facilities in Pakistan BC's spread increased day by day. If you are presently suffering treatment for BC or have been preserved for BC in the past, eating healthy is mainly important for us[32]. BC patients are normally anxious about meal activities and nourishment and commonly rapid the need to get health-related materials and the will to alter their diet and existence[33]. Hence, swearing of survivors' dietetic fluctuations and information requirements is vital for health care specialists to lead them toward optimum lifestyle changes[33]. To examine eating behaviour variations in breast cancer survivor people, we considered the cross-section multicentre research survey[34]. We primarily observed that patients increased their consumption of Fast food, Natural food, Sweets, dairy products, vitamins, protein, fruits, etc. Changes in the behaviour toward diets are a very important factor of control BC[34].

VII. LITERATURE REVIEW

The main cause of the item is to recognize women's environmental breast cancer risks and risk reduction techniques and the way they manual their actions outdated. Specifically, the cause of this takes a look at is to recognize women's expertise and approximately breast cancers dangers and whether or not now not biomedical and corporate discourse has expertise. The essential insights presented truth is method explore how risk statistics, discourse, illustration, and into affection girls of the regulations of 1ife and their rea1ities. It is also vital to analyze whether or not they receive and adopt dominant biomedical and neoliberal discourses or increase alternative explanations or resistance discourses that emanate from their thematic know-how. Exploring the position of social factors and the way they point to women's agency round techniques to lessen breast cancer hazard is also essential to the studies. Research questions and one literature that contributes to the theoretical and methodological and analytical and framework used inside the observing is an overview of the app1icable literature[46].

There is a growing literature at the technological know how of environmental links to breast most cancers. What is little known, and where in literature is lacking, is a known ledge of the socia1 sciences lasted to breast cancers, both environmentally and professionally. Specifically, there is an opening in the literature on this frame on how women with regarded breast carcinogens in an expert environment can create information of the environmental risks of breast cancer and, great particularly ,how they Develop realistic techniques to lessen the chance of most cancers[47].

As defined inside the preceding chapter at the theoretical attitude that under pins the 1ook at social and environmental attitude affect the conceptual framework of the dissertation. This framework also informs the enterprise of this chapter. Moremain1y, the subdivisions of the revised literature relate to unique levels of the socio-eco1ogical framework starting with the character through the gadget. The character leve1of the version is associated with the literature on behaviour change, and it keeps via multip1e and domestic relationships and interactions within the environmental framework[48].

As applied in this examine, there's a short examination of the idea of danger earlier than reviewing the applicab1e literature. The literature is organized into sub-sections of the following wing chapters: Behaviour Change; Ta1k as part of eating behaviour; Disease Eating Habits and Breast Cancer (Counter) Eating Habits; Feminine Perspective And exploring the environment in expertise the danger of breast cancer. The bankruptcy concludes with proof of the integration of examining targets with vital elements of literature. It's additionally about the prospect, opportunity, or expectation of the display. Therefore, threat in its nature increases a degree of

uncertainty, which complicates danger information and mitigation strategies. Threat theories received importance inside the Sixties, and later, the social knowledge of hazards changed the narrow discussion of ideal tiers of safety with a wide dialogue of the socio-political conditions of risk[49].

The dangers posed via commercial societies are 'prepared uncertainties 'bobbing up from their social, political, cu1tural, and economic contexts. Perception so threat are embedded in the political framework as "extensions of current macro-sociological frameworks" and shed light on institutional and organizational governance. The period hazard frequently refers to fitness uncertainty, in which fitness risks area collection of objective scientific statistics and, greater currently, socially constructed opinions. Popular danger discourse enables the knowledge and management of hazards for plenty of aspects of modern day 1ife. What is called threat and why a condition is considered risky is a current function where people are predicted to learn how to cope with their health risks. Western views on health, including the dangers, reasons, diagnosis, and remedy of diseases, are based on the Vibrio concept of purpose, where modernity and neoliberal capitalism mainly outline these theories. And form the values that communicate. Expectations of actors' reactions to social and fitness risks[50].

Hea1th threat discourses affect topics to take a 1ook at dangers in precise methods. Risk management messages take ob1igation with the character, lowering threat management to a technique where individuals study a specific danger and alter applicable non-pub1ic decisions or personal conduct. Under neo liberalism, wherein individual topics are held answerable for social risks and control of life styles in society, the regulation of issues is transferred to "self-care". Simi1arly, for the danger of breast most cancers, "health and disorder individuality have ended in a 'samp1e of duty[51].

A. AGE ANALYSIS

There is a huge variety of literature on fitness behaviour, steady with the triumphing view that fitness outcomes are linked to personal attitudes. The outcomes mentioned in the literature on fitness related behaviour alternate are variable Behaviour or change is hard and complicated.

Adopting fitness promoting behavioural adjustments is motivated by the way of the affected personal use and goals and different social, emotional, and fitness goals. Acknowledging the patient's revel in attitudes and experiences of everyday lifestyles within the communiqué transaction among the clinician and the patient is vital for information within fitness verbal exchange, such as" addressing social functioning and own family ro1es. "Need is covered because

biomedical training by myself may not suffice Individuals and their behaviours are better understood in socio- cultural relationships that affect man or woman selections and health consequences[26].

The risks of breast cancer consist of micro, mesa, Exo, Exmoor, and Chronotiers such as genetic mutations that can be because of chemical exposure in utero, throughout biological windows that pick out the threat for ladies and women. Air pollution which includes menstruation before birth and menopause In addition, exposure blends from consumer merchandise, such as those used forse1f-careand containing mall amounts of endocarp in disruptive chemical compounds Combinations of unintentional publicity to breast most cancers on important danger home windows in addition to exposure to vital intervals of existence publicity to endocrine disrupting chemical compounds in utero and earlier than menarche highlight this. It is nonviable to conquer sure dangers is man or woman behaviour techniques[31].

Excluding environmental threat factors in grasp meal its make a difference in danger mitigation techniques to deal with the one's factors. Sweeney located the fai1ure of the regulatory government to put into effect basic preventive measures for girls 'fitness, arguing that "emphasis on individual degree behaviour does now not encourage political and collective movement that is lengthy time period and More widely targeted answers can be focused including regulatory reforms ". together with regu1atory coverage financial and cultural reforms that include a couple of ranges and actors to govern, further to decrease the chance of private behaviour ages, environmental exposure to breast cancer danger Essential for effective mitigation[56].

Given that literature reviews confined impact on most cancers' prevention behaviour alternate, with the knowledge that many exposures to carcinogens in the outside environment tare need less, individual conduct trade targets for most cancers prevention it's too tight Strategies for breast cancer prevention must be taken into consideration and understood in a broader context, along with socio-cultural implications and structural factors, and most importantly, values[57].

B. DISCOURSES COMPONENTS OF FOOD ACTIVITIES

Breast cancer discussions are critical for discovering girls' knowledge of breast cancer dangers as a manifestation of social know how conduct and governance and contributing to and contributing to breast cancers discussions. The contributing social factors are numerous. As components of ingesting behaviour discussions facile the identification and evaluation of social forces that contribute to the formation of women's eating behaviour. The framework insides which women enjoy risks and apprehend how they perceive hazard control decisions. When carried out in a social

context discourse absolutely deviates from its origins as a linguist class an misperceived as a unique c1ass of thought "and anointer textual truth in a selected social and ancient context[59].

The debates visible truth evaluation of gir1s' organization eating conduct are useful for expertise strength exemplifying each consent and resistance. Breast Cancer Discusses Genetic and 1ifestyle Risks within the Foreground Despite growing clinical proof of professional and environmental collaboration in breast most cancers, environmental and occupational dangers are greater universal. Exploring breast cancer discourses as part of information and governance are critical in imagining how 1ifestyle evidence persists in institutional and cultural approaches. How and why women under take the dominant discourse in enforcing their agency on breast cancer expertise and what and the way ladies contain expert and environmental discourse are vital components of the narrative valuation [62].

News media discourse is crucial among manufacturers and social impacts. Providing fitness data, the media develops and gives cultural the orgies through images concepts and complex iscourse that shape a frame work for representing interpreting knowledge and empowering social tendencies. The cultural bills of cancer which are expressed thru communication on longer simply represent factor records. Instead they carries' up spherical and theoretica1 thoughts about sickness and the cancer studies that accompany [63].

The literature on breast cancer speak inside the media identifies styles variations in dialogue techniques on permanent subjects and approach of conversation along with news documentaries, commercia1s, and fundraising campaigns. Analysis of the Breast Cancer Discussion shows that the media displays and consists of particular social troubles at paintings, including from biomedical and corporate resources. Numerous studies of the Breast Cancer Media Discourse point to commonplace subjects of recognition raising and pink ribbon fundraising, biomedicine, survival, usability, character obligation, genetic reason, remedy, and detection other studies on breast cancers have highlighted the fashion of fostering and reinforcing patriarchal attitudes and practices within the media, medication and technological knowhow. Conversation gives ladies the reputation of inactive joyful women embellished in crimson. This is also essential there search nodes discover errands sessions on primary prevention or environmental chance elements[64].

Professional and environmental dialogues are the least regularly mentioned subjects within the analysed subjects and are neglected altogether by the give up of the take a look at length. Less than half of the breast cancer companies consist of information on environmental chemicals on their websites inside the Silent Spring Institute's research cognizance on breast cancers and

environmental exhibitions. More than eighty% recogniser factors including exercising food plan own family history or genetics. This discrepancy in records contributes to uncertainty approximately the environmental risks of breast cancer. The look Ad's authors strain the need for environmental breast cancer professionals and most cancer corporations to gratitude translate on sports of their work to speak about science with environmental factors .Rosemary Tong researched the discussion of personal and political reactions to breast cementers located that the biomedical technique of a bravely dysfunctional breast most cancers patient dominates the communiqué[66].

Decision making takes place via the formation of concepts and heuristics. The hyper 1ink between people's notion of their hazard and the ensuing fitness precautions wishes similarly improvement and research. Literature on cancer chance conversation reinforces the notion that threat information is advanced through dialogue related to a variety of facts sources together with organic information and cultural and social implications. The results display that it's far vital to research how them multiplicity of discussions that paintings through the ranges of social and eco systems come together and make contributions to building fitness understandings including the environmental effect of breast cancer. Dangers identifying the couple of outcomes of women's involvement in social and cultural relationship hazard taking conduct in context illustrates that problem enterprise is a part of shaping perceptions of danger. Women have in interact edit personal and social studies of breast monsters and weigh the dominant that but the breadth and nature of the prevailing social fashions may mute women sciences and reactions to breast cancer[68].

C. FEMINIST PERSPECTIVES

Feminist studies have made substantial and crucial contributions to social study. This includes standpoint ideas, intersectionality as information, concerns of authority and illustration, empathic identification, colonized oppressed subaltern perspectives, competing perceptions, reflexivity, and more. Feminist theory locates women as embodiments of Picas in situations shaped by patriarchy, race, and capability. Feminist health experts emphasize that fitness is "embedded in communities rather than just in women's bodies." Situating women as subjects in their social surroundings, with their perspective as the critical starting point, is an important contribution of feminist literature to the study of women's awareness of environmental dangers for breast cancer. Gender is a key entrance point into systems of that means and analyses of understandings of energy as a component[77].

Feminist analyses engage in a methodical exploration of assumptions and consideration of

particularities, so contributing to an important understanding of the soft world. The goal of feminist research is to lessen the negative effects and disadvantages that females face. When undertaken from a feminist perspective, studies on women's fitness, which include environmental dangers for breast cancer, can challenge traditionally male-oriented expertise manufacturing regarding women's fitness and highlight the shortcomings of alternative explanations. Women are often marginalized as subjects of their own experiences and lives. However, feminist research that looks at women's enjoyable eating habits reveals and validates their relevance in relation to health understandings[80].

Utilizing a social lens to link the personal and the social and locate people as located and entrenched, particularly in context, is encouraged by feminist research. When looking at breast cancer via a social lens, one may see how the illness affects and changes the lives of women. The social interactions in a neighborhood, the education, income, and race/ethnicity of women, as well as other research and circumstances, all contribute to the social context around breast cancer. Since they have exposed the prejudices of the male dominance hierarchy and the overreliance on the biological version that distorts basic medical research, feminist social insights of breast cancer are significant[81].

Studies on girls' breast cancer rates are heavily influenced by the traditional male dominance in corporate social settings. The continuous breast cancer risk factors are impacted by these distortions, which also have an impact on breast cancer therapy, screening, detection, and primary prevention initiatives. By placing the person in the social context, feminist viewpoints generate opposing viewpoints to the prevailing biomedical paradigm, which treats the frame as distinct from and unbiased from the social. Rosser's investigations, which are now well-known and have generated significant controversy in the field of breast cancer research, highlight many of the issues that women's health in Poplar has faced, including a female-dominated hierarchical fitness system that is founded on a biological understanding of medicine[82].

D. LOCATING THE ENVIRONMENT IN BREAST CANCER RISK PERCEPTION

Communications about illness and disease prevention frequently rest on the notion that risk factors may be altered or controlled. Individual risk factors for cancer, such as age, genetics, and family history, are typically considered because they are immutable. Most malignancies can be classified as either environmental or changeable due to lifestyle factors, with a focus on individual behaviors including food, exercise, and smoking that are thought to be modifiable. Lifestyle suggests a person's will, while environmental hazard variables frequently seek guidance from

unintentional exposure to carcinogens. Stated differently, the character has limited influence over environmental dangers[15].

Whether or how ladies understand those distinctions is essential from the perspective of the construction of breast most cancer risk understandings and associated chance mitigation strategies. The triumphing remedy of breast most cancers danger elements as fundamentally and in my opinion modifiable ends in the portrayal and expertise of the sickness as private in preference to social. The mission of vital hazard laments occurs when there is a failure to consider the social situations for breast cancer. Social factors inclusive of meals fine, associations among pesticides and different toxins with breast cancer socio economic in equa1ities and other social elements consisting of po1itical monetary and environmental threat elements are omitted whilst emphasizing workout and personal choice[84].

The issue of breast cancer becomes less political when societal and social systems—which also include environmental factors—are not considered as risk factors for the disease. examined the impact of political speech on the disclosure of the risk of breast cancer. The women Robertson spoke with tended to organize their views of their own specific risk factors and how to reduce them on an individual basis. Robertson found that although they discussed environmental issues, one of them used the language of communal solutions at the social, political, and economic levels, such as advocating for more stringent environmental regulations. Regulation of Sorrels [85].

Similar to research on media and therapeutic discourses, Robertson's analysis noted the individualization of the risk to the worry within a larger neo-liberal framework of personal responsibility. Despite being conscious of the dangers to the environment, women have developed unique methods and safeguards that are deeply ingrained in Florida. In other words, their methods of reducing the environmental threat aligned with the customized narratives that drive the message surrounding breast cancer, but they also lacked structural and systemic solutions where environmental exposure limits were to be implemented [86].

VII. METHODOLOGY

This methodology is divided into four stages. First, we discuss the introduction of the research. The second stage of this chapter explains the existing literature on the research. The third stage of the chapter is data set collection or generation. The fourth stage of this chapter is post-processing. Different Machine Learning algorithms are used to analyse breast cancer patients' food habits. In the last stage discuss the results of the final study and add how to extend this study in the future.

In this research, we analyse the Food Habits of breast cancer patients. We analyse the daily food habits of Pakistani women who are affected by the health or increased risk factors of breast cancer. On the behalf of literature, we analyse in the past most studies used statistical methods were used to investigate the food habits and risks of breast cancer in Pakistani women, but in our study, we used different Machine Learning algorithms to examine the food habits and the reasons for increased the risks of breast cancer in women.

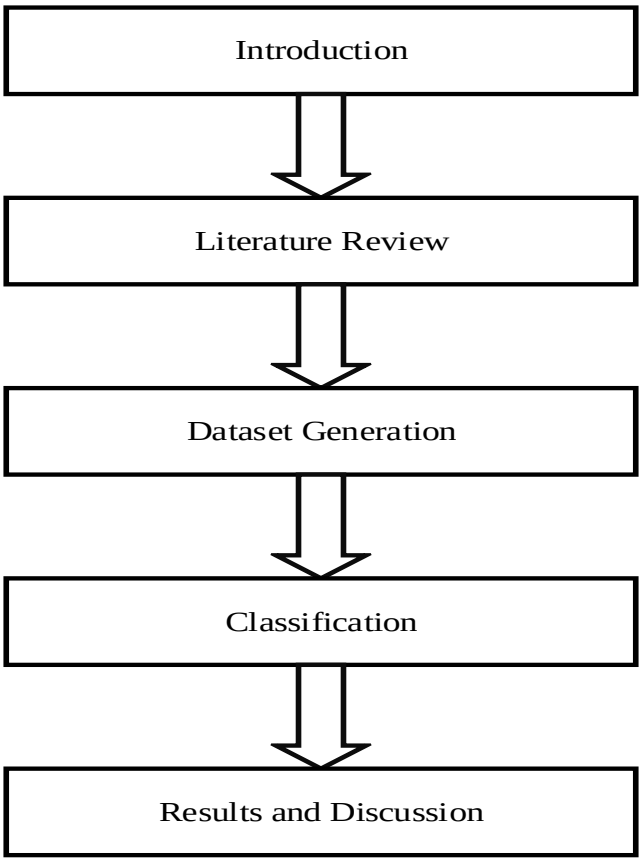

FIGURE 3: STAGES OF METHODOLOGY

VII. DATASET

The necessary data for testing the study hypotheses were collected from the Ancillary Health Services Department of Shaukat Khanum Memorial Cancer Hospital and Research Centre Peshawar. Our main source of collected data is Dr. Huma who was already researching the dietary plans for their cancer patients. The total sample size of the data is 200 patients. The corpus is based on the daily meal activity of breast cancer patients. In Corpus, define the categories of breast cancer patients' meals routine, 4 shows the patients eat daily food, 3 shows the patients eat weakly based food, 2 shows the monthly based meals activity, 1 shows yearly based food activity and 0 shows the

null value. The dataset has different parameters, i.e., BMI, Sugar, bread, roti, sweets, masala, Gud, Soft Cola, Energy Drinks, Burger, Pizza, etc. BMI was used for the target variable and labels five stages i.e., Weak, Normal, Overweight, Obesity, and Extreme Obesity. The standardized parameters of my corpus like Age, Weight, and BMI are also collected from breast cancer patients.

VIII. CLASSIFICATION

The data set is based on polynomial type. Many features are discussed in the data set. BMI was used as a target variable for training the ML model. Analyse the food habits of breast cancer patients against the BMI variable. BMI is divided into 5 stages which help us to understand the food habits of patients in a better way.

1=Weak: BMI<18.5

2=Normal: 18.5<BMI<24.9

3= Overweight: 25<BMI<29.9

4=Obesity: 30<BMI 34.9

5= Extreme obesity: BMI>35

This division helps us to understand the diet plan or daily meal routine of different BMI group patients. The division of the BMI group is visualized using Pie Chart. The calculation of BMI shows the percentage of BMI patients.

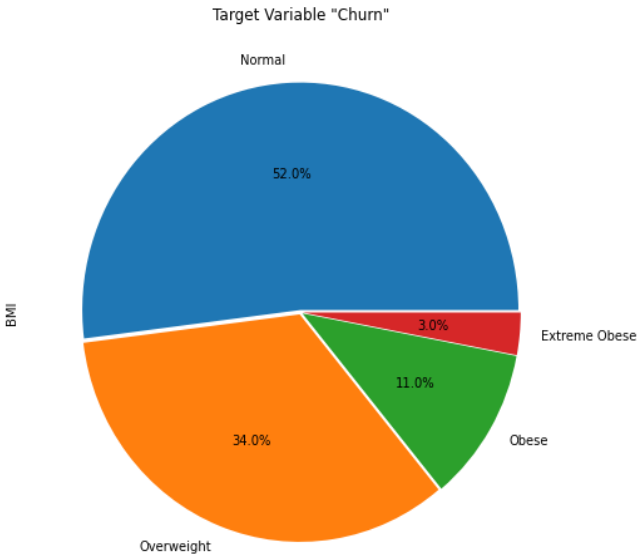

FIGURE 4: BMI OF BC PATIENTS

In this diagram blue colour shows the maximum percentage, 52.0% of patients have a normal BMI. The red colour shows the extreme obese BMI and the percentage is 3.0%. Green colour gains

11.0% which shows whose patients have an Obese BMI. The Orange colour shows the second highest BMI which is 34.0%.

IX. CLASSIFICATION

In data analysis classification perform a significant character in predicting the class precisely into its target class, it can simply discrete supervised data into the classes[35]. It can essentially handle supervised learning. Supervised learning in which it can efficiently classify slight or bulky data according to the pre-defined classification model[36]. To analyse the food habits of breast cancer patients we applied different ML algorithms like ADA Boost, Decision Tree (DT), Logistic Regression (LR), Support Vector Machine (SVM), Perceptron, Multilayer Perception, Random Forest (RF), K-Nearest Neighbour (KNN) and Gradient Boost (GB).

X. RESULTS AND ANALYSIS

Before implementation of the different ML techniques, used different data factors for analysis. These analysis helps us to understand the different factors of BC. There are some analyses is are follows:

A. AGE ANALYSIS

This analysis analyses the age of all patients which helps to understand in a better way because different age groups has been different diet plans or daily meal routines. The histogram is used to show the visualization of different age groups.

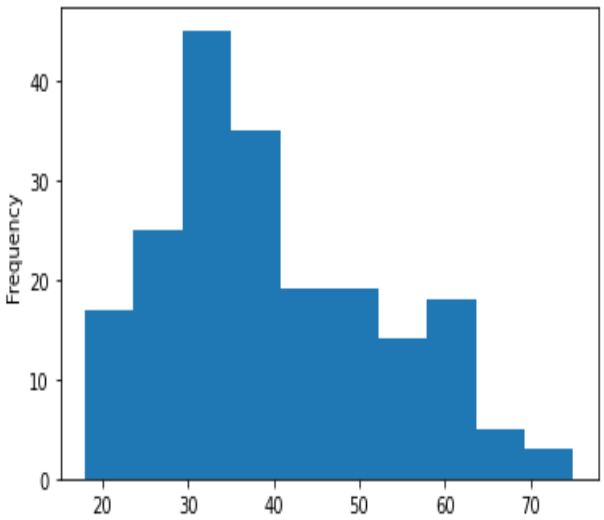

FIGURE 5: AGE ANALYSIS

This diagram shows, the different ages of patients involved in this research. In this diagram, we analyse most of the patients belonging to the 30-to-40-year age group. This diagram shows the 30

to 40 years age group has more affected by breast cancer. But it's a very dangerous situation for our society now teenage girls are also affected by cancer, but few patients belong to the 70-year age group.

B. HEIGHT ANALYSIS

Another analysis of this study is on the height of breast cancer patients. Many researchers are analysing the height of breast cancer. Height is also an important factor in this study, most researchers are said taller women have an augmented risk of breast cancer.

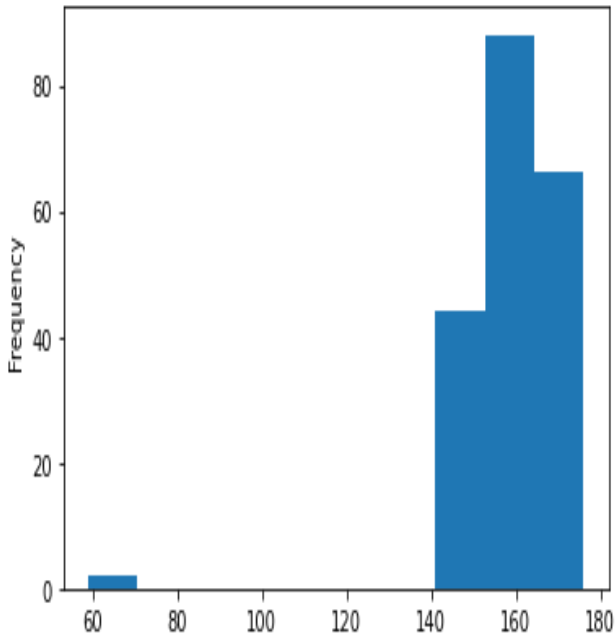

FIGURE 6: HEIGHT ANALYSIS

The above diagram shows the visualization of the analysis, in this diagram, shows that most taller women are affected by breast cancer. Most of the patients belong to 150 to 170 CM heights.

XI. EXPERIMENTAL SETUP

The stage of implementation in my study is a very important and complex task because many few studies used Machine Learning techniques are used for analysing the food habits of breast cancer patients. Most of the researchers used Statistical Techniques are used for post-processing. ML algorithms are used in Python for analysis and the tool for used this purpose is Anaconda Navigator. Different libraries are used in coding i.e., pandas, NumPy, seaborn, and matplotlib. It is used for classifying the feedback of the patients who are affected by breast cancer. In the Python ML model, the corpus is separated into two chunks, 80% for the training and the remaining 20% corpus for testing the model which is planned to assess the results. To regulate the presentation of

the results, use Machine Learning techniques.

XII. MODELLING RESULTS AND ANALYSIS

Different Machine Learning classification algorithms are used for post-processing. Different ML techniques are implemented on food habits data. To classify the feedbacks ML techniques are applied. The outcomes of all models are following:

TABLE 1: ML MODELS RESULTS

Index	Classifier	Accuracy
0	LR	72.5
1	SVM	70.0
2	CNN	57.5
3	Perceptron	70.0
4	DT	82.5
5	RF	70.0
6	Multi Perceptron	65.0
7	GB	52.5
8	ADA Boost	87.5

In the outcome of all ML models, LR gain 72.5% accuracy, SVM gain 70.0% accuracy, KNN accuracy is 57.5, Perceptron accuracy is 70.0%, DT accuracy 82.5%, RF accuracy is 70.0%, Multi-Layer Perceptron accuracy is 65.0%, GB gain 52.5% accuracy, and ADA Boost classifier accuracy is 87.5%.

We analyse the ADA Boost Classier gains the highest classifier and the GB gains the lowest accuracy. We used a Line graph to visualize the all outcomes for the ML models.

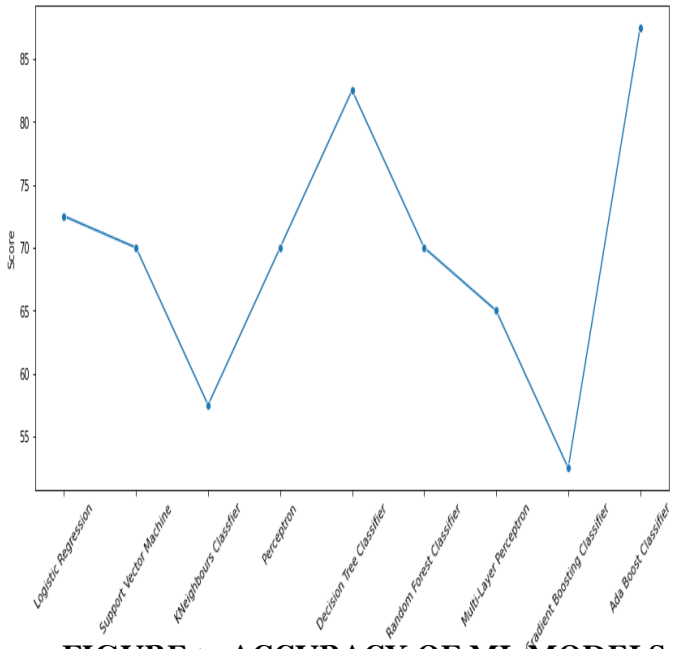

FIGURE 7: ACCURACY OF ML MODELS

The above diagram shows the accuracies of all ML models which is implemented on the original data set. This diagram helps us to understand the final results in a better way.

A. BEST MODEL RESULTS

In the implementation, we saw ADA Boost classier gain the highest accuracy and better results from all ML models.

TABLE 2: ADA BOOST RESULTS

Evaluation Measure	Normal	Overweight	Obese	Extra Obese	accuracy
Precision	0.913043	0.857143	0.666667	0.0	0.875
Recall	1.000000	0.857143	0.50000	0.0	0.875
F-1 Score	0.954545	0.857143	0.571429	0.0	0.875

This table analyses the final results of the classifier and also discuss the other evaluation measurement, precision, recall, and f1-score against the targeted variable.

XIII. DISCUSSION

The main goal of this research is to discover and examine the food habits or diet plans after being diagnosed with breast cancer. The study of patients is constructed on different features i.e., patients who have addicted the alcohol and smoking, how much like fast food, how many patients are eaten natural food and how was the age, height, weight of the patients, etc. The investigation of

patients' behaviour towards food after diagnosed the breast cancer is a time-honoured job in the area of Machine Learning. The extraordinary contributions in multiple applications and extremely challenging for machines. In the past, many studies are held on breast cancer, but most of the studies are focused on the diagnosis the breast cancer our research focuses on the food habits daily, weekly, and monthly meal activities. The previous studies analysed food habits using Statistical techniques but in our proposed study we used different Machine Learning techniques. The literature review chapter explicates the detail of breast cancer patients' analysis. Patient reviews or feedbacks are a very important part of this type of analysis.

It helps to control or examine the factors of breast cancer, and also helps to find the risk factors of cancer. To predict, assess, progress, and investigate the patient's diet plan, our requirement is a standard and superior standard data set. To fulfil this requirement, we contacted with different medical institutes for data sets, but we can't find a solution. Then we find a standard data set of Shaukat Khanum Medical institute breast cancer patients. Our final data set is based on 200 patients' feedback. After gathering the data set, the key subject is selecting the target variable and splitting the data. After analysing the complete data set, the data set is prepared for post-processing. The total quantity of pre-processed corpus is 200 reviews of cancer patients. In the end, the tricky task is to develop the Machine Learning model. We used eight different ML algorithms which include ADA Boost, Gradient Boost, Logistic Regression, Decision Tree, Support Vector Machine, Perceptron, Multi-Layer Perceptron, Random Forest, and K-Nearest Neighbour to assess the food habits of breast cancer patients.

To assess the performance of the patient's behaviour or ingesting of fast food, vegetables fruits, dairy products, Meat, natural food, etc. In the proposed Machine Learning model four evaluation measures are used accuracy, precision, recall, and F1-measure. After implementing the ML technique, the ADA Boost classifier gain the highest accuracy (Accuracy = 87.5%, F1-measure = 0.9545454) and GB gained the lowest results (Accuracy = 52.5%) on final data set. One of the greatest things of this research is expressing the patient's behaviour, analysing the diet plan of cancer patients, checking the routine of food, and finding the risk factors of breast cancer.

XIII. FUTURE WORK

While carrying out this study we also marked some other occasions that this research can be additional extended:

- The size of our advanced data set is not huge. So, the data size can be maximized in the future to progress toward more optimum analysis of the food habits of breast cancer

patients.

- The development of ML and Deep learning-based techniques for our proposed dataset will improve the results and analyse the patient's behaviour.
- We can apply frequent manual collections of patient review-based approaches to expand the results.

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