VISVESVARAYA TECHNOLOGICAL UNIVERSITY
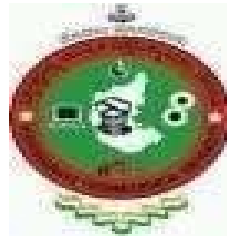## BELAGAVI, KARNATAKA

INTERNSHIP TRAINING REPORT
ON
"Heart Failure Prediction Using KNN Algorithm"

A report submitted in the partial fulfilment of the requirements for the award of the degree of

Bachelor of Engineering

in

Information Science & Engineering

Submitted by

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Under the guidance of

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DEPARTMENT OF ISE

Department of Information Science & Engineering

CERTIFICATE

Certified that the Internship work entitled **Heart Failure Prediction Using KNN Algorithm** carried out by **S Kaushal (1SG19IS087)** bonafide student of 8th semester, Department of **Information Science & Engineering**, Sapthagiri College of Engineering, Bengaluru in partial fulfillment of the award of **Bachelor of Engineering** in **Information Science & Engineering** of the **Visvesvaraya Technological University,** Belagavi during the year 2022-23. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The Internship report has been approved as it satisfies the academic requirements in respect of Internship work prescribed for the said Degree.

_____   _____   _____
Prof. Swetha K B   **Dr. H R Ranganatha**   **Dr. H Ramakrishna**

Signature of the Guide   **Signature of the HOD**   **Signature of the Principal**

Name of the Examiners   **Signature with date**

1. _____   _____

2. _____   _____

Abstract

Heart failure is a critical medical condition affecting millions worldwide. Accurately predicting heart failure is crucial for improving patient outcomes and reducing healthcare costs. In recent years, machine learning algorithms have shown promise for heart failure prediction. This study explores the application of the K-Nearest Neighbour's (KNN) algorithm in predicting heart failure. Using a dataset of 299 patients with 13 clinical features, the KNN algorithm was trained and tested using 10-fold cross-validation. Results indicate that the KNN algorithm achieved an accuracy of 83.67% in predicting heart failure. These findings suggests that the KNN algorithm is a promising approach for heart failure prediction. The algorithm's high accuracy and performance metrics, along with the identification of important clinical features, could help healthcare providers identify patients at high risk for heart failure and implement early intervention strategies to improve patient outcomes.

ACKNOWLEDGEMENT

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CHAPTER 1

Introduction

Karunadu Technologies Pvt. Ltd. is a leading IT software solutions and providing services industry focusing on quality standards and customer values. They offer broad range of customized software applications powered by concrete technology and industry expertise. Karunadu Technologies Pvt. Ltd. Offers end to end embedded solutions to its customers that entail all stages of product life cycle. Their proficient and dedicated embedded application development team helps you to build embedded application solutions that will ensure the best customer satisfaction. They will match customer requirements with our strong experience and in-depth expertise of the market. Karunadu Technologies Pvt. Ltd. is also a leading Skills and Talent Development company that is building a manpower pool for global industry requirements. They empower individual with knowledge, skills and competencies that assist them to escalate as integrated individuals with a sense of commitment and dedication towards the society. Karunadu Technologies Pvt. Ltd. empower individual with knowledge, skills and competencies that assist them to escalate as integrated individuals with a sense of commitment and dedication.

Karunadu Technologies Pvt. Ltd. also helps companies to find right individuals matching the requirements. They engage in Outsourcing of talented candidates. They find you the best talent of pre-screened, interested candidates to our recruiters and/or hiring managers. Karunadu Technologies Pvt. Ltd. helps students to transform their own ideas to project. They provide assistance to individuals for their IEEE Academic project.

1.1 Overview of The Organization

Karunadu Technologies Pvt. Ltd. is rapid emerging IT development and Service Company engrossed on providing cost effective and reliable solutions to customers across various latest technologies. They offer scalable end-to-end application development and management solutions from requirement analysis to deployment and rollout.

1.2 Vision

To Empower Unskilled Individual with knowledge, skills and technical competencies in the field of Information Technology and Embedded engineering which assist them to escalate as integrated individuals contributing to company's and Nation's growth.

1.3 Mission

- Provide cost effective and reliable solutions to customers across various latest technologies
- Offer scalable end-to-end application development and management solutions.
- Provide cost effective highly scalable products for varied verticals.
- Focus on creating sustainable value growth through innovative solutions and unique partnerships.
- Create, design and deliver business solutions with high value and innovation by leveraging technology expertise and innovative business models to address long-term business objectives.
- Keep our products and services updated with the latest innovations in the respective requirement and technology.

1.4 Values

The Company not only work but also live to help and share kindness to the people, especially to those who need their help the most. They are keeping their values by continuously and courageously creating synergy between the company as well as clients.

They strive to deliver the finest services to their clients while strengthening their own business value. They are stern believers in maintaining honesty and integrity along with respect for their hardworking work force. They spare no efforts in respecting their peers sustaining a fair balance at the work place. Karunadu Technologies Pvt. Ltd. also helps companies to find right individuals matching the requirements. They engage in Outsourcing of talented candidates.

1.5 Quality Policy

The company is a provider of customized software applications, as well as end-to-end embedded solutions and services. With expertise in concrete technology and various industries, the company is able to deliver software that is tailored to the specific needs of its clients. Customer satisfaction is a top priority, and the company involves clients in the development process to ensure that its products meet their needs and exceed their expectations. Additionally, the company is committed to empowering individuals through the provision of knowledge, skills, and competencies that foster dedication and commitment. The company values innovation and staying up-to-date with the latest technologies and trends, which enables it to offer cutting-edge solutions to its clients and stay ahead of the competition. Overall, the company is dedicated to delivering high-quality software and services that provide the utmost customer satisfaction.

1.6 Development Sectors

Karunadu Technologies offers web development services, including the design and development of custom websites, e-commerce sites, and web applications. They use a range of web technologies, including PHP, HTML5, CSS3, and JavaScript. Karunadu Technologies provides software development services for a range of industries and platforms, including desktop, mobile, and cloud-based applications. They specialize in developing custom software solutions tailored to their clients' specific needs. Karunadu Technologies offers mobile app development services for both iOS and Android platforms. They develop custom mobile apps for businesses and startups, using technologies such as React Native and Swift. Karunadu Technologies provides digital marketing services to help businesses improve their online presence and reach their target audience. Their services include SEO, PPC advertising, social media marketing, and content marketing.

CHAPTER 2

Task Performed

2.1 Learning Experiences

During my internship at the Department of Information Science and Engineering, S.C.E, I had the opportunity to focus on learning machine learning algorithms, PyQt, and Python frameworks. Through this experience, I became familiar with different algorithms such as KNN, SVM, and K-means and learned how they can be applied to real-world datasets. I also gained hands-on experience with PyQt, a GUI toolkit, and learned how to use it to develop user-friendly interfaces. In addition, I became proficient in various Python frameworks and how they can be applied in machine learning applications.

Internships are an excellent way to gain practical experience in a real-world setting, and during my time at S.C.E, I was able to develop my problem-solving skills and network with professionals in my field. My internship allowed me to gain a deeper understanding of how machine learning algorithms work and how they can be applied to real-world problems. Furthermore, I learned how to apply my programming skills to develop useful and efficient solutions using Python frameworks and PyQt.

Overall, my internship was a valuable experience that helped me gain new skills, learn about new concepts, and explore my interests in machine learning and programming. I am confident that the skills and knowledge I gained during my internship will be useful to me in my future studies and career.

2.2 Knowledge Acquired

Knowledge about the functioning of the various departments in the company. The process carried out for the conversion of requirements to the final software application. The interaction with the employees and the officials has enhanced my communication skills. Learning about the various policies followed in the company and the work culture. Learning about the research process and analysis of the data collected. The presentation of the data and contents in the report has improved. Learning that continuous practice can make the performance of tasks easier and reduce the commitment of errors and hence the activities are performed smoothly.

- About pyqt5 creating a graphical user interfaces (GUI) in python.

- Basic knowledge about the widgets been used.

- Creating a simple pyqt5 application.

- Designing a GUI and Qt designer how to use a Qt designer a visual tool for designing GUI and python.

- About Jupyter Notebook how it can be used to write and execute Python code.

- Knowledge about jupyter notebook as it supports interactive data visualizations.

- Learnt libraries like Numpy and Pandas.

- Using pyqt5 and jupyter notebook to create interactive GUIs.

- Demonstrated this by creating simple application that allow users to input data and view results.

2.3 Skills Learned

2.3.1.Basics Of Python

Python is a multiparadigm, general-purpose, interpreted,high-level programming language. Python allows programmers to use different programming styles to create simple or complex programs, get quicker results and write code almost as if speaking in a human language.

The topics learnt on Python are as follows:

- Installation of Python.

- Use of variables to store, retrieve and calculate information.

- Utilization of core programming operations such as functions and loops.

2.3.2 Features of Python

- Extensive support libraries (NumPy for numerical calculations, Pandas for data analytics).

- Open source and community development.

- Dynamically typed language (No need to mention data type based on value assigned, it takes data type).

- Object-oriented language, Portable and Interactive across Operating systems.

2.3.3 Python libraries

Machine Learning, as the name suggests, is the science of programming a computer by which they are able to learn from different kinds of data. A more general definition given by Arthur Samuel is – "Machine Learning is the field of study that gives computers the ability to learn without being explicitly programmed." They are typically used to solve various types of life problems. In the older days, people used to perform Machine Learning tasks by manually coding all the algorithms and mathematical and statistical formula. This made the process time consuming, tedious and inefficient. But in the modern days, it is become very much easy and efficient compared to the olden days by various python libraries, frameworks, and modules. Python libraries that used in Machine Learning are:

• NumPy

• Pandas

 • Matplotlib

2.3.4 NumPy

NumPy is basic package for scientific computing. It is the python language implementation which includes powerful N-dimensional array structure, sophisticated functions, Tools that can be integrated into C/C++ and Fortran code, Linear algebra, Fourier transform and Random number features. Besides its obvious scientific uses, numpy can also be used as an efficient multidimensional container of generic data. The main aspect NumPy is the NumPy array, on which you can do various operations. The key is that a NumPy array isn't just a regular array you'd see in a language like Java or C++, but instead it is like a mathematical object as a vector or a matrix. That means you can do vector and matrix operations like addition, subtraction, and multiplication. The most important aspect of NumPy arrays is that they are optimized for speed. NumPy is a general-purpose array-processing package. It provides a highperformance multidimensional array object, and tools for working with these arrays. It is the fundamental package for scientific computing with Python. Besides its obvious scientific uses, NumPy can also be used as an efficient multi-dimensional container of generic data.

2.3.5 Pandas

Pandas Data Frame is two-dimensional size-mutable, potentially heterogeneous tabular data structure with labelled axes (rows and columns). A Data frame is a twodimensional data

structure, i.e., data is aligned in a tabular fashion in rows and columns. Pandas Data Frame consists of three principal components, the data, rows, and columns .The basic operations which can be performed on Pandas Data Frame are:

• Creating a Data Frame

• Dealing with Rows and Columns

• Indexing and Selecting Data

• Working with Missing Data

2.3.6 Software tool used

Anaconda is a free and open-source distribution of the Python programming language for scientific computing (data science, machine learning applications, large-scale data processing, predictive analytics, etc.), that aims to simplify package management and deployment. Package versions are managed by the package management system conda. Anaconda distribution comes with more than 1,500 packages as well as the conda package and virtual environment manager. It also includes a GUI, Anaconda Navigator, as a graphical alternative to the command line interface (CLI). Anaconda Navigator can search for packages on Anaconda Cloud or in a local Anaconda Repository, install them in an environment, run the packages and update them. There are many applications available by default in navigator; among them is the Spyder. Spyder is an open source cross-platform integrated development environment (IDE) for scientific programming in the Python language. Spyder integrates with a number of prominent packages. Some of the features of Spyder are:

• An editor with syntax highlighting, introspection, code completion.

• Support for multiple I Python consoles.

• The ability to explore and edit variables from a GUI.

• A Help pane able to retrieve and render rich text documentation on functions, classes and methods automatically or on-demand.

• A debugger linked to IP dB, for step-by-step execution.

• A run-time Profiler, to benchmark code.

• Project support, allowing work on multiple development efforts simultaneously.

• A built-in file explorer, for interacting with the filesystem and managing projects.

• A "Find in Files" feature, allowing full regular expression search over a specified scope.

• An online help browser, allowing users to search and view Python and package documentation inside the IDE.

• A history log, recording every user command entered in each console. An internal console, allowing for introspection and control over Spyder's own operation.

2.3.7 PyQt5

• PyQt5 is a Python binding of the cross-platform GUI toolkit Qt.

• It allows developers to create desktop applications with a graphical user interface (GUI).

• PyQt5 is compatible with a wide range of platforms including Windows, Linux, and macOS.

• PyQt5 is based on Qt, which is a comprehensive set of C++ libraries that provide a wide range of functionality.

• PyQt5 provides a wide range of widgets that can be used to create GUIs, including buttons, labels, text boxes, and sliders.

• PyQt5 supports a variety of layout managers that allow developers to create flexible and responsive GUIs.

• PyQt5 includes support for event-driven programming, which allows developers to respond to user input and system events.

• PyQt5 includes support for a variety of graphics and multimedia formats, including SVG, PNG, JPEG, and MP3.

• PyQt5 includes a number of tools that can be used to debug and optimize applications, including a debugger, profiler, and memory analyzer.

• PyQt5 is licensed under the GPL and commercial licenses, which allows developers to choose the licensing model that best suits their needs.

• PyQt5 is widely used in industry and academia, and there are many resources available online to help developers get started with PyQt5 development.

2.3.8 Machine Learning Algorithms

• Linear Regression

• Multiple Linear Regression

• Logistic Regression

• Decision Tree

• K-Nearest Neighbors

- K-Means
- Support Vector Machine

2.3.8.1 K-Nearest Neighbors

K nearest neighbors or KNN Algorithm is a simple algorithm which uses the entire dataset in its training phase. Whenever a prediction is required for an unseen data instance, it searches through the entire training dataset for k-most similar instances and the data with the most similar instance is finally returned as the prediction. KNN is often used in search applications where you are looking for similar items, like find items similar to this one.

Features of KNN Algorithm

• KNN is a Supervised Learning algorithm that uses labelled input data set to predict the output of the data points.

• It is one of the simplest Machine learning algorithms and it can be easily implemented for a varied set of problems.

• It is mainly based on feature similarity. KNN checks how similar a data point is to its neighbor and classifies the data point into the class it is most similar to.

• Unlike most algorithms, KNN is a non-parametric model which means that it does not make any assumptions about the data set. This makes the algorithm more effective since it can handle realistic data.

• KNN is a lazy algorithm; this means that it memorizes the training data set instead of learning a discriminative function from the training data.

• KNN can be used for solving both classification and regression problems.

Working

In KNN, K is the number of nearest neighbors. The number of neighbors is the core deciding factor. K is generally an odd number if the number of classes is 2. When K=1, then the algorithm is known as the nearest neighbor algorithm. This is the simplest case. However, the number of neighbours (K) is a hyper parameter that needs to be chosen at the time of model building. Research has shown that no optimal number of neighbors suits all kind of data sets. Each dataset has its own requirements. Generally, Data scientists choose as an odd number if the number of classes is even. We can also check by generating the model on different values of k and check

their performance. Suppose '?' is the point, for which label needs to predict. First, you find the k closest point to P1 and then classify points by majority vote of its k neighbors. Each object votes for their class and the class with the most votes are taken as the prediction. For finding closest similar points, you find the distance between points using distance measures such as Euclidean distance, Hamming distance, Manhattan distance and Minkowski distance. Then we find the one closest point to '?' and then the label of the nearest point is assigned to '?'
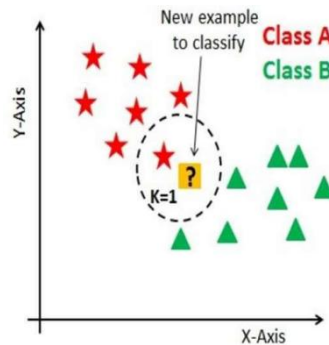
KNN has the following steps :

1)Calculate distance   2) .Find closest neighbors
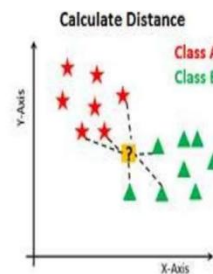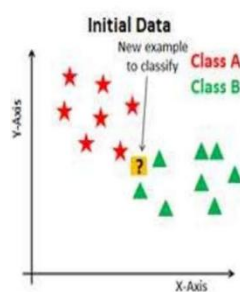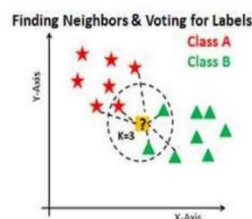

3. Vote for labels

Fig 2.3.1 -KNN Algorithm Working

Advantages and Disadvantages

Advantages

• The algorithm is simple and easy to implement.

• There's no need to build a model, tune several parameters, or make additional assumptions.

• The algorithm is versatile. It can be used for classification, regression, and search

• The training phase of K-nearest neighbor classification is much faster compared to other classification algorithms. There is no need to train a model for generalization, that is why KNN is known as the simple and instance-based learning algorithm.

• KNN can be useful in case of nonlinear data. It can be used with the regression problem. Output value for the object is computed by the average of k closest neighbors value.

Disadvantages

• The algorithm gets significantly slower as the number of examples and/or predictors/independent variables increase.

• The testing phase of K-nearest neighbor classification is slower and costlier in terms of time and memory. It requires large memory for storing the entire training dataset for prediction.

• KNN requires scaling of data because KNN uses the Euclidean distance between two data points to find nearest neighbors. Euclidean distance is sensitive to magnitudes. The features with high magnitudes will weigh more than features with low magnitudes.

• KNN also not suitable for large dimensional data.

2.4 The Most Challenging Task Performed

• Various activities were conducted during the internship training program which was very challenging. Activities provided the grounds for new ideas, and it also stimulated our creative and problem-solving skills.

• Learnt Usages of pyqt5 and Jupyter notebook.

• Integrating pyqt5 with other libraries was sometimes challenging.

• Debugging the pyqt5 application in jupyter was challenging.

• Throughout the program, we gained valuable experience in using both Pyqt5 and Jupyter Notebook.

- The internship training program offered a variety of activities that were designed to push our limits and challenge our abilities.

- One of the main benefits of the program was that it provided us with ample opportunities to generate new ideas and develop our creativity and problem-solving skills.

- The program also focused on teaching us how to use Pyqt5 and Jupyter Notebook effectively. We learned the fundamental concepts and practical applications of these tools.

- During the program, we encountered several challenges when it came to integrating Pyqt5 with other libraries. This required us to be precise in our work and to pay close attention to the details.

- Debugging the Pyqt5 application in Jupyter Notebook was also a challenging task that required a lot of patience and persistence.

- Despite the challenges, the program was extremely rewarding, and we gained a great deal of practical experience that will serve us well in our future careers.

- Overall, the internship training program was an excellent opportunity to develop our skills, learn new tools and technologies, and gain practical experience in the field of software development.

2.4 Problems Identified

- Objective : Heart failure prediction is a critical task in healthcare that can help identify individuals who are at high risk for developing heart failure. The aim is to develop a K-nearest neighbors (KNN) algorithm model for predicting heart failure in patients based on their clinical data .

- By analyzing a clinical dataset, it is possible to predict whether a patient has a healthy heart function or is at risk of heart failure. This analysis can provide valuable information for healthcare professionals to make informed decisions about the patient's treatment.

- Software used: Jupyter notebook,Pyqt5

- Algorithm used: K-nearest neighbors (KNN) Algorithm: It is a supervised machine learning algorithm used for classification and regression tasks and predicts the value of a new data point based on the labels of its K nearest neighbors in the training set.

Dataset:

The dataset used in this project consists of 12 variables:

The main variable we are interested is 'HEART HEALTH'. This variable has two possible outcomes: 0 and 1. 0 refers to the case where a patient has a healthy heart function, while 1 refers to the case where a.patient has a unhealthy/defective heart function.

The dataset consists of below features which can be summarized as follows:

1. Age: the age of the patient in years.

2. Sex: the sex of the patient, with 1 representing male and 0 representing female.

3. Chest Pain Type: the type of chest pain experienced by the patient, with possible values including Typical Angina, Atypical Angina, Non-Anginal Pain, and Asymptomatic.

4. Resting BP: the resting blood pressure of the patient in mm Hg.

5. Cholesterol: the serum cholesterol level of the patient in mm/dl.

6. Fasting BS: a binary variable indicating whether the patient had a fasting blood sugar level greater than 120 mg/dl, with 1 representing true and 0 representing false.

7. Resting ECG: the results of the patient's resting electrocardiogram, with possible values including Normal, ST (indicating ST-T wave abnormality), and LVH (indicating probable or definite left ventricular hypertrophy by Estes' criteria).

8. Max HR: the maximum heart rate achieved by the patient, measured in beats per minute.

9. Exercise Angina: a binary variable indicating whether the patient experienced exercise-induced angina, with 1 representing yes and 0 representing no.

10. Old peak: a numeric value indicating the amount of ST depression on the electrocardiogram.

11. ST_Slope: a categorical variable indicating the slope of the peak exercise ST segment, with possible values including Up, Flat, and Down.

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Chapter 3

Reflections

3.1 Project Code

```python
import pandas as pd
path = "C:\\Users\\kaush\\Desktop\\Heart attack prediction\\heart.csv"

%matplotlib inline
import seaborn as sns
import matplotlib.pyplot as plt

%config InlineBackend.figure_format = 'retina'
sns.set()
data = pd.read_csv(path)
print(data)
data.describe()
data.info()
sns.set(rc = {'figure.figsize':(12,10)})
sns.set_context("talk",font_scale = 0.5)
sns.heatmap(data.corr(),cmap = 'Reds',annot =True)

import sklearn
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import train_test_split

X = data.drop("target",axis = 1)

y = data['target']
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size = 0.3)


clf = KNeighborsClassifier(n_neighbors = 5,metric='euclidean')
clf.fit(X_train,y_train)
result = valarr
val = clf.predict(result)
print(val[0])
accuracy = clf.score(X_train,y_train)
print("Accuracy",accuracy)




from sklearn import svm
clf2 = svm.SVC(kernel = "linear")
clf2.fit(X_train,y_train)
confidence2 = clf2.score(X_train,y_train)
print("Accuracy:",confidence2)

finalresult = ""
if val[0]==0:
    finalresult = "The person has a Defective heart function"
else:
    finalresult = "The person has an Optimal heart function"
self.result.setText(finalresult)
```

```python
from PyQt5 import QtCore, QtGui, QtWidgets


class UI_Form(object):
    def setupUi(self, Form):
        Form.setObjectName("Form")
        Form.resize(1000, 900)
        Form.setStyleSheet("background-color: rgb(255, 131, 100);")
        self.label = QtWidgets.QLabel(Form)
        self.label.setGeometry(QtCore.QRect(230, 10, 671, 71))
        self.label.setStyleSheet("color:rgb(85, 0, 0);\n"
"background-color: qradialgradient(spread:pad, cx:0.5, cy:0.5, radius:0.5, fx:0.5, fy:0.5, stop:0 rgba(0, 0, 0, 0), stop
"font: 36pt \"MS Shell Dlg 2\";")
        self.label.setObjectName("label")
        self.label_2 = QtWidgets.QLabel(Form)
        self.label_2.setGeometry(QtCore.QRect(110, 110, 55, 16))
        self.label_2.setStyleSheet("font: 87 12pt \"Segoe UI Black\";color:rgb(124, 0, 0)")
        self.label_2.setObjectName("label_2")
        self.label_3 = QtWidgets.QLabel(Form)
        self.label_3.setGeometry(QtCore.QRect(110, 160, 55, 16))
        self.label_3.setStyleSheet("font: 87 12pt \"Segoe UI Black\";color:rgb(124, 0, 0)")
        self.label_3.setObjectName("label_3")
        self.label_4 = QtWidgets.QLabel(Form)
        self.label_4.setGeometry(QtCore.QRect(110, 220, 160, 16))
        self.label_4.setStyleSheet("font: 87 12pt \"Segoe UI Black\";color:rgb(124, 0, 0)")
        self.label_4.setObjectName("label_4")
        self.label_5 = QtWidgets.QLabel(Form)
        self.label_5.setGeometry(QtCore.QRect(110, 280, 160, 16))
        self.label_5.setStyleSheet("font: 87 12pt \"Segoe UI Black\";color:rgb(124, 0, 0)")
        self.label_5.setObjectName("label_5")
        self.label_6 = QtWidgets.QLabel(Form)
        self.label_6.setGeometry(QtCore.QRect(110, 340, 160, 16))
        self.label_6.setStyleSheet("font: 87 12pt \"Segoe UI Black\";color:rgb(124, 0, 0)")
        self.label_6.setObjectName("label_6")
        self.label_7 = QtWidgets.QLabel(Form)
        self.label_7.setGeometry(QtCore.QRect(110, 400, 160, 16))
        self.label_7.setStyleSheet("font: 87 12pt \"Segoe UI Black\";color:rgb(124, 0, 0)")
        self.label_7.setObjectName("label_7")
        self.label_8 = QtWidgets.QLabel(Form)
        self.label_8.setGeometry(QtCore.QRect(110, 470, 160, 16))
        self.label_8.setStyleSheet("font: 87 12pt \"Segoe UI Black\";color:rgb(124, 0, 0)")
        self.label_8.setObjectName("label_8")
        self.label_9 = QtWidgets.QLabel(Form)
        self.label_9.setGeometry(QtCore.QRect(110, 540, 160, 16))
        self.label_9.setStyleSheet("font: 87 12pt \"Segoe UI Black\";color:rgb(124, 0, 0)")
        self.label_9.setObjectName("label_9")
        self.label_10 = QtWidgets.QLabel(Form)
        self.label_10.setGeometry(QtCore.QRect(560, 100, 170, 17))
        self.label_10.setStyleSheet("font: 87 12pt \"Segoe UI Black\";color:rgb(124, 0, 0)")
        self.label_10.setObjectName("label_10")
        self.label_11 = QtWidgets.QLabel(Form)
        self.label_11.setGeometry(QtCore.QRect(560, 150, 160, 16))
        self.label_11.setStyleSheet("font: 87 12pt \"Segoe UI Black\";color:rgb(124, 0, 0)")
        self.label_11.setObjectName("label_11")
        self.label_12 = QtWidgets.QLabel(Form)
        self.label_12.setGeometry(QtCore.QRect(560, 210, 160, 16))
        self.label_12.setStyleSheet("font: 87 12pt \"Segoe UI Black\";color:rgb(124, 0, 0)")
        self.label_12.setObjectName("label_12")
        self.label_13 = QtWidgets.QLabel(Form)
        self.label_13.setGeometry(QtCore.QRect(560, 270, 160, 16))
        self.label_13.setStyleSheet("font: 87 12pt \"Segoe UI Black\";color:rgb(124, 0, 0)")
        self.label_13.setObjectName("label_13")
        self.label_14 = QtWidgets.QLabel(Form)
        self.label_14.setGeometry(QtCore.QRect(560, 340, 160, 16))
        self.label_14.setStyleSheet("font: 87 12pt \"Segoe UI Black\";color:rgb(124, 0, 0)")
        self.label_14.setObjectName("label_14")


        self.age = QtWidgets.QLineEdit(Form)
        self.age.setGeometry(QtCore.QRect(280, 110, 113, 22))
        self.age.setObjectName("age")
        self.sex = QtWidgets.QLineEdit(Form)
        self.sex.setGeometry(QtCore.QRect(280, 160, 113, 22))
        self.sex.setObjectName("sex")
        self.cp = QtWidgets.QLineEdit(Form)
        self.cp.setGeometry(QtCore.QRect(280, 220, 113, 22))
        self.cp.setObjectName("cp")
        self.trest = QtWidgets.QLineEdit(Form)
        self.trest.setGeometry(QtCore.QRect(280, 280, 113, 22))
        self.trest.setObjectName("trest")
        self.chol = QtWidgets.QLineEdit(Form)
        self.chol.setGeometry(QtCore.QRect(280, 340, 113, 22))
        self.chol.setObjectName("chol")
        self.fast = QtWidgets.QLineEdit(Form)
        self.fast.setGeometry(QtCore.QRect(280, 400, 113, 22))
        self.fast.setObjectName("fast")
        self.rest = QtWidgets.QLineEdit(Form)
        self.rest.setGeometry(QtCore.QRect(280, 470, 113, 22))
        self.rest.setObjectName("rest")
        self.thalach = QtWidgets.QLineEdit(Form)
        self.thalach.setGeometry(QtCore.QRect(280, 530, 113, 22))
        self.thalach.setObjectName("thalach")
        self.exang = QtWidgets.QLineEdit(Form)
        self.exang.setGeometry(QtCore.QRect(730, 100, 113, 22))
        self.exang.setObjectName("exang")
        self.oldpeak = QtWidgets.QLineEdit(Form)
        self.oldpeak.setGeometry(QtCore.QRect(730, 150, 113, 22))
        self.oldpeak.setObjectName("oldpeak")
        self.slope = QtWidgets.QLineEdit(Form)
        self.slope.setGeometry(QtCore.QRect(730, 210, 113, 22))
        self.slope.setObjectName("slope")
```

3.2 Output

HEART FAILURE PREDICTION USING KNN ALGORITHM

Fig 3.2.1- Basic Design for Heart failure Prediction

Fig 3.2.2 - Person with Defective heart function

Fig 3.2.3- Person with Healthy Heart Condition

Chapter 4

Conclusion

- In this project, we built a heart failure prediction model using the KNN algorithm.

- The dataset consists of 12 variables related to various clinical and demographic characteristics of patients, including age, sex, chest pain type, blood pressure, cholesterol level, exercise-induced angina, old peak and st slope.

- The primary variable of interest is the presence or absence of heart is healthy or not, which is coded as either 0 or 1, respectively.

- The performance of the model was evaluated using various metrics such as accuracy and precision.

- The final model can be used in healthcare industries to quickly and accurately identify weather the patient heart is healthy or not.

- Further improvements could be made by using other machine learning algorithms or exploring different aspects of heart conditions and diseases.

Chapter 5

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