FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY (FISAT)

DEPARTMENT OF COMPUTER APPLICATIONS

MAIN PROJECT

SCRUM BOOK

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Name of the Guide: Ms.Joice T

Name of the Scrum Master: Dr.Rakhi Venugopal

Project Title: CNN-LSTM Based Model for ECG Arrhythmias and Myocardial Infarction Classification

GitHub ID: https://github.com/anjalykrishna522002

Sprint Release 1:

Date: 01-02-25

Description of Work:
In the first Scrum release, I focused on developing an automated system for ECG classification using a hybrid CNN-LSTM model to identify Myocardial Infarction (MI), Abnormal Heartbeats, and Normal signals with high precision. I analyzed the limitations of existing systems, highlighting the drawbacks of manual diagnosis and standalone CNN or LSTM models. To address these issues, I proposed a hybrid approach that integrates CNN for spatial feature extraction and LSTM for capturing temporal dependencies, aiming to achieve improved accuracy. Additionally, I conducted dataset research, carefully exploring and selecting a suitable ECG dataset from available sources. I then performed an in-depth study of the dataset, analyzing its structure, features, and preprocessing requirements. To strengthen my approach, I also referred to multiple research papers, studying existing methodologies and insights to validate my model selection and improve the overall system design.
Remarks:

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PRODUCT BACKLOG

1)Data Collection & Preprocessing

- Collect ECG datasets from public sources (Kaggle) or hospital databases.
- Preprocess raw ECG signals by handling missing values and normalizing amplitudes.
- Segment ECG signals into uniform lengths for model input.
- Store processed ECG data in a structured format (CSV/NumPy arrays).

2)Exploratory Data Analysis (EDA)

- Visualize ECG waveforms using Matplotlib & Seaborn.
- Identify anomalies and variations in ECG signals.
- Perform statistical analysis (mean, standard deviation, peak detection).
- Analyze waveforms, peaks, and intervals for feature selection.

3) Model Development & Classification

- Implement 1D CNN for spatial feature extraction.
- Implement LSTM for capturing temporal dependencies.
- Train and test the CNN-LSTM model using ECG datasets.
- Evaluate performance metrics (accuracy, precision, recall, F1-score, AUC-ROC).

4)Model Optimization & Validation

- Tune hyperparameters to improve classification accuracy.
- Perform cross-validation to assess model generalization.
- Compare results with baseline models for validation.
- Address potential overfitting and underfitting issues.

5.Final Testing & Performance Analysis

- Conduct extensive testing on unseen ECG data.
- Analyze classification results and misclassified cases.
- Generate confusion matrices and ROC curves for performance insights.
- Document findings and prepare a final report

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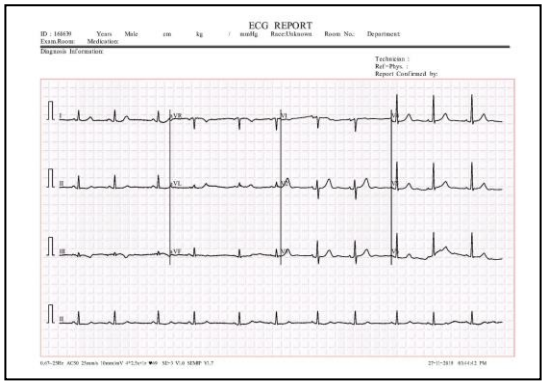
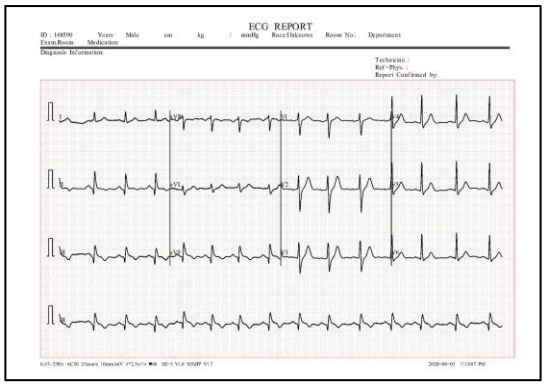
DATABASE & UI DESIGN

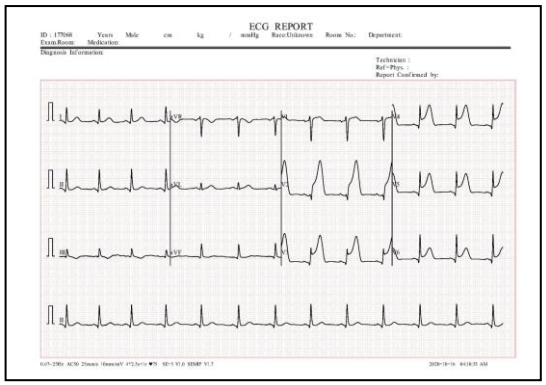
cardiovascular ECG dataset (Kaggle)



NORMAL



ABNORMAL



MYOCARDIAL INFARCTION

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TESTING AND VALIDATION

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DETAILS OF VERSIONS
v1.0 – [01-02-25] • Set up the initial project structure and organized directories. • Collected and studied the cardiovascular ECG dataset from Kaggle (stored in .csv format). • Performed dataset preprocessing, including handling missing values, normalizing amplitudes, and segmenting signals. • Selected key features relevant for ECG classification. • Implemented feature engineering techniques for better model performance. • Trained and evaluated models: CNN, LSTM, and CNN-LSTM hybrid model. • Compared model performance using accuracy, precision, recall, F1-score, and AUC-ROC.

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