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Heart Disease Prediction using Machine Learning

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Abstract: ***Machine Learning allows us to automatically learn and improve from experience without being explicitly programmed. There are various applications providing a method of data analysis that automates analytical model building. Resurging interest in machine learning is due to the same factors that have made data mining and Bayesian analysis more popular than ever. Things like growing volumes and varieties of available data, computational processing that is cheaper and more powerful, and affordable data storage. All of these things mean it's possible to quickly and automatically produce models that can analyze bigger, more complex data and deliver faster, more accurate results – even on a very large scale. And by building precise models, an organization has a better chance of identifying profitable opportunities – or avoiding unknown risks.***

We need to advance more information to doctors so that they can make better decisions about patient diagnoses and treatment options while understanding the possible outcomes and costs for each. The value of machine learning in health care is its ability to process large datasets outside the scope of human capabilities, and then reliably transforms the analysis of the data into clinical insights that help doctors plan and provide care, which ultimately leads to better outcomes, costs lower than care, and increasing patient satisfaction.

Heart disease is one of the most critical human diseases in the world and affects human life very badly. In heart disease, the heart is unable to push the required amount of blood to other parts of the body. Accurate and on time diagnosis of heart disease is important for heart failure prevention and treatment. The diagnosis of heart disease through traditional medical history has been considered as not reliable in many aspects. To classify the healthy people and people with heart disease, noninvasive-based methods such as machine learning are reliable and efficient.

Keywords: Prediction, machine learning, heart disease, classify, reliable, efficient

I. INTRODUCTION

The heart disease (HD) has been considered as one of the complex and life deadliest human diseases in the world. In this disease, usually the heart is unable to push the required amount of blood to other parts of the body to fulfill the normal functionalities of the body, and due to this, ultimately the heart failure occurs.

In the proposed study, we developed a machine-learning-based diagnosis system for heart disease prediction by using heart disease dataset. we present a brief overview of ML methodologies that are used for the construction of inferential and predictive data-driven models. We highlight several domains of ML applications such as echocardiography, electrocardiography, and recently developed non-invasive imaging modalities such as coronary artery calcium scoring and coronary computed tomography angiography. We conclude by reviewing the limitations associated with contemporary application of ML algorithms within the cardiovascular disease field. The research paper analyses the algorithms and methods used to implement prediction of heart diseases. It is directed towards machine learning and also to provide a detailed analysis of heart disease risk based on several factors that may have a direct impact on cardiovascular health.

II. LITERATURE SURVEY

In the research paper named Heart Disease Prediction using Evolutionary Rule Learning [1] Anjan Repaka, Sai Ravikanti and Ramya Franklin. The system has been prototyped by using an Android App and it has been tested on a dataset of cardiovascular health. Experiments show that the proposed system is able to automatically detect heart disease, with an average accuracy upto 73%.

In the research paper named Smartphone based ischemic heart disease (heart attack) risk prediction using clinical data and data mining approaches,a prototype design [2] M. Raihan, Saikat Mondal, Arun More, Md. Omar Faruqe Sagor,Gopal Sikder, Mahbub Arab Majumder, Mohammad Abdullah Al Manjur and Kushal Ghosh. This paper used data mining approach for predicting heart disease. This paper proposes a system where a score is calculated and then the score is classified into results. It provides the accuracy upto 59.1%

In the research paper named Prediction of heart disease using a hybrid technique in data mining classification [3]Ankita Dewan, Meghna Sharma proposed a back propagation technique approach It focuses on hybrid model for prediction with an average of 65% accuracy.

Table I Literature Survey Of Research Papers

Sr. no.	Title Of Paper	Technique used	Efficiency	Future Scope
1	Heart Disease Prediction Using Naives Bayesian	Naïve Bayesian algorithm	73.00%	Can improve using better web development techniques.
2	Smartphone based ischemic heart disease (heart attack) risk prediction using clinical data and data mining approaches,a prototype design	Data Mining	59.10%	Can improve accuracy using a Machine Learning algorithm.
3	Prediction of heart disease using a hybrid technique in data mining classification	Back Propagation technique	65.00%	Hybrid model can be used to improve accuracy
4	Disease Risk Prediction by Using Convolutional Neural Network	Neural Network	65%	Can improve accuracy using ML algorithms
5	Efficient Heart disease prediction using decision tree algorithm	Decision tree algorithm	72%	Can improve accuracy using better dataset
6	Heart Disease Prediction using Evolutionary Rule Learning	Weighted Association Rule	60%	Can improve accuracy using ML algorithms

In Disease Risk Prediction by Using Convolutional Neural Network[4] Sayali Ambekar, Rashmi Phalnikar propose the disease risk prediction using structured data. They use convolutional neural network based unimodal disease risk prediction algorithm. The prediction accuracy of CNN-UDRP algorithm reaches more than 65%. Moreover, this system answers the question related to disease which people face in their life.

Efficient Heart disease prediction using decision tree algorithm [5] Purushottam, Prof. Kanak Sharma, Richa Sharma have designed a system that can efficiently discover the rules to predict the risk level of patients based on the given parameter about their health. The rules can be prioritized based on the user's requirement.

The performance of the system is evaluated in terms of classification accuracy and the results shows that the system has great potential in predicting heart disease risk level more accurately.

Heart Disease Prediction using Evolutionary Rule Learning [6] Akash Chauhan,Aditya Jain, Purushottam Sharma, Vikas Deep, Weighted Association Rule is a type of data mining technique used to eliminate the manual task which also helps in extracting the data directly from the electronic records. This will help in decreasing the cost of services and also helps in saving lives. In this paper, we will find the rule to predict a patient's risk of having coronary disease. Test results have shown that the vast majority of the rules helps in the best prediction of coronary illness

We are using "Multiple ML algorithms approach" which are giving 77% accuracy and also we can improve it by using good data dataset generation techniques.

III. PROPOSED SYSTEM

A. System Architecture

1) User/Admin Interface: It is the Front End of the system through which the user can interact with the system. The Web Interface contains the following parts:-

a) Login Portal

b) Registration Portal

c) User Data Form

2) Prediction System: It is the part of the system which contains the actual raw data provided by the user, dataset, and machine learning algorithms and helps process that data for further use.

It performs the following tasks

a) Processing User Input Data

b) Handling Database

c) Machine Learning algorithms

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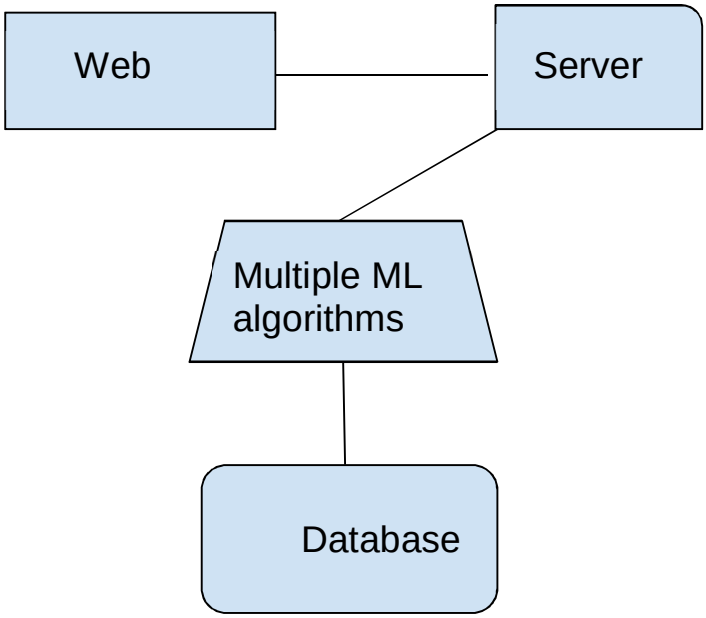
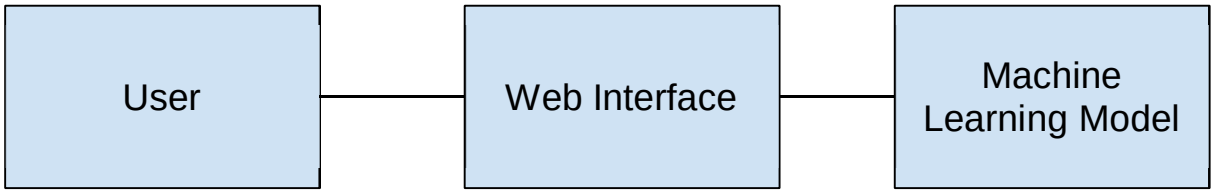


B. Data flow Diagrams



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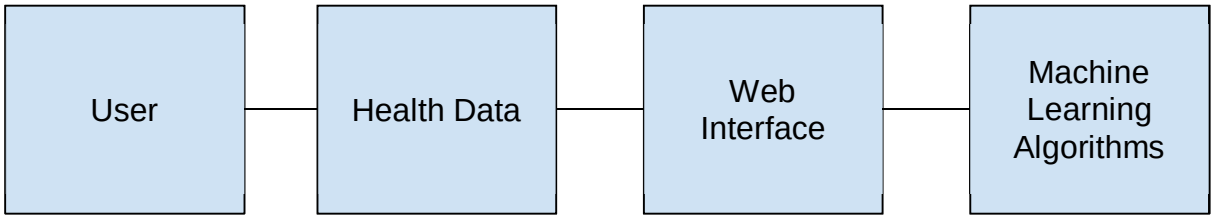

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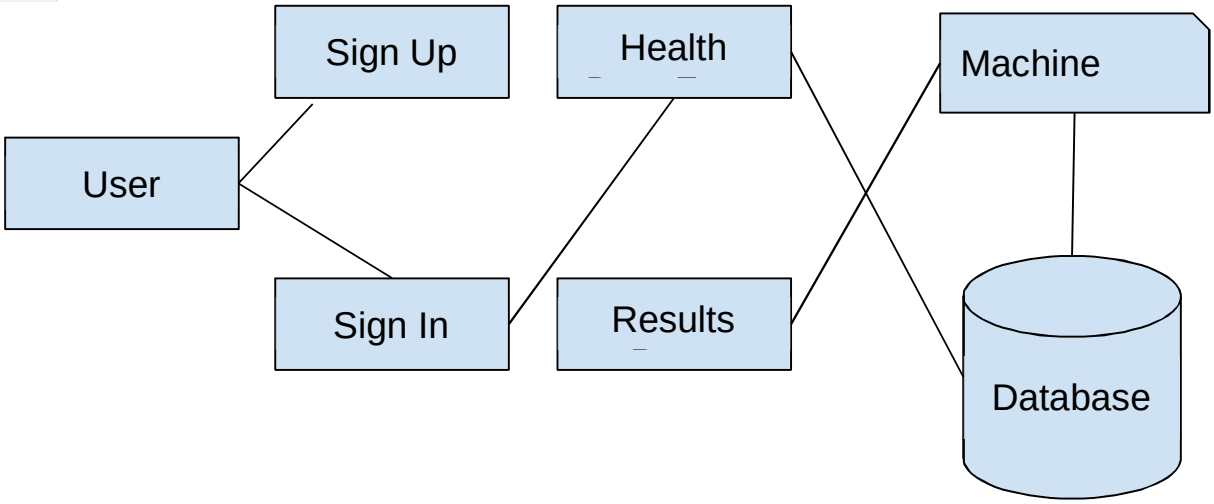


DFD Level

IV. ANALYSIS AND DESIGN

A. *Requirements*

1) *Problem Definition:* To take user cardiovascular health data and predict heart diseases

2) Hardware and Software Requirements

a) *Hardware Requirements:* 4GB Ram, Intel/AMD Processor, 5GB Storage Space.

b) *Software Requirements:* Modern Web Browser, Python, Anaconda Python Distribution with Jupyter Notebook.

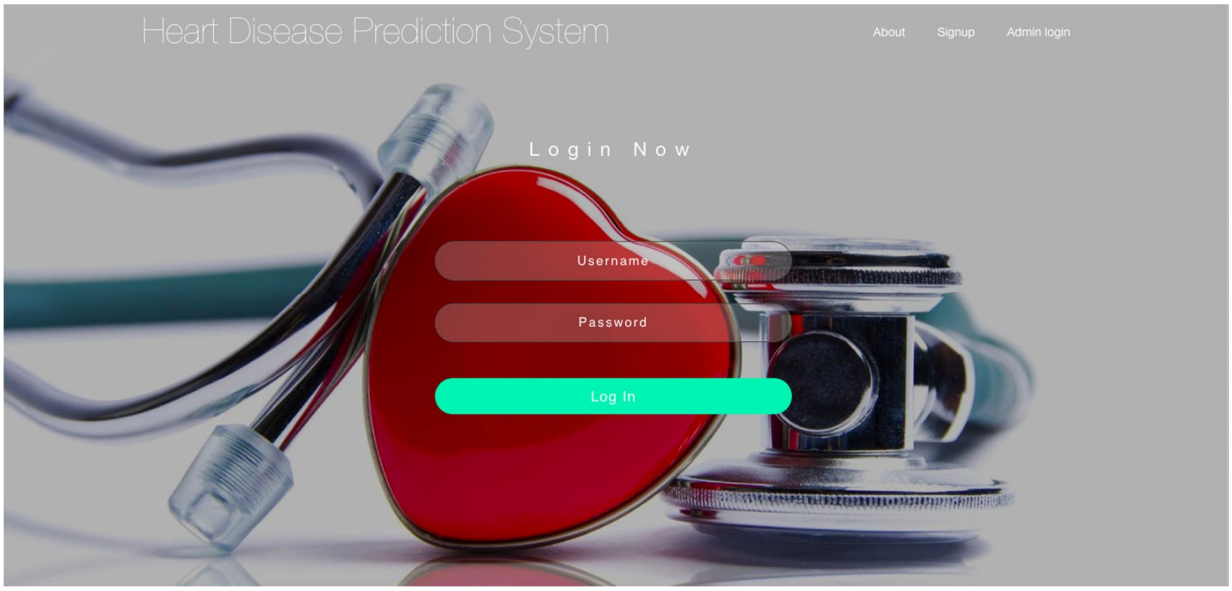
B. *Analysis*

As we are performing multiple machine learning algorithms , the accuracy is better than single algorithm approach.
Analysis of Work needed to be done in stages:-

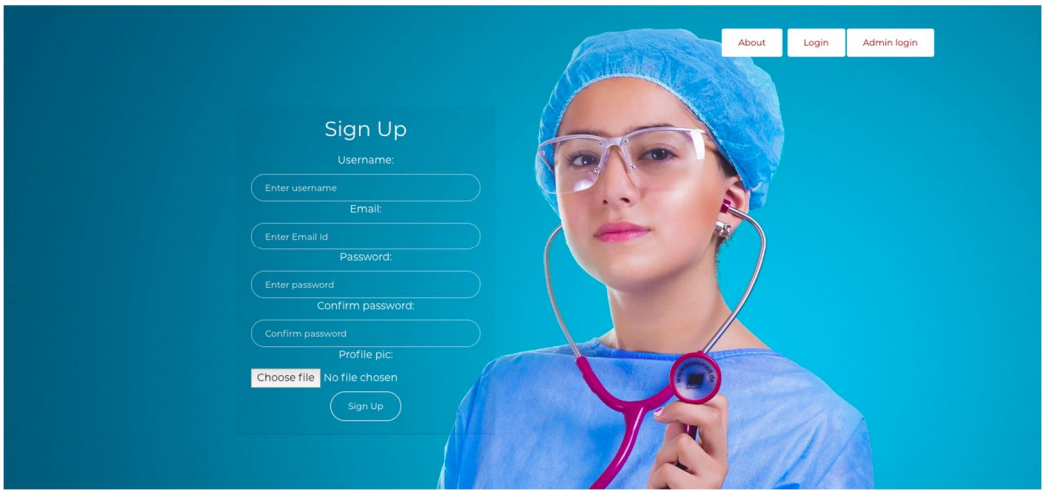
1) Identify the most effective sets of conditions of dataset

2) Create a heart disease prediction system using multiple machine learning algorithms

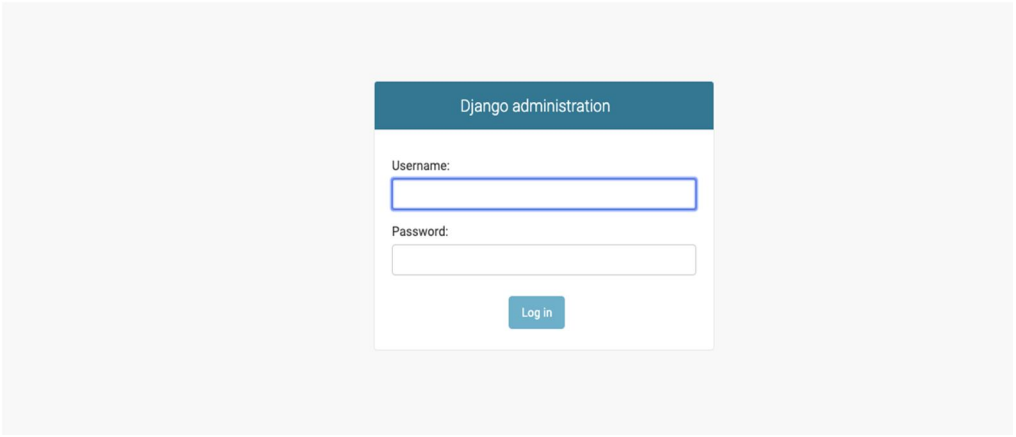
C. *Design Phase*



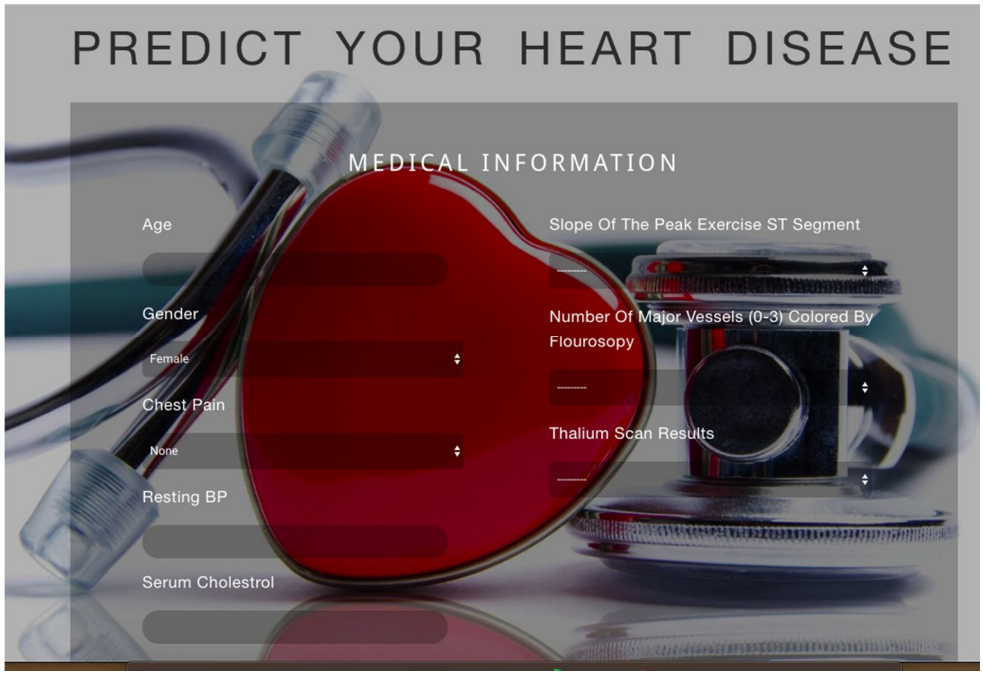
1. Homepage / Sign In Page



2. Sign Up Page



3. Admin Log In Page



4.User Input Form Page

V. CONCLUSIONS

A. We will develop the proposed expert system by using different machine learning algorithms to determine the quality, user perception predicted by each algorithm. The proposed expert system is to deploy on a web-application which will be built on Django, PHP, Python and Jupyter Notebook.

B. We will also work to add some new features in the algorithms and try to increase accuracy of heart disease prediction system. We are going to analyse the dataset by referring to various respected medical sources online.

VI. ACKNOWLEDGMENT

Would like to express gratitude to my guide Prof. Mrinalini Bhajibhakare for valuable suggestions and direction towards the execution of this project. I convey my heartfelt thanks to Prof. Swati Patil for her dynamic support being the project coordinator. I'm very thankful to Dr. Arati Dandavate, Head of the Department, Computer Engineering, who has extended support and valuable suggestions towards achieving success in this project.

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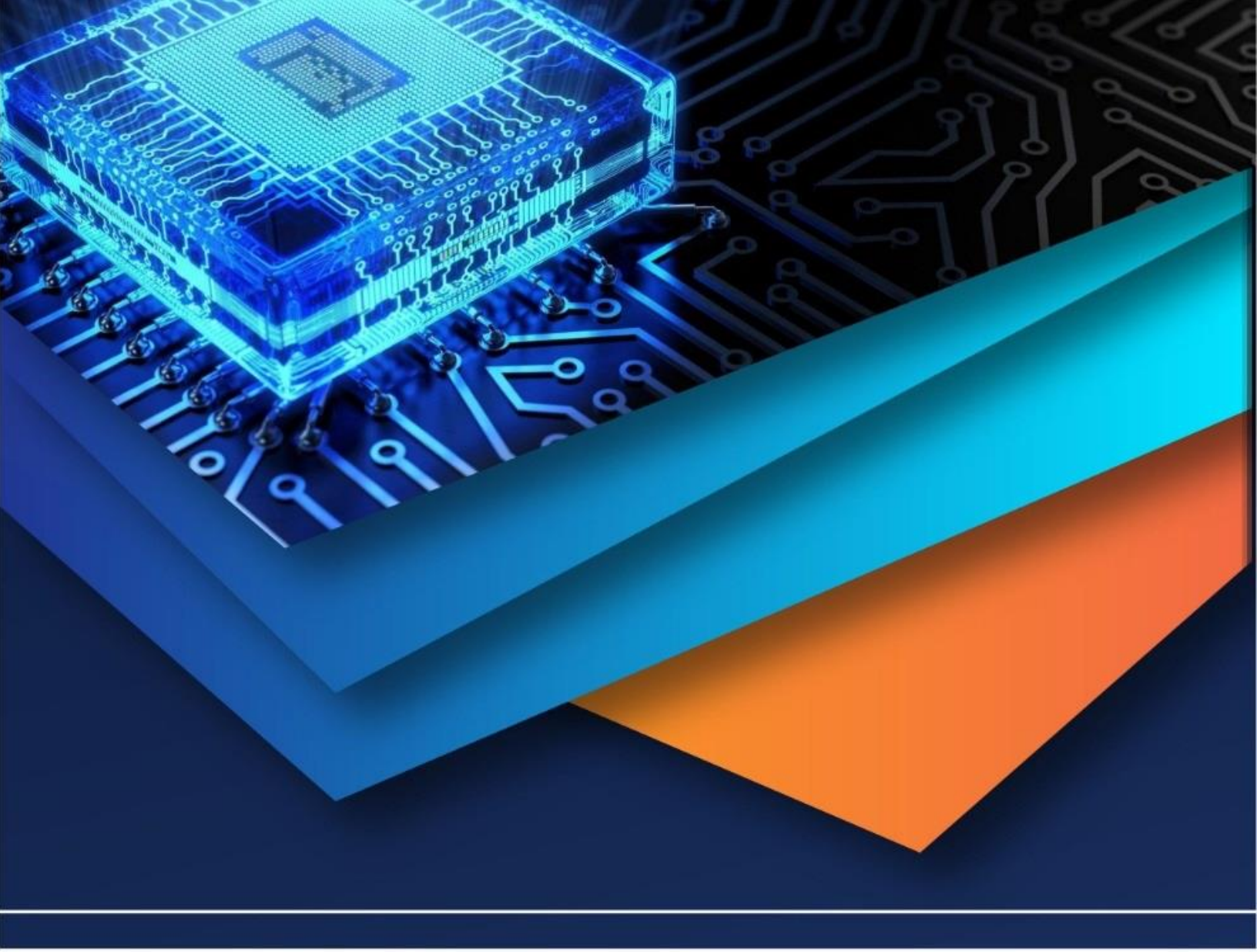
[8] https://medicalxpress.com/news/2019-05-machine-humans-death-heart.html



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