ECG Arrhythmia Classification using CNN (MATLAB)

Tools: MATLAB, CNN, Signal Processing, Deep Learning
Dataset: PhysioNet CinC Challenge 2017 (not included)

📌 Overview

This research project implements a **2-D Convolutional Neural Network (CNN)** to classify ECG signals into four classes:

- Normal Sinus Rhythm (NSR)

- Atrial Fibrillation (AF)

- Alternative Rhythm (AR)

- Noisy Signal

The model was developed as part of an academic research project at **Ulster University**.

📊 Results

- **69.4% accuracy** for 4-class classification

- **F1-score: 0.76** for binary AF vs NSR detection

- AUC (AF): **0.82**

🧠 Methodology

- ECG denoising using notch and moving average filters

- Baseline wander removal using Butterworth high-pass filter

- Signal normalization and resampling

- Conversion of 1-D ECG signals to **2-D spectrogram images**

- CNN trained using **ADAM optimizer**

📂 Dataset

The dataset is **not included** due to licensing restrictions.
You can obtain it from:
PhysioNet – Computing in Cardiology Challenge 2017.

⚠️ Disclaimer

This repository contains **research and experimental code** intended for educational and research purposes.