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A SURVEY ON HYPERTENSION PREDICTION USING IMAGE PROCESSING

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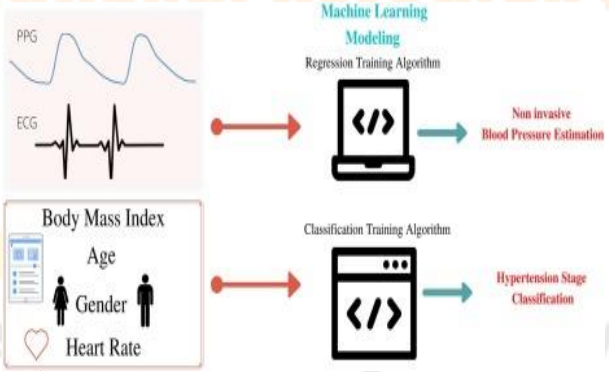
Abstract: Pulmonary hypertension is another name for hypertension. The blood vessels are impacted by this illness. They result from the blood arteries becoming clotted, scarred, or inflamed. This illness primarily affects the body's sensitive areas. By foreseeing the hypertension via image processing. The forehead, cheeks, and nose were three areas of the complexion that were determined using face landmarks that were automatically discovered using image processing techniques. The "Facial Complexion Variables" are employed. The analysis of the relationship between hypertension and certain color variables is done using "Logistic Regression." In various analysis, the A* (green-red) complexion factors were found to be significant predictors across all facial regions for both sexes. Women's L* (lightness) variables emerged as the most reliable predictors after age and body mass index were taken into account.

IndexTerms - blood pressure, Prediction Modules, Logistic Regression, Complex facial variables, Chronic Disease styling, insert.

I. INTRODUCTION

Hypertension has been a persistent worldwide health issue among adults. The high prevalence of hypertension in various countries and regions had been widely reported within last few years in adults. Hypertension also referred to as high blood pressure, is a condition in which the arteries have persistently elevated blood pressure. Blood pressure is the force of blood pushing up against the blood vessel walls. The higher the pressure the harder the heart has to pump.

Blood pressure is the measurement of the pressure or force of blood pushing against blood vessel walls. When you have hypertension (high blood pressure), it means the pressure against the blood vessel walls in your body is consistently too high. High blood pressure is often called the “silent killer” because you may not be aware that anything is wrong, but the damage is still occurring within your body.



Your blood pressure reading has two numbers. The top number is the systolic blood pressure, which measures the pressure on the blood vessel walls when your heart beats or contracts. The bottom number is the diastolic blood pressure, which measures the pressure on your blood vessels between beats when your heart is relaxing.

By foreseeing the hypertension via Machine Learning. We use to collect the data-set related to hypertension. We used to trained and tested by using the various machine learning algorithms like K-Nearest Neighbors (KNN), Logistic Regression, support vector machine (SVM), XGBoost, Decision tree, Random Forest algorithms for the prediction of hypertension.

Finally, we used to observe the accuracies of the all the algorithms for the hypertension prediction. If the accuracies of any algorithm are high hence we conclude that the algorithm is more suitable for the hypertension prediction.

II. RELATED WORK

Adults hypertension has been a persistent global health problem. Adults' high incidence of hypertension has been widely reported over the past few years in many different nations and areas. Hypertension, commonly known as high blood pressure, is a disorder when the blood pressure in the arteries remains consistently higher.

Elevated blood pressure, often known as hypertension, is a serious medical condition that dramatically raises the risk of kidney, heart, and other disorders. Worldwide, 1.28 billion persons between the ages of 30 and 79 are believed to have hypertension, with two thirds of them residing in low- and middle-income nations. Adults with hypertension are reportedly 46% less likely to be aware of their condition. Adults with hypertension are only diagnosed and treated in 42% of cases. About one in five (21%) persons with hypertension has observed.

Zhentao Liu is reviews A four-layer system framework is created for the proposed FEER-HRI system, which is based on facial expression emotion recognition. The FEERHRI system gives robots the ability to create facial expressions in order to respond to human emotions in addition to recognizing human emotions. We describe a method for real-time facial emotion recognition for robots based on 2D-Gabor, the uniform local binary pattern (LBP) operator, and the multiclass extreme learning machine (ELM) classifier. Robotic facial expressions are exhibited on an LED screen that is built into the robots and are represented by straightforward cartoon symbols that are understandable to humans. In the human-robot interaction experiment, four scenarios are run, including guidance, entertainment, home service, and scene simulation.

W. H Organization at the Global brief on hypertension, released in honour of World Health Day 2013, explains why hypertension is a global public health concern in the early 21st century. It explains how high blood pressure increases the risk of heart disease, stroke, renal failure, early mortality, and disability. The document also outlines how treating and preventing hypertension are both possible, as well as how families, communities, businesses, and governments may work together to lessen the effects of hypertension.

F. D. Fuchs review on his Fragmented research has obscured the full picture of cardiovascular disease causes (CVD). High blood pressure (BP) is one of the risk factors for CVD that is associated with the highest evidence for causation and has a high exposure prevalence. In research and clinical practise, normal blood pressure levels have often been described as being far higher than what is considered to be biologically normal. We suggest that a right-sided change in the population's distribution of BP is what predominantly contributes to CVD. Our belief that high blood pressure is the main risk factor for cardiovascular disease is supported by theoretical hypotheses that have been put to the test in observational studies and clinical trials. Large cohort studies have shown that, in addition to coronary heart disease and stroke, high blood pressure is a significant risk factor for heart failure, atrial fibrillation, chronic renal disease, heart valve disorders, aortic syndromes, and dementia. As lower values for normal blood pressure have been used more frequently in multivariate modeling, the supposed attributable risk of high blood pressure for stroke and coronary heart disease has gradually grown. An almost exact match between the benefit of BP-lowering randomised controlled trials and that which was anticipated from BP risk linkages in cohort studies has been shown. Together with intensive treatment of established hypertension, prevention of age-related increases in blood pressure would greatly lessen the vascular effects often associated with ageing and eliminate a significant fraction of the burden of BP-related disease in the population.

C.EI-Hajj is review on High blood pressure, often known as hypertension, is a leading cause of death worldwide and a significant risk factor for developing catastrophic illnesses, such as cardiovascular conditions including stroke and heart failure. For the early detection, prevention, and treatment of cardiovascular illnesses, blood pressure must be regularly monitored. Both invasive and cuff-based traditional blood pressure measuring methods are unreliable, inconvenient, and uncomfortable for patients. In an effort to use photoplethysmogram (PPG) to estimate blood pressure, a number of indirect methods have been studied over the past few decades. These include pulse transit time, pulse wave velocity, pulse arrival time, and pulse wave analysis. Recent developments in signal processing methods, such as machine learning and artificial intelligence, have also unlocked fascinating new possibilities for PPG-based continuous blood pressure monitoring. Such a device will significantly and fundamentally change how patients' vital signs are tracked, especially those who are at high risk of cardiovascular disease. In-depth information about the problems and limitations of non-invasive, cuff-free PPG blood pressure estimation is provided in this work.

A. Using K-Nearest Neighbors (KNN)

The supervised machine learning technique known as the k-nearest neighbours (KNN) can be used to tackle classification and regression issues. It is simple to use and comprehend, but it has the important problem of becoming noticeably slower as the amount of data in use increases.

KNN finds the distances between a query and each example in the data, chooses the K examples closest to the query, and then, in the case of classification, votes for the label with the highest frequency or averages the labels (in the case of regression).

Regardless of where we got our data, there can be some issues with it that need fixing before we can use the KNN method. The data might not be in the format that the algorithm requires, for instance, or it could include missing values that we need add or remove before passing the data to the algorithm.

Our KNN implementation uses structured data in the example above. It must be laid forth in a tabular manner. The method further assumes that all columns in our data set have numerical information and that the last column of our data contains labels that can be used for certain functions. We must therefore make our data, from wherever it came, comply with these restrictions.

B. By Logistic Regression

Regardless of where we got our data, it can have certain flaws that we need to fix in order to get it ready for the KNN algorithm. For instance, the data might not be in the format that the algorithm requires, or there might be blank spaces in the data that we should fill in or eliminate before passing it along to the algorithm.

Structured data is used in the aforementioned KNN implementation. It must be organized in a table. The method also presupposes that all columns of our data have numerical data and that the last column of our data has labels that we may manipulate. Therefore, wherever source our data came from, it must adhere to these restrictions.

C. By relating supervised learning algorithm

One of the most well-liked supervised learning algorithms, Support Vector Machine, or SVM, is used to solve Classification and Regression problems. However, it is largely employed in Machine Learning Classification issues.

The SVM algorithm's objective is to establish the best line or decision boundary that can divide n-dimensional space into classes, allowing us to quickly classify fresh data points in the future. A hyper plane is the name given to this optimal decision boundary.

SVM selects the extreme vectors and points that aid in the creation of the hyper plane. Support vectors, which are used to represent these extreme instances, form the basis for the SVM method. Take a look at the diagram below, where two distinct categories are identified.

III. IMAGE PROCESSING VS MACHINE LEARNING

Image processing is a technique for applying operations to an image to enhance or extract information from it. There are many uses for digital image processing, including picture restoration, medical imaging, remote sensing, image segmentation, etc. Different techniques are required for each step. They are various image processing methods for machine learning will be covered.

Image restoration

An image might deteriorate for a variety of causes. For instance, an old photograph of your grandparents taken with an antiquated camera may become fuzzy or lose its original shape.

This could occur if the image experiences physical stress, or it might happen if the image is in digital form and suffers from motion blur or additive noise.So, how do you intend to repair it? Perhaps fifty years ago that wasn't conceivable, but today it is.

Researchers developed a degradation model that can reverse the effects of deterioration on the input image. When used in convolution with a linear shift-invariant, the degradation model operates.

Therefore, we take two images: one before degradation, referred to as the "True Image," and one after degradation, referred to as true image.

Linear filtering

When using linear filtering, the neighboring input pixels are combined linearly to get the value of the output pixel. A procedure known as convolution is used to carry out this process. Convolution is the process of adding each image component to its nearby neighbours while using the kernel's weighting. A kernel with an anchor point is present, as well as an input picture. This effect overlays the image like a sliding window. We take the sum after multiplying each pixel by its matching kernel. A new pixel is created in the final image using that total.

Independent componet analayis

A method for identifying the underlying components of a multivariate signal is known as independent component analysis, or ICA. Using ICA, the required component can be extracted from a signal or component combination. We "Whiten" our signal in ICA. Accordingly, a given will be changed so that any potential correlations between its components are eliminated and the variance of each component is set to 1.

IV. DATA SOURCE FOR MACHINE LEARNING

Supervised Learning

Machines are educated using appropriately "labeled" training data, and then utilizing that data to anticipate the output, is known as supervised learning. The term "labeled data" refers to input data that has already been assigned the appropriate output.

In supervised learning, the training data that is given to the computers serves as the supervisor, instructing them on how to correctly predict the output. It employs the same idea that a pupil would learn under a teacher's guidance.

The method of supervised learning involves giving the machine learning model the right input data as well as the output data. Finding a mapping function to link the input variable (x) with the output variable is the goal of a supervised learning algorithm (y).

Unsupervised Learning

Because unlike supervised learning, we have the input data but no corresponding output data, unsupervised learning cannot be used to solve a regression or classification problem directly. Finding the underlying structure of a dataset, classifying the data into groups based on similarities, and representing the dataset in a compressed format are the objectives of unsupervised learning.

- Finding relevant insights from the data can be aided through unsupervised learning.
- Unsupervised learning is far more like how a human learns to think through personal experience, which brings it closer to the true AI.
- Unsupervised learning is more significant because it operates on unlabeled and uncategorized data.
- In the actual world, we don't always have input data with the corresponding output, hence unsupervised learning is necessary to address these situations.

Reinforcement Learning

Machine learning includes the discipline of reinforcement learning. It involves acting appropriately to maximize reward in a certain circumstance.

It is used by a variety of programmers and machines to determine the optimal course of action to pursue in a given circumstance. There is no answer in reinforcement learning, but the reinforcement agent selects what to do to complete the job. This is different from supervised learning, where the training data includes the answer key and the model is trained with the correct response. Without a training dataset, it will inevitably gain experience.

V. ALGORITHMS USED FOR PROCESS HYPERTENSION COMPENDIUM

Support Vector Machine (Svm)

One of the most well liked supervised learning algorithms, Support Vector Machine, or SVM, is used to solve Classification and Regression problems. However, it is largely employed in Machine Learning Classification issues. The SVM algorithm's objective is to establish the best line or decision boundary that can divide n-dimensional space into classes, allowing us to quickly classify fresh data points in the future. A hyper plane is the name given to this optimal decision boundary. SVM selects the extreme vectors and points that aid in the creation of the hyper plane. Support vectors are the phrase for these extreme circumstances, and as a result, Support Vector Machine is the name of the algorithm. Strong yet adaptable supervised machine learning methods called support vector machines (SVMs) are employed in for regression and classification. However, they are typically employed in classification issues. SVMs were initially introduced in the 1960s, but around 1990 they underwent further development. SVMs are implemented in a different way than other machine learning algorithms. They have recently gained a lot of popularity thanks to their capacity to handle numerous continuous and categorical variables.

Decision Tree Algorithm

A decision tree, as a classification method, is more commonly used in medical diagnostic protocols. Although it may be used to solve classification and regression problems, Decision Tree is a Supervised learning technique that is typically used for classification problems. It is a tree-structured classifier, where internal nodes stand in for a dataset's features, branches for the decision-making process, and each leaf node for the classification result. The Decision Node and Leaf Node are the two nodes of a decision tree.

While Leaf nodes are the results of decisions and do not have any more branches, Decision nodes are used to create decisions and have numerous branches. The given dataset's features are used to execute the test or make the decisions. It is a graphical display for obtaining all the potential answers to a decision or problem based on the circumstances. It is known as a decision tree because, like a tree, it begins with the root node and grows on subsequent branches to form a structure resembling a tree. The CART algorithm, which stands for Classification and Regression Tree algorithm, is used to construct a tree. A decision tree only poses a question and divides the tree into subtrees depending on the response (Yes/No).

XGBOOST

Gradient Boosted decision trees are implemented using the XG-boost algorithm. It is a kind of software library that was primarily created to increase model performance and speed. Decision trees are generated sequentially in this approach. Weights are significant in XG-boost. Each independent variable is given a weight before being fed into the decision tree that forecasts outcomes. Increased weight is applied to factors that the tree incorrectly anticipated, and these variables are subsequently fed into the second decision tree. Then, these distinct classifiers and predictors are combined to produce a robust and accurate model. It can be used for user-defined predict, classification, ranking, and regression.

Regularization: To prevent overfitting, XG-boost has built-in L1 (Lasso Regression) and L2 (Ridge Regression) regularization. Due to this, XG-boost is also referred to as a regularised form of GBM (Gradient Boosting Machine). Using the Scikit Learn module, we give the regularisation algorithm XG-boost two hyper-parameters (alpha and lambda). For L1 regularisation, alpha is utilised, while for L2 regularisation, lambda.

CONCLUSION

ML was utilized to generate a decision tree that was helpful in the prediction of hypertension. Using predictive models to identify potential hypertensive people have several real-world implications, including tailoring preventive solutions to those at high risk of developing hypertension. As explained along with the present work, some clinical and socio-demographic variables such as age, BMI, heart rate, and gender have some degree of correlation with hypertension and its different stages.

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