

Project Report

on

HEART DISEASE PREDICTION USING MACHINE LEARNING

by

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Submitted to the

DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS (BCA)

Under the guidance of

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DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS (BCA)

BONAFIDE CERTIFICATE

Certified that this project report titled **“HEART DISEASE PREDICTION USING MACHINE LEARNING”** is the bonafide work of **ROSHAN V.C (RA2231241020040)** who carried out the **“UCA20D10J- PROJECT WORK”** done under my supervision.

Certified further, that to the best of my knowledge the work reported here in does not form part of any other project report on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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Signature of Internal Examiner

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Acknowledgment of Project Completion – Machine Learning

Dear V C Roshan

Greetings from **STAIR Progressive Minds Private Limited!**

We are delighted to congratulate you on completing your final year project guidance with us, focusing on **Machine Learning**. It has been our pleasure to mentor and support you in gaining **practical industry exposure**, working with **state-of-the-art technologies** and **enhancing your analytical and technical skills** in a real-world setting.

Program Summary:

- **Specialization:** Machine Learning
- **Duration:** 3 months
- **Mode:** Hybrid
- **Commencement Date:** 14.12.2024
- **Mentorship:** Expert guidance from seasoned industry professionals
- **Certification:** Awarded upon successful completion

Your commitment and enthusiasm throughout the program have been truly commendable. We trust that your acquired skills and insights will contribute significantly to your future academic and professional success.

We wish you the very best in all your future endeavors!

Bhagirathi Sarath
Program Manager



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COMPANY PROFILE

Signa Tech Solutions LLC is a globally recognized IT services and digital transformation company headquartered in Brookfield, Wisconsin, USA, with a subsidiary, Signa Tech Services Private Limited, based in Chennai, India. With a strong focus on healthcare, life sciences, medical devices, and manufacturing industries, the company delivers cutting-edge solutions designed to drive efficiency, innovation, and business growth. Its core services include Digital Transformation, Remote Infrastructure Management (RIM), Data Analytics & BI Solutions, DevOps, Cloud Services, and Business Process Outsourcing (BPO). Signa Tech leverages advanced technologies such as AI, IoT, and automation to help clients optimize operations, reduce costs, and enhance decision-making through intelligent insights.

A key differentiator for Signa Tech is its domain-specific expertise, particularly in healthcare, where it provides solutions like claims analytics, cloud migration, and patient engagement portals, and in manufacturing, where it enables IoT-driven automation, inventory analytics, and smart supply chain management. The company boasts a robust technology stack, including .NET, React, Angular, Power BI, Tableau, Azure, AWS, and Snowflake, ensuring scalable and secure digital solutions. Signa Tech also operates STAIR Progressive Minds Pvt Ltd, its training and skill development arm, which bridges the gap between industry demands and academic readiness. STAIR offers psychometric assessments, business agility workshops, AI & data science training, and corporate readiness programs, empowering professionals and students with mission-critical skills. With a 90% employee retention rate, a hybrid staffing model (managed resources, shared outsourcing, and fully outsourced services), and a strong emphasis on security and compliance, Signa Tech ensures reliability and continuity for its clients.

The company is led by CEO Siva Dakshinamurthy and a leadership team with over 30 years of international IT experience, fostering a culture of innovation, partnership, and excellence.

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Cardiovascular diseases (CVDs) are the leading cause of death globally, often progressing silently until severe complications arise. Early detection and risk assessment play a crucial role in preventing heart disease and improving long-term health outcomes. Cardio-AI is an AI-powered cardiovascular risk assessment system designed to predict heart disease risk in real time using machine learning techniques. It analyzes key health metrics—age, gender, BMI, total cholesterol, triglycerides, HDL, and LDL—to generate a probability score and categorize users into high-risk or low-risk groups. Built using Python and Streamlit, Cardio-AI provides a modern, user-friendly glassmorphism UI for seamless navigation. At its core, the system integrates a pre-trained Random Forest model with 89.5% accuracy, ensuring reliable risk predictions. Users can register securely, store and manage their health records, track historical trends, and generate comprehensive PDF reports for medical consultation. A MySQL database ensures secure authentication and health data storage, maintaining patient privacy and data integrity. The system features interactive Plotly charts to help users visualize their cardiovascular risk progression over time. Additionally, the Model Information section provides insights into the predictive mechanics, helping users understand the basis of AI-driven recommendations. Cardio-AI bridges the gap between technology and preventive healthcare, providing individuals with actionable insights to make informed lifestyle and medical decisions. With a focus on privacy, usability, and clinical relevance, Cardio-AI empowers individuals to take control of their cardiovascular health. Future enhancements may include real-time wearable device integration, expansion to other chronic disease predictions, and broader clinical validation to improve real-world applicability. By leveraging AI-driven risk assessment, Cardio-AI aims to transform cardiovascular health management and support early intervention strategies.

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Heart Disease Prediction Using Machine Learning

ABSTRACT

Cardiovascular diseases (CVDs) are a leading cause of global mortality, underscoring the need for early detection and risk assessment. Cardio-AI is an AI-powered clinical decision support system designed to predict heart disease risk using a pre-trained Random Forest model with 89.5% accuracy. Developed with Python and Streamlit, it analyzes key health metrics—age, gender, BMI, total cholesterol, triglycerides, HDL, and LDL—to provide real-time probability scores and risk categorization (High/Low).

The system features a modern glassmorphism UI, offering seamless navigation across its core modules: Home, Risk Assessment, Patient Profile, and Model Information. Users can securely register, manage health profiles, track historical data, generate detailed PDF reports, and visualize risk trends with interactive Plotly charts. A MySQL database ensures secure user authentication and health data storage, managed by a custom DatabaseManager class for robust data persistence.

Cardio-AI is designed with a strong focus on privacy, usability, and clinical relevance, providing actionable insights for individuals and healthcare professionals to support preventive cardiovascular care. By leveraging machine learning and interactive analytics, it bridges the gap between technology and healthcare, empowering users with AI-driven early warning tools.

Future enhancements may include real-time wearable data integration, expanded predictive capabilities for other chronic conditions, and broader clinical validation to improve its accuracy and adoption in real-world medical settings.

Project Work towards 17 SDGs is mapped as follows:



Target 3.4: "By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being."



Target 4.7: "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development."



Target 9.5: "Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending."



Target 10.2: "By 2030, empower and promote the social, economic, and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion, or economic or other status."

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I find no word to express profound gratitude to my guide **Dr.E.Srimathi**, Department of Computer Science & Applications (BCA), SRM IST Ramapuram.

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