



PROJECT DOCUMENTATION

Heart Attack Predictor

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1. Introduction

The Heart Attack Predictor is a Python-based desktop application designed to predict the likelihood of a heart attack based on medical parameters. By leveraging a Random Forest model and a graphical user interface, the application provides an intuitive tool for users to assess their risk. This documentation covers the application's design, features, usage, and implementation details.

2. Features

User-Friendly GUI:

Developed with Tkinter for user-friendliness.

Input fields clearly labeled for entry of medical data.

Machine Learning Integration:

Uses a pre-trained Random Forest model for the prediction.

Inputs are scaled to ensure consistency and accuracy in the model.

Result Presentation:

It will give the predicted output (Heart Attack Risk or No Risk) along with the probability score.

Error handling with descriptive error messages in case of any user mistake.

3. System Requirements

- **Operating System:** Windows, macOS, or Linux
- **Python Version:** 3.7 or higher
- **Required Libraries:**
 - numpy
 - joblib
 - tkinter
 - sklearn

4. Usage Instructions

4.1 Running the Application

Make sure the following files are in the same directory

- app.py
- heart_model_rf.pkl
- scaler_rf.pkl

Run the application:

```
python app.py
```

4.2 Running the Application

Fill the input fields

- Age: Age in years
- Sex: 1 for male and 0 for female
- Chest Pain Type: Value between 0 and 3
- Resting Blood Pressure: Fill it in mm Hg
- Do the same for all the fields at the GUI
- Click on the button Predict Risk.

Pop-up result view:

Prediction: It shows a chance of heart attack risk.

Probability: This shows the probability of the given prediction.

5. Code Explanation

5.1 Notebook Code

The notebook documents the model training pipeline, evaluation, and saving of the best-performing model:

1. Data Loading

Data is loaded using pandas library.

2. Data Preprocessing

Data is cleaned, normalized, and split into training and testing sets.

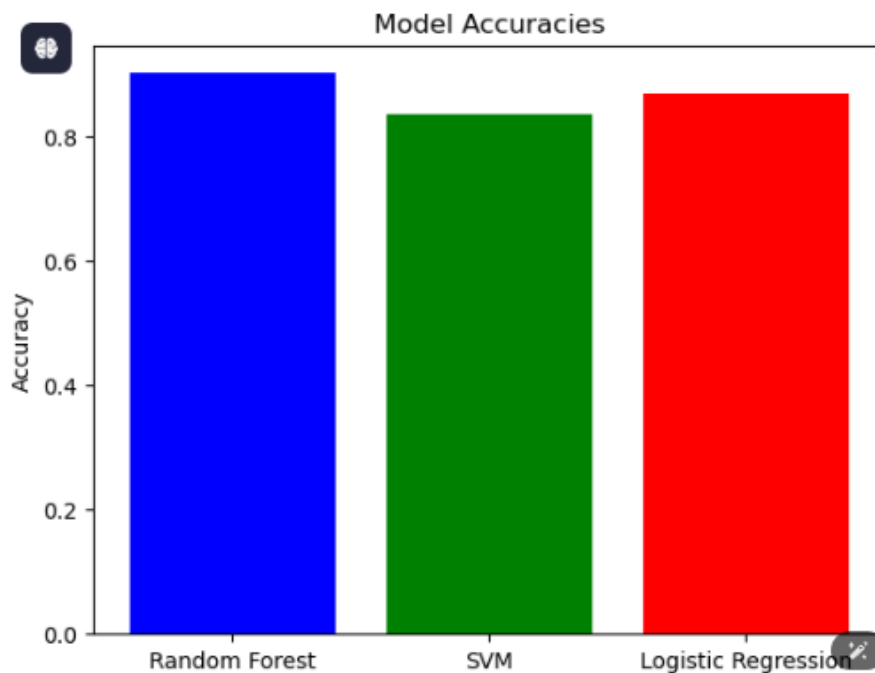
3. Model Training

Three models are trained:

- **Random Forest Classifier** (highest accuracy: 88%)
- Support Vector Machine
- Logistic Regression

4. Model Evaluation

The models' accuracy scores are calculated and visualized.



4. Saving the Best Model

The Random Forest model and scaler are saved for use in the application.

5.2 Application Code (app.py)

Model Loading

The app.py file initializes the Random Forest model and scaler from the saved .pkl files.

Key Functions

`predict_risk()`

- Collects input from GUI fields.
- Scales the input using `scaler_rf.pkl`.
- Predicts the risk using `heart_model_rf.pkl`.
- Displays the result in a pop-up window.

Example Workflow

- User enters 45 for age, 1 for sex (male), 2 for chest pain type, etc.
- These values are passed to the Random Forest model for prediction.
- The model returns a result and probability displayed to the user.

6. Troubleshooting

- **Error: "Model file not found":**
 - Ensure heart_model_rf.pkl and scaler_rf.pkl are in the same directory as app.py.
- **Error: "Invalid input":**
 - Verify all fields are filled and values are within the valid range.

7. Conclusion

The Heart Attack Predictor is a valuable tool for assessing heart attack risk using machine learning. Its user-friendly interface and robust prediction model make it suitable for both healthcare professionals and individuals. Future updates will focus on improving the prediction model and enhancing usability.