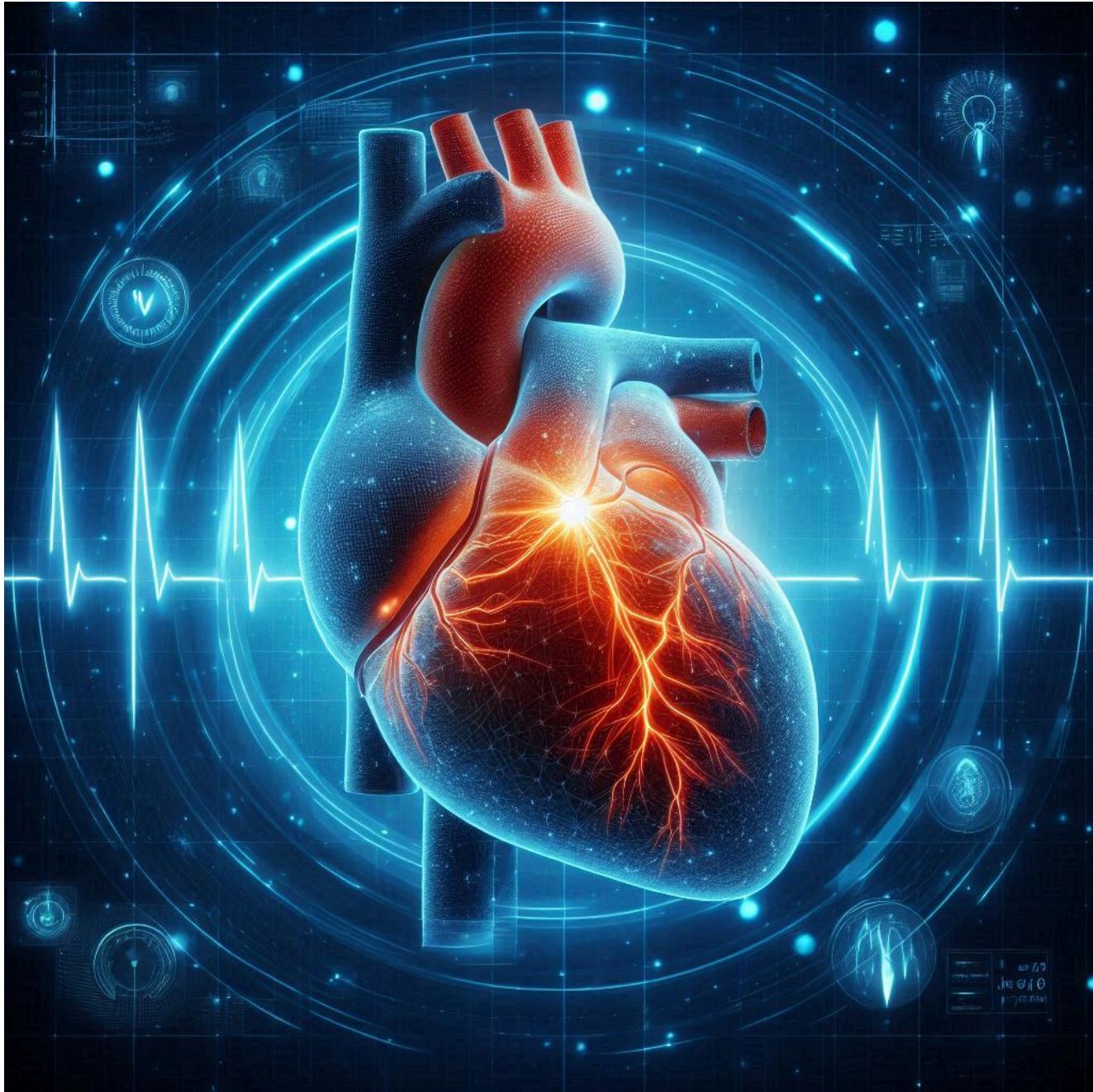


Heart Disease Prediction



In my recent project, I developed a heart disease prediction model utilizing various machine learning algorithms, including K-Nearest Neighbors (KNN), Random Forest, Decision Tree, Linear Regression, and Logistic Regression. Each model was evaluated based on its accuracy in predicting the presence of heart disease using a dataset comprised of relevant health parameters.

The KNN model emerged as the best-performing algorithm, achieving an impressive accuracy score of 84.83%. This high accuracy can be attributed to KNN's effectiveness in classifying data points based on the proximity of feature values, which is particularly beneficial in medical datasets where relationships between variables can be intricate.

In contrast, while Random Forest and Decision Tree models provided reasonable performance, they did not surpass the KNN results. The Logistic Regression model, despite being a robust statistical approach, yielded lower accuracy due to its linear assumptions, which may not fully capture the complexities of heart disease predictors. Linear Regression, being unsuitable for binary classification tasks, further highlighted the need for selection of appropriate models based on the nature of the data.

Overall, the project's findings underscore the importance of algorithm selection in predictive modeling, with KNN demonstrating significant potential in the medical domain for heart disease prediction.

Steps involved:

1. Linear Regression:

Steps:

- a. Train-test split
- b. Feature scaling using StandardScaler
- c. Model fitting
- d. Cross-validation
- e. Prediction and evaluation

Result: R-squared score of 0.21416719625311698

2. Logistic Regression:

Steps:

- a. Train-test split
- b. Feature scaling using StandardScaler
- c. Hyperparameter tuning using RandomizedSearchCV
- d. Further tuning using GridSearchCV
- e. Model fitting with best parameters
- f. Prediction and evaluation

Result: Accuracy of 0.8241758241758241 (82.42%)

3. K-Nearest Neighbors (KNN):

Steps:

- a. Train-test split
- b. Feature scaling (assumed, as it's generally required for KNN)
- c. Testing different k values (1 to 20)
- d. Model fitting with best k value
- e. Prediction and evaluation

Result: Accuracy of 0.8482795698924731 (84.83%)

4. Random Forest Classifier:

Steps:

- a. Train-test split
- b. Feature scaling (if performed, not explicitly mentioned)
- c. Model fitting
- d. Prediction and evaluation

Result: Accuracy of 0.8282795698924732 (82.83%)

5. Decision Tree Classifier:

Steps:

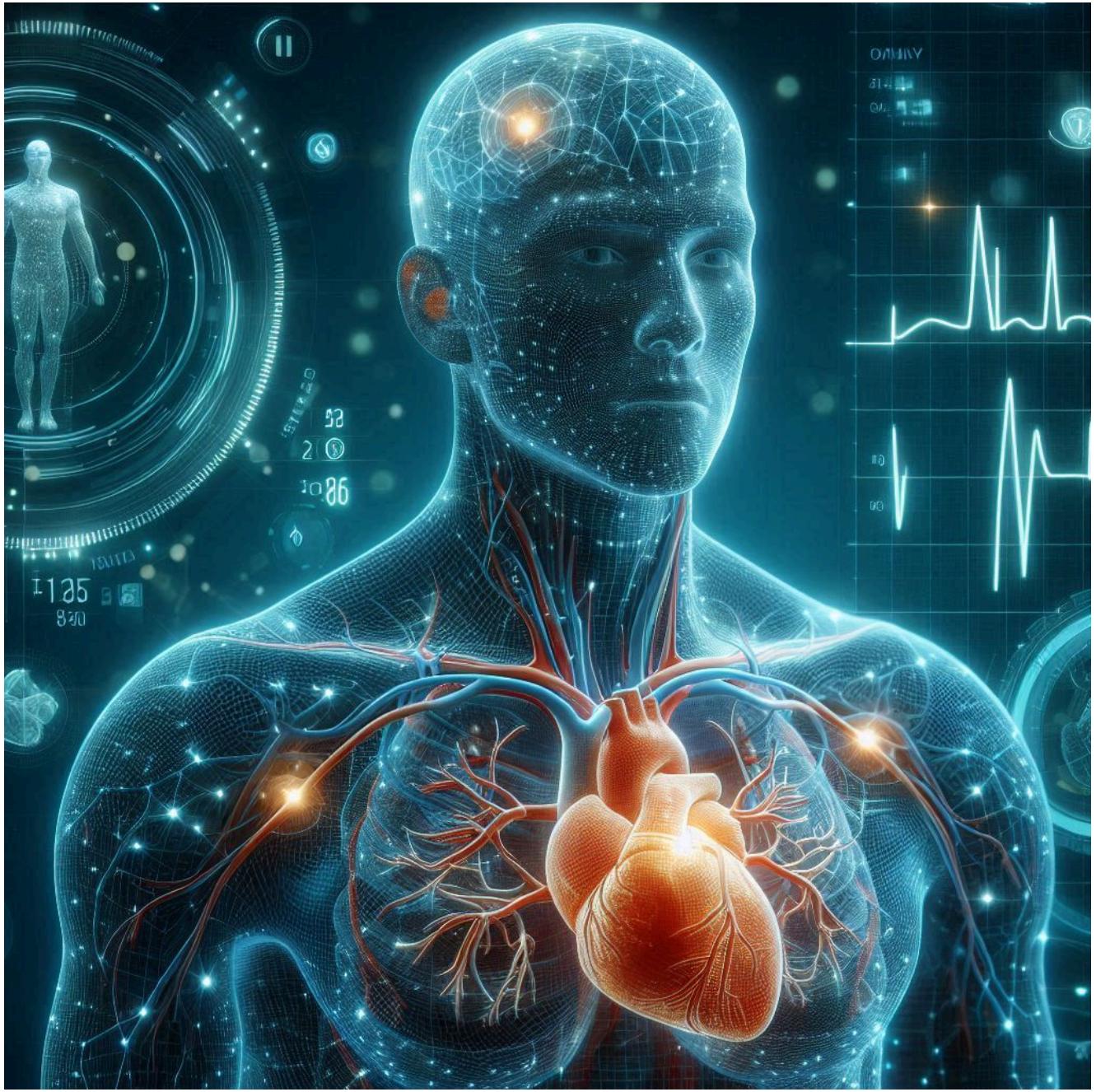
- a. Train-test split
- b. Feature scaling (if performed, not explicitly mentioned)
- c. Post-pruning approach: Setting max_depth=4
- d. Pre-pruning approach: Using GridSearchCV for hyperparameter tuning
- e. Model fitting
- f. Prediction and evaluation

Result: Accuracy of 0.75 (75%) for both post-pruning and pre-pruning approaches

Comparison:

1. KNN performed the best with 84.83% accuracy.
2. Random Forest came second with 82.83% accuracy.
3. Logistic Regression was close behind with 82.42% accuracy.
4. Decision Tree had the lowest accuracy at 75%.
5. Linear Regression, being a regression model for a classification task, isn't directly comparable but showed poor performance with an R-squared of only 0.214.

In conclusion, for this heart attack prediction dataset, KNN provided the best performance, followed closely by Random Forest and Logistic Regression. The Decision Tree classifier performed less well, and Linear Regression was not suitable for this classification task. The choice of algorithm would depend on the balance between performance and interpretability needed for the specific application.



Based on the information provided in the dataset, **chest pain and maximum heart rate** are indeed **important factors in predicting heart disease**. To help reduce and maintain these two factors, here are some recommended exercises and yoga practices:

For Chest Pain (Angina) Management:

1. Low-impact aerobic exercises:

- Walking: Start with 10-15 minutes daily, gradually increasing to 30-45 minutes.
- Swimming: A great full-body, low-impact exercise.
- Stationary cycling: Begin with short sessions and increase duration gradually.

2. Yoga poses:

- Cat-Cow Pose (Marjaryasana-Bitilasana): Helps improve chest flexibility and circulation.
- Bridge Pose (Setu Bandhasana): Gently opens the chest and improves blood flow.
- Cobra Pose (Bhujangasana): Stretches chest muscles and improves posture.

3. Breathing exercises:

- Diaphragmatic breathing: Helps reduce stress and improves oxygen flow.
- Alternate Nostril Breathing (Nadi Shodhana): Balances the nervous system and can help with chest discomfort.

For Maintaining a Healthy Heart Rate:

1. Cardiovascular exercises:

- Interval training: Alternating between high and low-intensity exercises.
- Jogging or running: Start slow and gradually increase intensity and duration.
- Jumping rope: An excellent exercise for improving heart rate variability.

2. Yoga practices:

- Sun Salutations (Surya Namaskar): A flowing sequence that gently elevates heart rate.
- Warrior Poses (Virabhadrasana series): Strengthens the body while moderately raising heart rate.
- Downward Facing Dog (Adho Mukha Svanasana): Improves circulation and can help regulate heart rate.

3. Relaxation techniques:

- Corpse Pose (Savasana): Helps lower heart rate and blood pressure.
- Meditation: Regular practice can improve heart rate variability.
- Progressive Muscle Relaxation: This can help reduce overall stress and regulate heart rate.

General recommendations:

1. Always consult with a healthcare provider before starting any new exercise regimen, especially if you have a history of heart problems.
2. Start slowly and gradually increase the intensity and duration of exercises.
3. Practice mindfulness and stress-reduction techniques regularly, as stress can exacerbate both chest pain and elevated heart rate.
4. Maintain a heart-healthy diet rich in fruits, vegetables, whole grains, and lean proteins.
5. Stay hydrated and avoid excessive caffeine or alcohol consumption.
6. Monitor your heart rate during exercise and learn to exercise within your target heart rate zone.

Remember, consistency is key. Regular, moderate exercise is generally more beneficial and safer than infrequent, high-intensity workouts. Always listen to your body and stop if you experience any chest pain, shortness of breath, or unusual discomfort during exercise.