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PREDICTION OF BREAST CANCER USING SIMPLE MACHINE LEARNING ALGORITHMS

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ABSTRACT:

Breast cancer is one of the most common and life-threatening diseases affecting women worldwide. Early detection plays a crucial role in increasing survival rates and reducing treatment costs. However, traditional diagnostic procedures are time-consuming and largely dependent on the expertise of medical specialists. This study aims to assist healthcare professionals in diagnosing breast cancer by predicting tumor characteristics using basic machine learning techniques. Clinical data are utilized to classify tumors as either benign or malignant. Machine learning algorithms such as K-Nearest Neighbors (KNN), Support Vector Machine (SVM), and Logistic Regression are applied to the dataset. The models are developed, trained, and evaluated using Python and standard machine learning libraries. The proposed approach enables early detection and supports clinical decision-making by providing accurate, efficient, and reliable predictions.

KEYWORDS

Breast Cancer Prediction, Machine Learning, Classification, Medical Diagnosis, Logistic Regression, SVM, KNN

INTRODUCTION

Breast cancer is a major health concern and one of the leading causes of death among women worldwide. Early diagnosis significantly improves survival rates and

treatment outcomes. With the rapid growth of medical data, the accuracy and efficiency of traditional diagnostic methods are increasingly being challenged. Machine learning offers effective techniques for analyzing large datasets and identifying hidden patterns within complex data. This study focuses on predicting breast cancer based on tumor characteristics using basic machine learning approaches. Learning Ologies such as Python, NumPy, Pandas, and Scikit-learn are utilized for data preprocessing and model development. The manual diagnostic process is transformed into an automated classification task, where supervised learning algorithms determine whether a tumor is benign or malignant. The primary objective of this project is to support healthcare professionals by providing a fast, accurate, and cost-effective diagnostic solution.

LITERATURE SURVEY

Smith et al. (2019) proposed a breast cancer prediction system using Logistic Regression and achieved satisfactory accuracy on clinical datasets. Ahmad and Khan (2020) explored Support Vector Machines for cancer classification and highlighted their robustness in handling high-dimensional data. Patel et al. (2021) implemented K-Nearest Neighbor algorithms to classify breast tumors and reported improved sensitivity. These studies emphasize the importance of machine learning in medical diagnosis. Most researchers used the Wisconsin Breast Cancer Dataset for experimentation. Their abstracts indicate that supervised learning techniques outperform traditional methods. However, issues such as overfitting and model complexity still exist. The reviewed papers form the foundation for this project's approach.

RELATED WORK

Previous studies have demonstrated the effectiveness of machine learning techniques in the detection of breast cancer. Logistic Regression is widely used due to its simplicity, efficiency, and ease of interpretation. Support Vector Machines (SVM) achieve high classification accuracy by constructing optimal hyperplanes to separate data points. K-Nearest Neighbor (KNN) algorithms classify tumors based on similarity measures between instances. Most existing research emphasizes model optimization and feature selection to improve predictive performance. Python-based machine learning frameworks are commonly employed for implementation due to their flexibility and robustness. The reviewed

studies indicate that combining proper data preprocessing with basic classification algorithms yields reliable results. Building upon these findings, the present study compares multiple straightforward machine learning algorithms to evaluate their effectiveness in breast cancer prediction.

SYSTEMARCHITECTURE

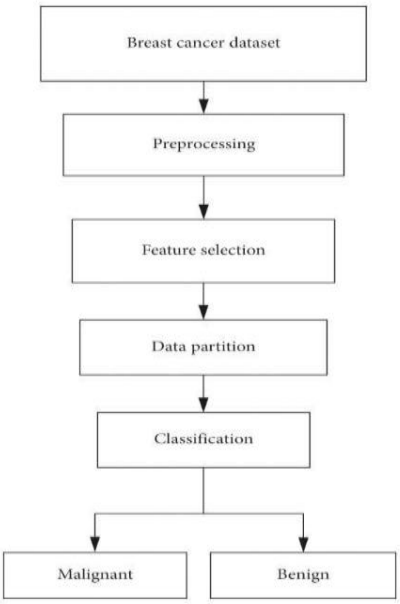

Fig 1: Architecture of the college Intelligent Tourism Chatbot

METHODOLOGY DESCRIPTION:

1.Data Collection and Preprocessing:

The breast cancer dataset is obtained from a reliable and well-established source. Preprocessing is performed to remove irrelevant features and handle missing values. Data normalization techniques are applied to ensure uniform feature scaling and to improve overall model performance.

2.Feature Selection and Dataset Splitting:

Relevant features that significantly influence

Breast cancer prediction are selected to enhance classification accuracy. The processed dataset is then divided into training and testing subsets to ensure unbiased and reliable model evaluation.

3.Model Selection and Training:

Basic machine learning algorithms, including K-Nearest Neighbours (KNN), Support Vector Machine (SVM), and Logistic Regression, are selected for this study. These models are trained using the training dataset to learn patterns associated with benign and malignant tumors.

Model Testing and Performance Evaluation:

The trained models are evaluated using unseen test data. Performance metrics such as accuracy, precision, recall, and the confusion matrix are calculated to assess and compare the effectiveness of each algorithm.

Prediction and Result Analysis:

The model demonstrating the highest performance is selected for final prediction. The results are analyzed to determine whether tumors are benign or malignant, thereby validating the effectiveness and reliability of the proposed machine learning approach.

RESULTS AND DISCUSSIONS

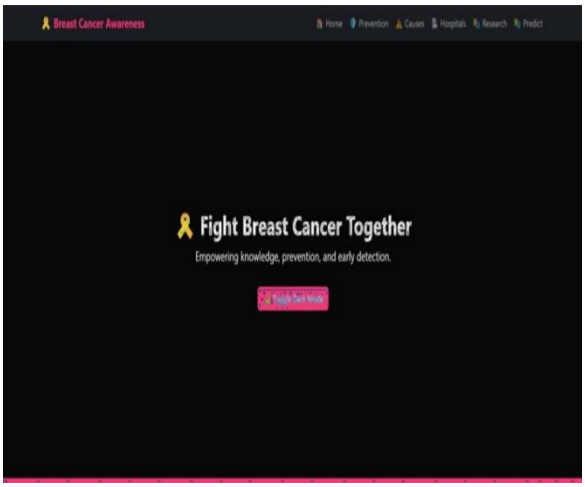

Fig.1: Prediction of breast cancer

Enter the mean radius mean area mean perimeter, mean texture and Click on Predict Quality.

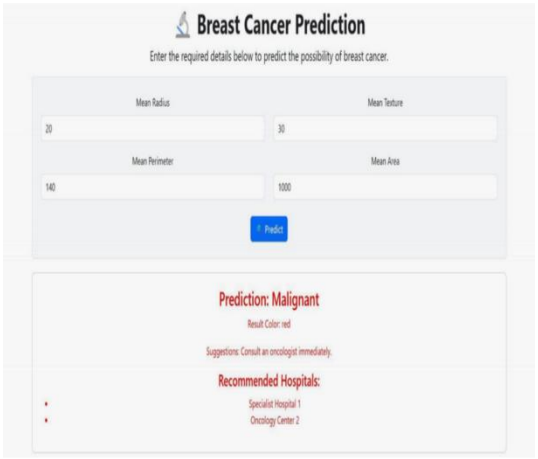

Fig 2: Breast cancer Prediction results

Here, the prediction is declared as Malignant, color as red,suggestions,and recommended hospitals.

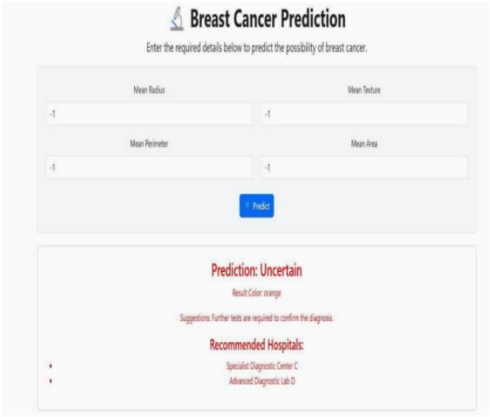

Fig 3: The prediction of breast cancer enters all the values as negative values

CONCLUSION AND FUTURE ENHANCEMENT

Simple machine learning techniques have shown considerable potential in enhancing early detection and improving patient

outcomes in breast cancer diagnosis. By analyzing medical data such as patient demographics and histopathological features, algorithms including Logistic Regression and Support Vector Machines can effectively predict the likelihood of breast cancer. These straightforward methods are particularly valuable in clinical decision making, as they are easy to implement and produce results that are highly interpretable. Although more complex models may achieve higher accuracy, simpler algorithms remain highly effective, especially in situations requiring rapid decision-making or when computational resources are limited.

FUTURE ENHANCEMENT

The proposed breast cancer prediction system can be further enhanced by integrating advanced machine learning and deep learning techniques such as Artificial Neural Networks (ANN) and Convolutional Neural Networks (CNN) to improve predictive accuracy. Incorporating larger and more diverse real-time medical datasets collected from hospitals would enable the model to generalize more effectively across different patient populations. Additionally, automated feature extraction and dimensionality reduction techniques, including Principal Component Analysis (PCA), can be applied to improve computational efficiency and model performance.

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