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ANALYSIS OF HEART ATTACK PREDICTION USING VARIOUS PARAMETERS

Nuthan AC*1, Bhoomika HR*2

*1Associate Professor And HOD, Department Of E & C, GMIT, India.

*2Student, Department Of E & C, GMIT, India.

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ABSTRACT

Heart attack is one of the most heinous attacks, especially the silent heart attack, which attacks a person so abruptly that there's no time to get it treated and such attack is very difficult to be diagnosed. The number of specialist doctors and an increase in wrong diagnosed cases have necessitated the need for building an efficient heart attack detection system. Various medical data mining and machine learning techniques are being implemented to extract valuable information regarding heart attack prediction. Yet, the accuracy of the desired results is not satisfactory. In this project, we propose a heart attack prediction system using Deep learning techniques, specifically Recurrent Neural Network to predict the likely possibilities of heart-related attacks of the patient. Recurrent Neural Network is a very powerful classification algorithm that makes use of the Deep Learning approach in Artificial Neural Network. The project discusses in detail the major modules of the system along with the related theory. The proposed model incorporates deep learning and data mining to provide accurate results with minimum errors. This project provides a direction and precedent for the development of a new breed of heart attack prediction platform.

Keywords: Data Mining, Machine Learning, HTML, CSS, Python, Tenser Flow, Open CV.

I. INTRODUCTION

Heart attacks are one of the highest-flying attacks of the modern world. According to a survey, about more than 17.7 million deaths occur all across the world annually due to heart attacks. Of these deaths, an estimated due to coronary heart attack and 6.7 million were due to stroke. Heart Attacks are one of the deadliest attacks which can knock one down at any point in time without any invitation and silent heart attacks are something which most doctors are not able to predict. The more number of specialists and increasing wrong diagnosed cases have necessitated the need for building an efficient Heart attack prediction system. This has led to research and development of new medical data mining techniques and various machine learning techniques. The main objective of this work is to identify the key patterns and features from the medical data using the classification algorithms and then to select the most relevant attributes for silent heart attack diagnosis. The use of a Recurrent Neural Network will further enhance the accuracy of the results. implementation of such an application is not unprecedented, the existing systems have drawbacks and do not aim at finding out the possibilities of silent heart attacks. This project aims to address these and propose the implementation of innovative features to develop a more comprehensive system.

II. LITERATURE SURVEY

The heart Attack(HA) has been considered as one of the complex and life deadliest human attacks in the world. In this attack, usually the heart is unable to push the required amount of blood to other parts of the body to fulfil the normal functionalities of the body, and due to this, ultimately the heart failure occurs [1]. The rate of heart attack in the United States is very high [2]. The symptoms of heart attack include shortness of breath, weakness of physical body, swollen feet, and fatigue with related signs, for example, elevated jugular venous pressure and peripheral edema caused by functional cardiac or noncardiac abnormalities [3]. The investigation techniques in early stages used to identify heart attack were complicated, and its resulting complexity is one of the major reasons that affect the standard of life [4]. The heart attack diagnosis and treatment are very complex, especially in the developing countries, due to the rare availability of diagnostic apparatus and shortage of physicians and others resources which affect proper prediction and treatment of heart patients [5]. The accurate and proper diagnosis of the heart attack risk in patients is necessary for reducing their associated

risks of severe heart issues and improving security of heart [6]. The European Society of Cardiology (ESC) reported that 26 million adults worldwide were diagnosed with heart attack and 3.6 million were diagnosed every year. Approximately 50% of heart attack people suffering from HD die within initial 1-2 years, and concerned costs of heart attack management are approximately 3% of health-care financial budget [7]. The invasive-based techniques to the diagnosing of heart attack are based on the analysis of the patient's medical history, physical examination report, and analysis of concerned symptoms by medical experts. All these techniques mostly cause imprecise diagnosis and often delay in the diagnosis results due to human errors. Moreover, it is more expensive and computationally complex and takes time in assessments [8]. In order to resolve these complexities in invasive-based diagnosing of heart attack, a non-invasive medical decision support system based on machine learning predictive models such as support vector machine (SVM), k-nearest neighbor (K-NN), artificial neural network (ANN), decision tree (DT), logistic regression (LR), AdaBoost (AB), Naive Bayes (NB), fuzzy logic (FL), and rough set [9, 10] has been developed by various researchers and widely used for heart attack diagnosis, and due to these machine-learning-based expert medical decision system, the ratio of heart attack death decreased [11]. Heart attack diagnosis through the machine-learning-based system has been reported in various research studies. The classification performance of different machine learning algorithms on Cleveland heart attack dataset has been reported in the literature review. Cleveland heart attack dataset is online available on the University of California Irvine (UCI) data mining repository which was used by various researchers [12]. This is the dataset that has been used by various researchers for investigation of different classification issues related to the heart attacks through different machine learning classification algorithms. Detrano et al. [13] proposed a logistic regression classifier-based decision support system for heart attack classification and obtained a classification accuracy of 77%. The Cleveland dataset used [14] with global evolutionary approaches and achieved high prediction performance in accuracy. The study used feature selection methods for selection of features. Therefore, the classification performance of the approach depends on selected features. Gudadhe et al. [15] used multilayer perceptron (MLP) and support vector machine algorithms for heart attack classification. They proposed classification system and obtained accuracy of 80.41%. Kahramanli and Allahverdi [16] designed a heart attack classification system used a hybrid technique in which a neural network integrates a fuzzy neural network and artificial neural network. And the proposed classification system achieved a classification accuracy of 87.4%. Palaniappan and Awang [17] designed an expert medical diagnosing heart attack system and applied machine learning techniques such as Naive Bayes, decision tree, and ANN in the system. The Naive Bayes predictive model obtained performance accuracy 86.12%. The second best predictive model was ANN which obtained an accuracy of 88.12%, and decision tree classifier achieved 80.4% with correct prediction. Olaniyi and Oyedotun [18] proposed a three-phase model based on the ANN to diagnose heart attack in angina and achieved a classification accuracy of 88.89%. Moreover, the proposed system could be easily deployed in healthcare information systems. [19] proposed an ANN ensemble-based predictive model that diagnoses the heart attack and used statistical analysis system enterprise miner 5.2 with the classification system and achieved 89.01% accuracy, 80.09% sensitivity, and 95.91% specificity. Jabbar et al. [20] designed a diagnostic system for heart attack and used machine learning classifier multilayer perceptron ANN-driven back propagation learning algorithm and feature selection algorithm. The proposed system gives excellent performance in terms of accuracy. In order to diagnose heart attack, an integrated decision support medical system based on ANN and Fuzzy AHP were designed by the authors in [12] which utilizes machine learning algorithm, artificial neural network, and Fuzzy analytical hierarchical processing. Their proposed classification system achieved a classification accuracy of 91.10%.

III. PROPOSED METHODOLOGY

The results generated have to be entered in to the system and any error or any value entered out of the boundary will not be understood by the system. In any case if the database crashes, the whole information collected and the results generated will be of no use.

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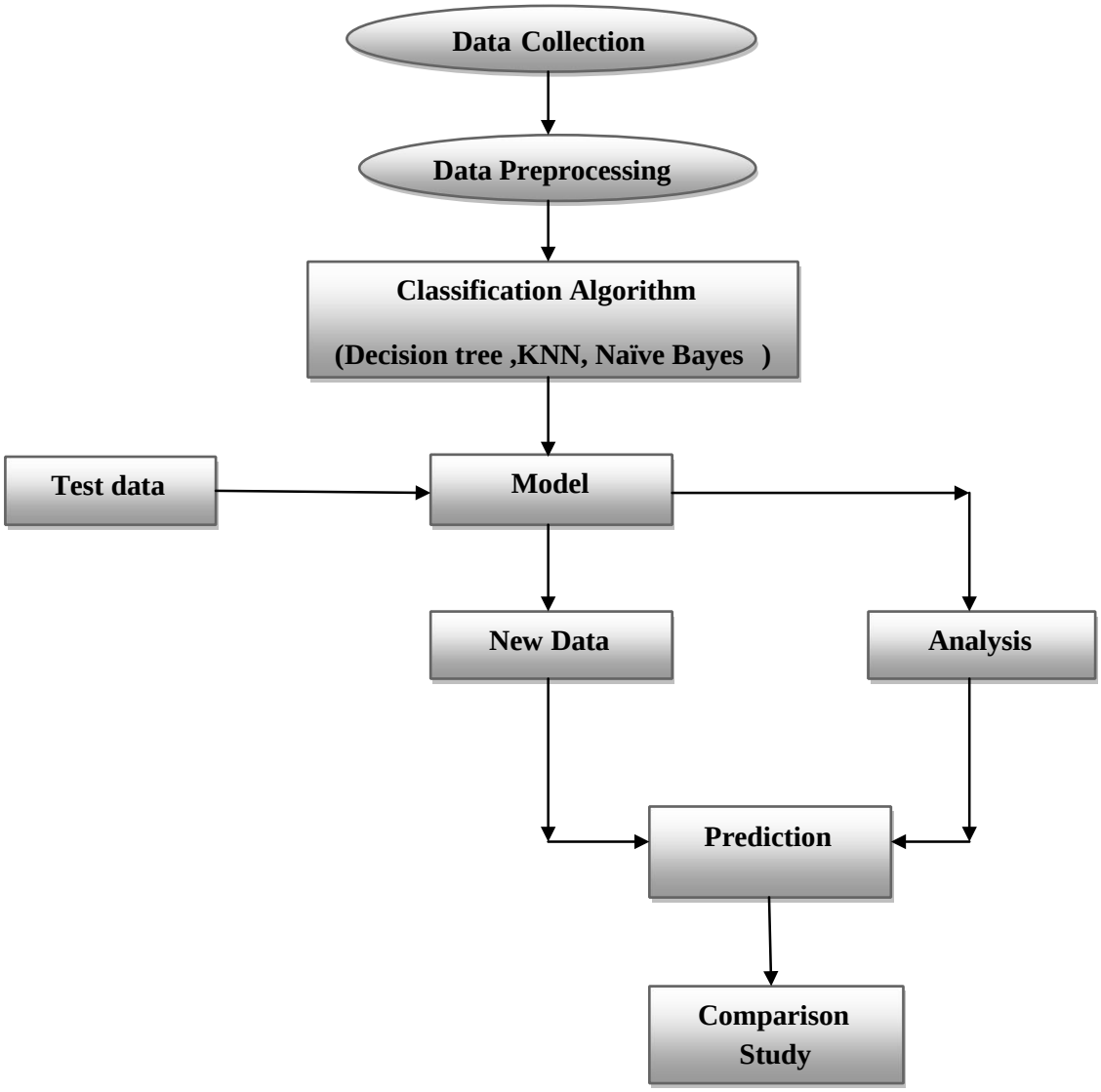

External Interface Requirements

This section provides a detailed description of all inputs into and outputs from the system. It also gives a description of the hardware, software and communication interfaces and provides basic prototypes of the user interface.

General Constraints: The results generated have to be entered in to the system and any error or an entered out of the boundary will not be understood by the system. In any case if the database crashes, the whole information collected and the results generated will be of no use.

Non-functional requirements

A non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. They are contrasted with functional requirements that define specific behavior or functions. The plan for implementing functional requirements is detailed in the system design. The plan for implementing non-functional requirements is detailed in the system architecture, because they are usually Architecturally Significant Requirement.

Accessibility: It refers to the design of products, devices, services, or environments for people who experience disabilities. The concept of accessible design and practice of accessible development ensure both "direct access" (i.e. unassisted) and "indirect access" meaning compatibility with a person's assistive technology.

a. Simplicity: The project is driven by a simple user interface.

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b. Availability: Availability of a system may also be increased by the strategy of focusing on increasing testability, diagnostics and maintainability and not on reliability. Improving maintainability during the early design phase is generally easier than reliability (and Testability & diagnostics). Maintainability estimates (item Repair by replacement rates) are also generally more accurate.
c. Reliability: The system should not crash and should identify invalid input and produce suitable error message.
d. Usability: The interface should be intuitive and easily navigable and user friendly.
e. Integrity: The software does not store any cache data or doesn‟t use system resources in background.
f. Authentication: Only authorized nodes can communicate with others.

IV. COMPONENTS REQUIRED

Software tools:

1. HTML:- The hypertext Markup Language or HTML is the standard markup language for documents designed to be displayed in a web browser. It can be assisted by technologies such as Cascading Style Sheets (CSS) and scripting languages such as JavaScript.

Web browsers receive HTML documents from a web server or from local storage and render the documents into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.

2. CSS: - Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language such as HTML or XML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript.

CSS is designed to enable the separation of presentation and content, including layout, colors, and fonts. This separation can improve content accessibility; provide more flexibility and control in the specification of presentation characteristics; enable multiple web pages to share formatting by specifying the relevant CSS in a separate .css file, which reduces complexity and repetition in the structural content; and enable the .css file to be cached to improve the page load speed between the pages that share the file and its formatting.

3. Python:- Python is a high-level, interpreted, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation.

Python is dynamically-typed and garbage-collected. It supports multiple programming paradigms, including structured, object-oriented and functional programming. It is often described as a "batteries included" language due to its comprehensive standard library.

4. Scikit learn :- Scikit-learn is a free software machine learning library for the python programming language. It features various classification, regression and clustering algorithms including support vector machines, random forests, gradient boosting, k-means and dbscan, and is designed to interoperate with the python numerical and scientific libraries numpy and scipy. Scikit-learn is largely written in python, and uses numpy extensively for high-performance linear algebra and array operations. Furthermore, some core algorithms are written in cython to improve performance. Support vector machines are implemented by a cython wrapper around libsvm; logistic regression and linear support vector machines by a similar wrapper around lib linear. In such cases, extending these methods with python may not be possible.

5. Tensor flow:- Tensorflow is a free and open-source software library for dataflow and differentiable programming across a range of tasks. It is a symbolic math library, and is also used for machine learning applications such as neural networks. It is used for both research and production at google. tensorflow is google brain's second-generation system. Version 1.0.0 was released on february 11, 2017. While the reference implementation runs on single devices, tensorflow can run on multiple cpus and gpus (with optional cuda and sycl extensions for general-purpose computing on graphics processing units). Tensorflow is available on 64-bit linux, macos, windows, and mobile computing platforms including android and ios.

6. Theano:- Theano is a python library and optimizing compiler for manipulating and evaluating mathematical expressions, especially matrix-valued ones. In theano, computations are expressed using a numpy-esque syntax and compiled to run efficiently on either cpu or gpu architectures.

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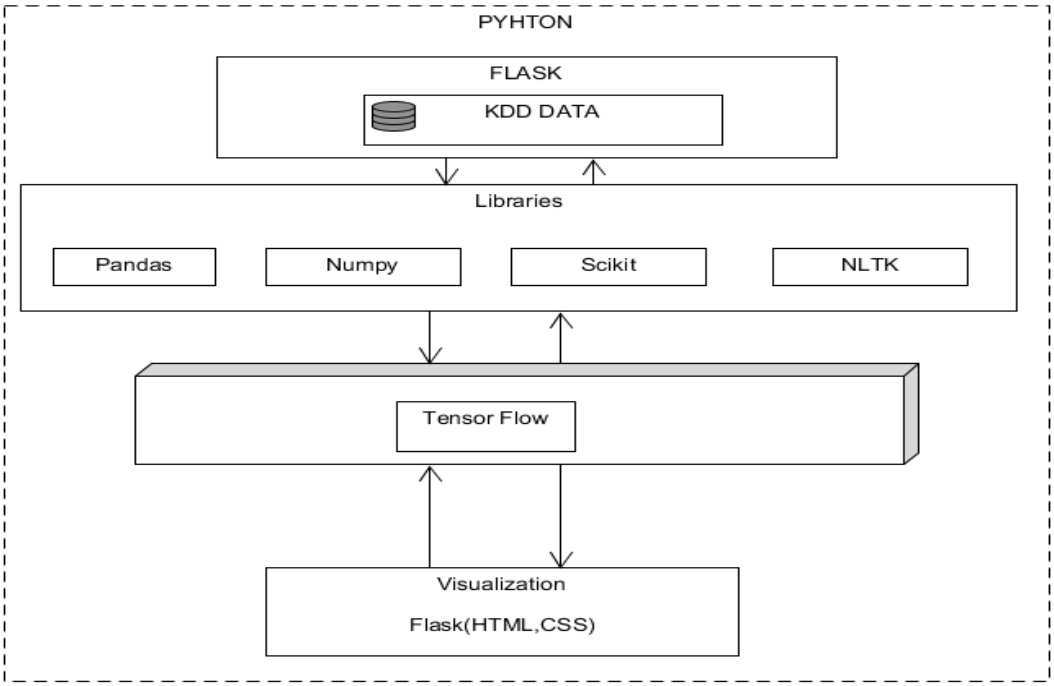
Theano is an open source project primarily developed by a montreal institute for learning algorithms (mila) at the université de montréal.

7. Numpy:- Numpy or sometimes /ˈnʌmpi/ (num-pee)) is a library for the python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays. The ancestor of numpy, numeric, was originally created by jim hugunin with contributions from several other developers. In 2005, travis oliphant created numpy by incorporating features of the competing numarray into numeric, with extensive modifications. Numpy is open-source software and has many contributors.

8. Pandas:- In computer programming, pandas is a software library written for the python programming language for data manipulation and analysis. In particular, it offers data structures and operations for manipulating numerical tables and time series. It is free software released under the three-clause bsd license.[2] the name is derived from the term "panel data", an econometrics term for data sets that include observations over multiple time periods for the same individuals

9.Opencv:- Opencv (open source computer vision) is a library of programming functions mainly aimed at real-time computer vision. Originally developed by intel, it was later supported by willow garage then itseez (which was later acquired by intel). The library is cross-platform and free for use under the open-source bsd license



V. RESULT

Test cases:-

Test Case	Test Purpose	Test condition	Expected outcome	Actual result	Pass or Fail
Load Data	Load heart attack data sets In CSV format.	If the data is not in the CSV format, shows error message	Load datasets	The data is loaded Successfully in CSV format	Pass
Pre-Process data	CSV data	If values are missing, or improper data	Preprocessing is done	As Expected	Pass
Prediction	Result obtained	FindPrediction Result	Attacks found	As Expected	Pass

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	from ANN				
KNN Algorithm	To get the analysis of heart attack data.	If the criteria do not match with dataset no result is obtained	Heat Attack prediction Status.	As Expected	Pass
Naïve Bayes Algorithm	To get the analysis of heart attack data.	If the criteria do not match with dataset no result is obtained.	Heat Attack prediction Status.	As Expected	Pass
Decision Tree Algorithm	To get the analysis of heart attack data.	If the criteria do not match with dataset no result is obtained.	Heat Attack prediction Status.	As Expected	Pass

VI. CONCLUSION

As we have been through number of projects and their papers and found different algorithms had different accuracy starting from ML algorithms to deep learning algorithms accuracy kept on increasing but we were not able to obtain good results for silent heart attack prediction. Hence after analysis we thought of using RNN and Sequential Layer to make the system more accurate and efficient to predict the silent heart attacks and inform the user at the earliest possible. This system has increased the heart attack prediction accuracy to 92% and has proved to be an excellent source in predicting silent heart attacks.

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