Tech Saksham

Capstone Project Report

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FUNDAMENTALS

“Project Name”: Heart disease prediction

“College Name” : Anna University Regional Campus-Tirunelveli

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ABSTRACT

The health care industries collect huge amounts of data that contain some hidden information, which is useful for making effective decisions. For providing appropriate results and making effective decisions on data, some advanced data mining techniques are used. In this study, a Heart Disease Prediction System (HDPS) is developed using Naives Bayes and Decision Tree algorithms for predicting the risk level of heart disease. The system uses 15 medical parameters such as age, sex, blood pressure, cholesterol, and obesity for prediction. The HDPS predicts the likelihood of patients getting heart disease. It enables significant knowledge. E.g. Relationships between medical factors related to heart disease and patterns, to be established. We have employed the multilayer perceptron neural network with backpropagation as the training algorithm. The obtained results have illustrated that the designed diagnostic system can effectively predict the risk level of heart diseases.

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INTRODUCTION

1.1 Problem Statement :Heart disease can be managed effectively with a combination of lifestyle changes, medicine and, in some cases, surgery

1.2 Proposed Solution : To predict the heart attack disease. It helps in reducing treatment costs by providing effective treatments. To find the parameters values in prediction like accuracy ,elapsed time and energy consumption.

1.3 Feature *Age**: Age is a crucial factor. As individuals get older, their risk of heart disease tends to increase[6].

Blood Pressure (Diastolic)**: High diastolic blood pressure is associated with heart issues[6].

Diabetes: Diabetic individuals are at higher risk of heart disease[6]

1.4 Advantages : Increased Accuracy**: Machine learning models can enhance the accuracy of heart disease diagnosis. By analyzing large datasets, these models can identify patterns and risk factors more effectively than traditional methods[4].

Reduced Time Complexity**: Machine learning algorithms can handle enormous amounts of data efficiently. By automating certain aspects of diagnosis, they ease the burden on healthcare professionals and reduce the time complexity of decision-making[4].

Scope : *Data Insight**: Researchers work with heart disease detection datasets, extracting meaningful insights. These insights help understand the weightage of each feature and their interrelationships[1].

2. **Exploratory Data Analysis (EDA)**: EDA is a pivotal step in obtaining meaningful results. It involves exploring data patterns, distributions, and correlations to inform subsequent modeling[1].

1.4 Future Work : Precision Medicine**: Future approaches to predicting heart disease will likely rely more on **precision medicine**. This concept involves tailoring **medical care, including prevention strategies.**

CHAPTER 2

2 SERVICES AND TOOLS REQUIRED

2.1 Services Used

Researchers evaluate the effectiveness of heart disease prediction models using metrics such as:

- **Accuracy**: Measures the proportion of correctly predicted cases.
- **Precision**: Indicates the ratio of true positive predictions to all positive predictions.
- **F1-Score**: Combines precision and recall to assess model performance.

2.2 Tools and Software used

*Machine Learning Models**:

- Researchers employ various machine learning algorithms to predict heart disease. Some popular ones include:
  - **Random Forest**: A powerful ensemble learning method that combines multiple decision trees to improve accuracy.
  - **Logistic Regression**: A simple yet effective model for binary classification.
  - **Naïve Bayes**: Based on Bayes' theorem, it's commonly used for medical diagnosis.
  - **Decision Trees**: These hierarchical structures help classify patients based on attribute values.
- **Deep Learning Techniques**:
  - **Neural Networks**: These artificial neural networks can learn complex patterns from data.
  - **Convolutional Neural Networks (CNN)**: Especially useful for image-based heart disease prediction.
  - **Recurrent Neural Networks (RNN)**: Suitable for sequential data, such as time-series heart rate measurements.

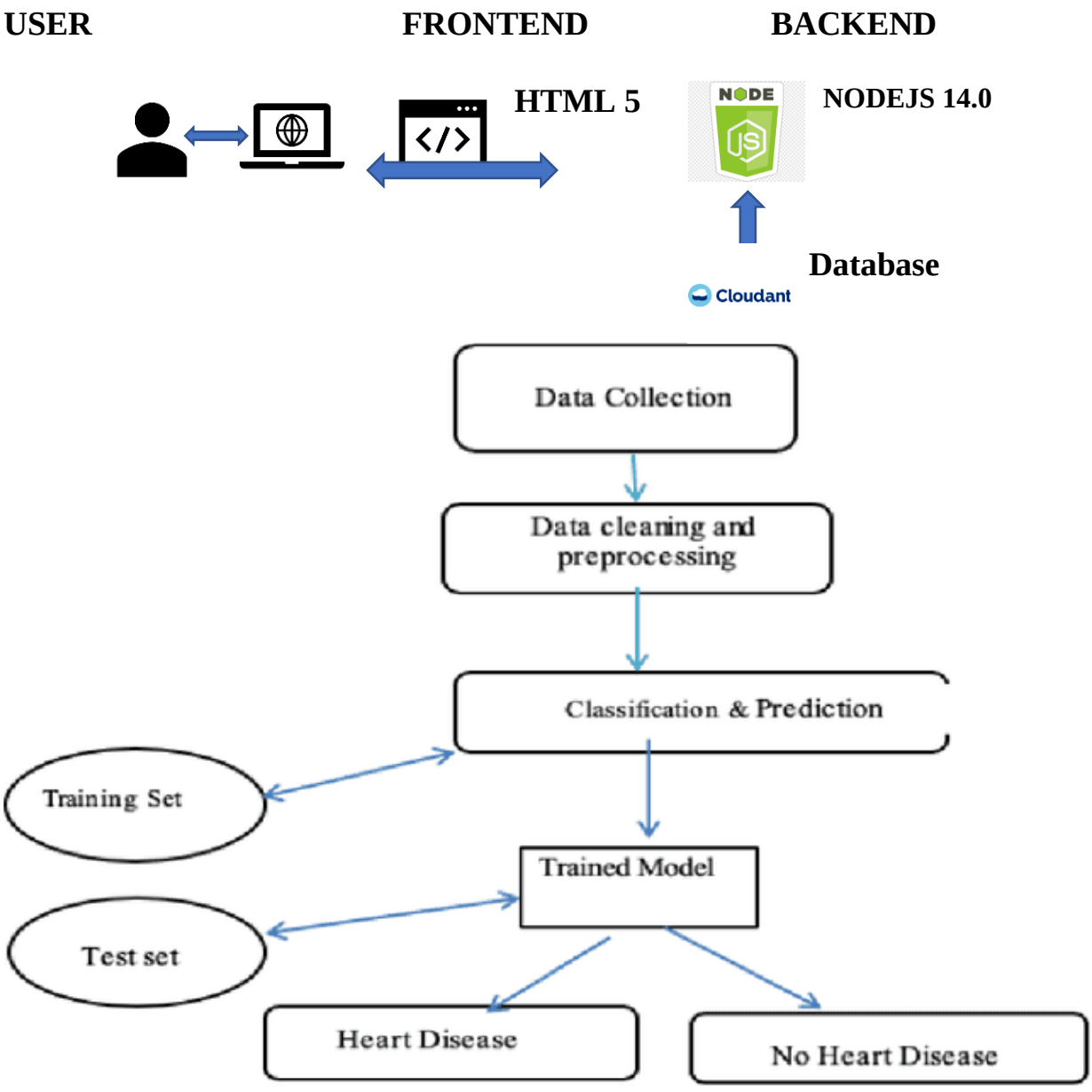
2. **Datasets**:

- Researchers use various datasets containing patient information, including attributes like blood pressure, cholesterol levels, and heart rate.
- Common datasets include the **Cleveland dataset** and data from **IEEE Dataport**.

CHAPTER 3

PROJECT ARCHITECTURE

3.1 Architecture



CHAPTER 4

PROJECT OUTCOME

```
from sklearn.neighbors import KNeighborsClassifier
knn = KNeighborsClassifier().fit(X_train, y_train)
knn.score(X_train, y_train)
```

output : 0.9199291516521102

```
from sklearn.metrics import confusion_matrix
prediction=rf.predict(X_train)
prediction
confusion_matrix=confusion_matrix(y_train,prediction)
confusion_matrix
```

output : array([[14891, 3],
[11, 1468]])

```
from sklearn.linear_model import LogisticRegression
accuracies={}
lr=LogisticRegression()
lr.fit(x_train.T,y_train.T)
acc=lr.score(x_train.T,y_train.T)*100
print('Test accuracy {:.2f}%'.format(acc))

test accuracy 90.91%
```

CONCLUSION 5/9

Correlation-based Feature Subset Selection method with the Best First Search has been carried out to select the most significant features. It has been discovered that all of the features are not strongly connected and that a combination of just 14 features (age, gender, smoking, obesity, diet, physical activity, stress, chest pain type, previous chest pain, blood pressure diastolic, diabetes, troponin, ECG, and target) significantly contribute to the prediction of heart disease. Finally, the datasets containing his research has provided a comprehensive study of patient characteristics for heart all features and selected features are used to develop seven AI (logistic regression, Naïve Bayes, K-NN, SVM, decision tree, random forest, and MLP) methods

FUTURE SCOPE

Precision Medicine**: Future approaches to predicting heart disease will likely rely more on **precision medicine**. This concept involves tailoring medical care, including prevention strategies, to individual differences in people's genes, environments, and lifestyles[2].

collaboration and Research**: Collaboration between researchers, clinicians, and data scientists is essential. Continued research, validation, and refinement of prediction models will drive progress in heart disease prevention and management.

. **Real-Time Monitoring**: Real-time monitoring of physiological parameters can alert healthcare providers to potential heart disease risks. Continuous monitoring using wearable devices and smart health applications will enable timely interventions.

REFERENCES

Heart Disease Prediction System

Research Proposal · March 2019

Heart disease prediction using machine learning algorithms

To cite this article: Harshit Jindal et al 2021 IOP Conf. Ser.: Mater. Sci. Eng. 1022 012072

Please Provide Code through Git Hub Repo Link

https://github.com/au950021135042/NM-Project-AI-AND-ML-.git

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THANK YOU