Project Initialization and Planning Phase

Date	21 JUNE 2025
Project Title	**Arrhythmia Classification with Deep Learning and 2-D ECG Images**
Maximum Marks	3 Marks

Project Proposal report

Project Proposal (Proposed Solution) report	
The proposal report aims to	Transform arrhythmia diagnosis using deep learning, boosting efficiency and accuracy. It tackles manual ECG review challenges, promising faster, more accurate, and scalable arrhythmia detection for healthcare providers and patients. Key features include a deep learning-based arrhythmia classification model, real-time prediction, and a user-friendly web application.
Project Overview	
Objective	The primary objective is to revolutionize arrhythmia diagnosis by implementing advanced deep learning techniques, ensuring faster and more accurate ECG-based arrhythmia classification.
Scope	The project comprehensively addresses the detection and classification of arrhythmias from ECG data by developing and deploying a deep learning model. The model will be integrated into a web application for real-time, scalable, and user-friendly arrhythmia prediction.

Problem Statement	
Description	Manual review of ECG signals for arrhythmia detection is time-consuming, error-prone, and often leads to delayed or missed diagnoses, impacting operational efficiency and patient outcomes.
Impact	Solving these issues will result in improved diagnostic speed and accuracy, reduced clinician workload, and better patient outcomes through timely intervention and monitoring.
Proposed Solution	
Approach	Employ deep learning techniques (multi-layer CNN) to analyze 2D spectral images derived from ECG signals. The model will be trained from scratch (not using transfer learning) to learn hierarchical features for robust arrhythmia classification. The solution will include a web interface for real-time predictions.
Key Features	- Implementation of a deep learning-based arrhythmia classification model (CNN from scratch). - Advanced data augmentation and regularization for improved generalization. - Real-time prediction via a Flask-based web application. - Comprehensive model evaluation using accuracy, precision, recall, and F1-score. - User interface for uploading ECG images and receiving instant results

Resource Requirement

Resource Type	Description	Specification/Allocation
Hardware	Computing Resources	T4 GPU
	Memory	8 GB
	Storage	1 TB SSD
Software	Frameworks	Python frameworks, Flask
	Libraries	scikit-learn, pandas, numpy, matplotlib, seaborn
	Development Environment	Jupyter Notebook, PyCharm
Data	Data	Kaggle dataset, 614 samples, CSV format