**AI for Sustainable Development – Predicting Heart Disease (SDG 3)**

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Course: AI for Sustainable Development

Project Title: Heart Disease Prediction using Machine Learning

Goal: Support SDG 3 – Good Health and Well-being

***1. SDG Problem Addressed***

Cardiovascular diseases (CVDs) remain the leading cause of global deaths, responsible for over 17 million deaths annually. Many of these deaths are preventable through early detection and lifestyle changes. However, limited access to advanced diagnostic tools and trained healthcare professionals in developing regions contributes to delayed intervention.

This project addresses SDG 3: Good Health and Well-being, specifically Target 3.4, which seeks to reduce premature mortality from non-communicable diseases through prevention and treatment.

The AI-driven heart disease prediction system provides a data-based approach for early detection of heart-related risks, empowering both healthcare providers and individuals with actionable insights.

***2. Machine Learning Approach***

A supervised learning approach was adopted using two models:

- Logistic Regression

- Random Forest Classifier

Dataset: The project used the Heart Disease Dataset (UCI) available on Kaggle, which includes clinical attributes such as age, sex, blood pressure, cholesterol, maximum heart rate, and chest pain type.

Process Overview:

1. Data cleaning and preprocessing

2. Feature correlation analysis

3. Splitting data into training and test sets (80/20)

4. Model training and evaluation

5. Performance comparison between Logistic Regression and Random Forest

Tools Used: Python, Google Colab, Pandas, Scikit-learn, Matplotlib, Seaborn

***3. Results and Discussion***

Logistic Regression Accuracy: 79.5%

Random Forest Accuracy: 98.5%

The Random Forest model demonstrated superior performance due to its ability to handle complex, non-linear relationships in medical data. The model identifies key predictors such as cholesterol level, maximum heart rate, and chest pain type as strong indicators of heart disease.

This predictive capability enables early risk detection and targeted medical attention, contributing to preventive healthcare and reducing cardiovascular mortality rates.

***4. Ethical and Sustainability Reflection***

Bias & Fairness: The dataset represents a limited population; expanding it to include diverse demographics is essential for global applicability.

Sustainability: The AI system promotes equitable healthcare by providing cost-effective, data-driven tools for early diagnosis.

Privacy: All data used is publicly available and anonymized, ensuring compliance with ethical data standards.

Conclusion

The project illustrates how AI and machine learning can support SDG 3 (Good Health and Well-being) by facilitating early diagnosis and prevention of heart diseases. The system provides a foundation for developing scalable, community-level health monitoring solutions in the future.