PROJECT:

WIRELESS ECG MONITORING AND HEALTH ANALYSIS USING MACHINE LEARNING

ABSTRACT

This project aims to develop a wireless ECG monitoring system using Arduino Uno that sends data to another device via WiFi or Bluetooth

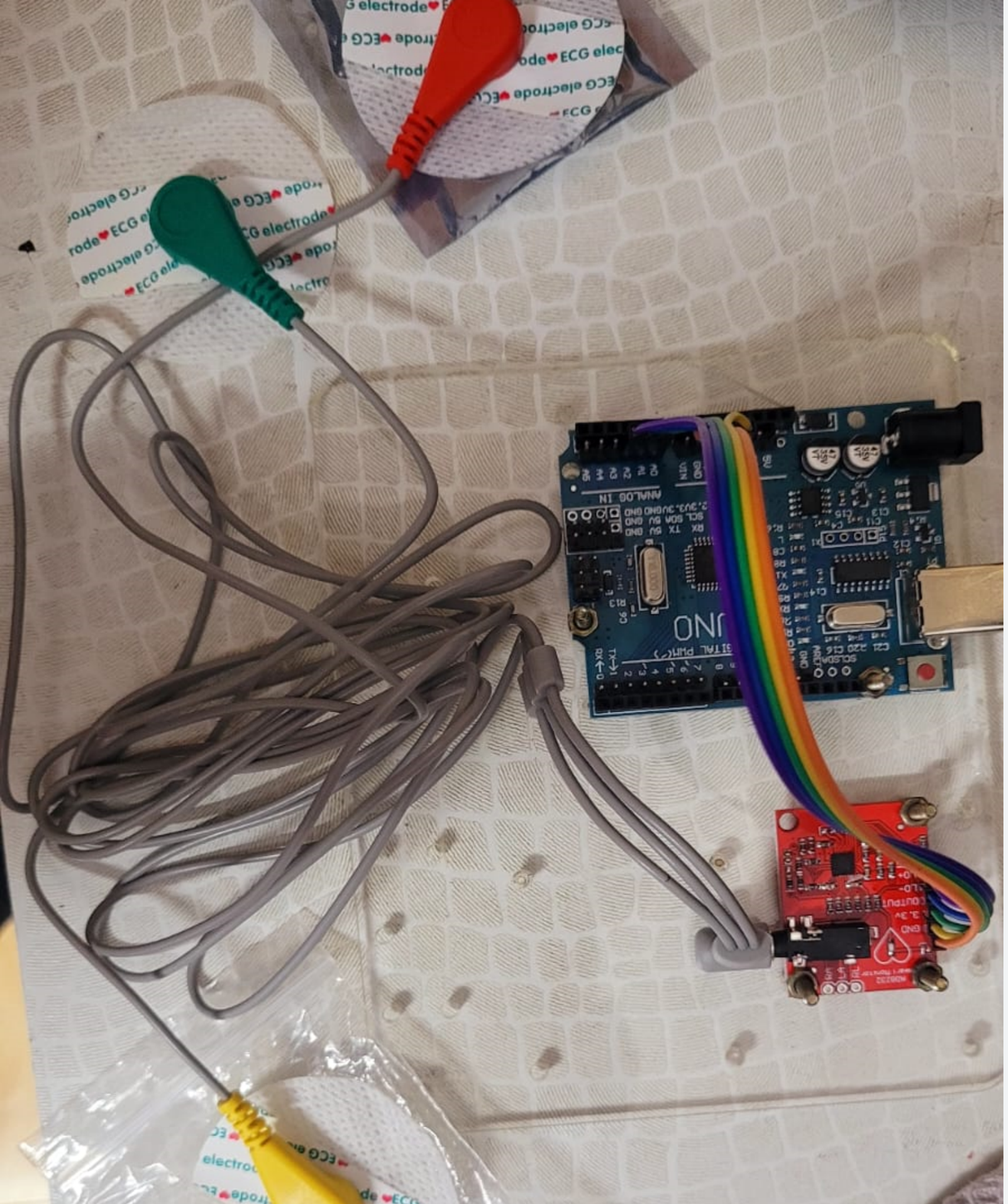
The collected ECG data will be used by a machine learning (ML) model to perform health analysis and provide insights into the user's cardiac health

The project combines hardware design, data transmission, and ML techniques to enable real-time monitoring and analysis of ECG signals

PROPOSED FEATURES

- ECG Signal Acquisition: Arduino Uno will be equipped with an ECG sensor module to acquire real-time ECG signals from the user
- Wireless Data Transmission: Utilize WiFi or Bluetooth connectivity to transmit the acquired ECG data from Arduino Uno to another device (e.g., a computer or smartphone) for further processing and analysis

- ML-based Health Analysis: Develop an ML model capable of analyzing the ECG data to detect abnormalities, identify cardiac arrhythmias, and provide insights into the user's overall cardiac health
- Real-Time Monitoring: Enable real-time monitoring of ECG signals and display the live waveform on a connected device for immediate feedback and observation
- User-Friendly Interface: Design a user interface that allows easy interaction with the system, displays analysis results, and provides recommendations or alerts based on the ML model's output



Prototype

The ECG hardware prototype is a compact and wireless monitoring system that includes comfortable ECG sensors for attachment to the patient's chest. These sensors continuously capture the electrical activity of the heart and transmit the data wirelessly to a centralized monitoring system in real-time. The system is designed to securely store the ECG data, integrate with electronic health records, and incorporates advanced machine learning algorithms for efficient data analysis. With customizable alerts, a patient-friendly interface, and the ability for continuous monitoring, the prototype aims to provide early detection of cardiac abnormalities and improve patient care through data-driven treatment decisions.

KEY MILESTONES

Week 1-2

Research and familiarize with ECG signal processing techniques, ML models for cardiac health analysis, and Arduino programming.

Week 2-3

Assemble the hardware components, connect the ECG sensor module to Arduino Uno, and ensure proper signal acquisition

Week 3-4

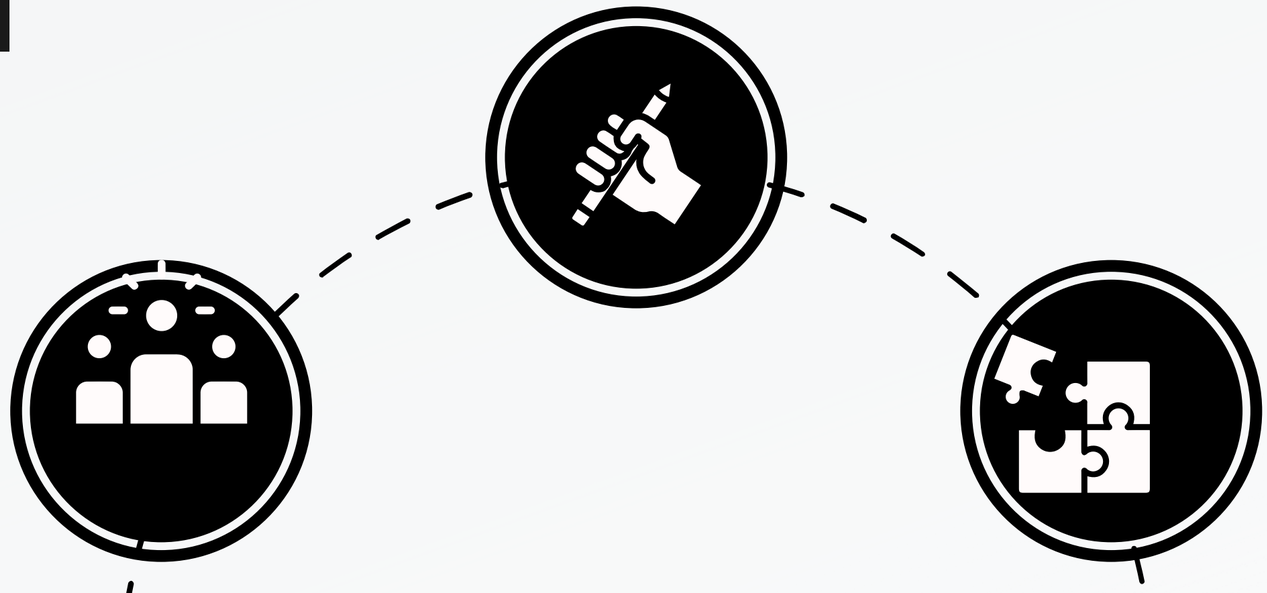
Implement wireless data transmission using WiFi or Bluetooth modules and establish a communication link with the receiving device

Week 4-5

Develop an ML model for health analysis using the collected ECG data and integrate it with the Arduino system

Week 5-6

Design and implement the user interface to display real-time ECG waveforms, analysis results, and recommendations

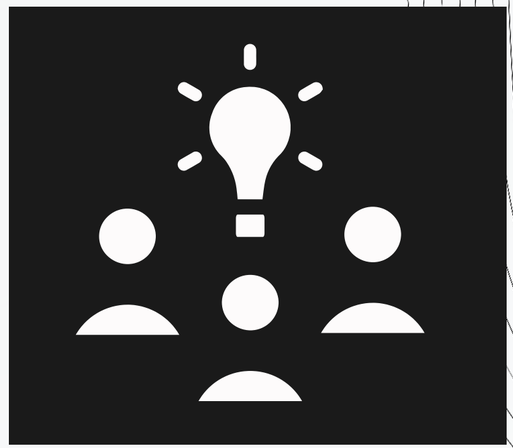


Week 6-7

Test the system's functionality, evaluate the accuracy of the ML model, and refine the prototype based on user feedback

LIST OF COMPONENTS AND BUDGET ESTIMATION

- Arduino Uno board: 600
- ECG Sensor Module: 450
- WiFi or Bluetooth module: 200
- Power supply and connectors: 150
- Display module (LCD or OLED): 200
- Miscellaneous (wires, resistors, etc.): 1000
- Total Estimated Budget: 3000INR



TYPES OF HEALTH ANALYSIS THAT CAN BE PREDICTED USING ECG SIGNALS AND MACHINE LEARNING (ML)

Arrhythmia Detection

ML models can classify ECG signals to identify different types of arrhythmias

Myocardial Infarction (Heart Attack) Prediction

ML models can analyze ECG signals to predict the likelihood of a heart attack or detect signs of ischemia.

Heart Rate Variability (HRV) Analysis

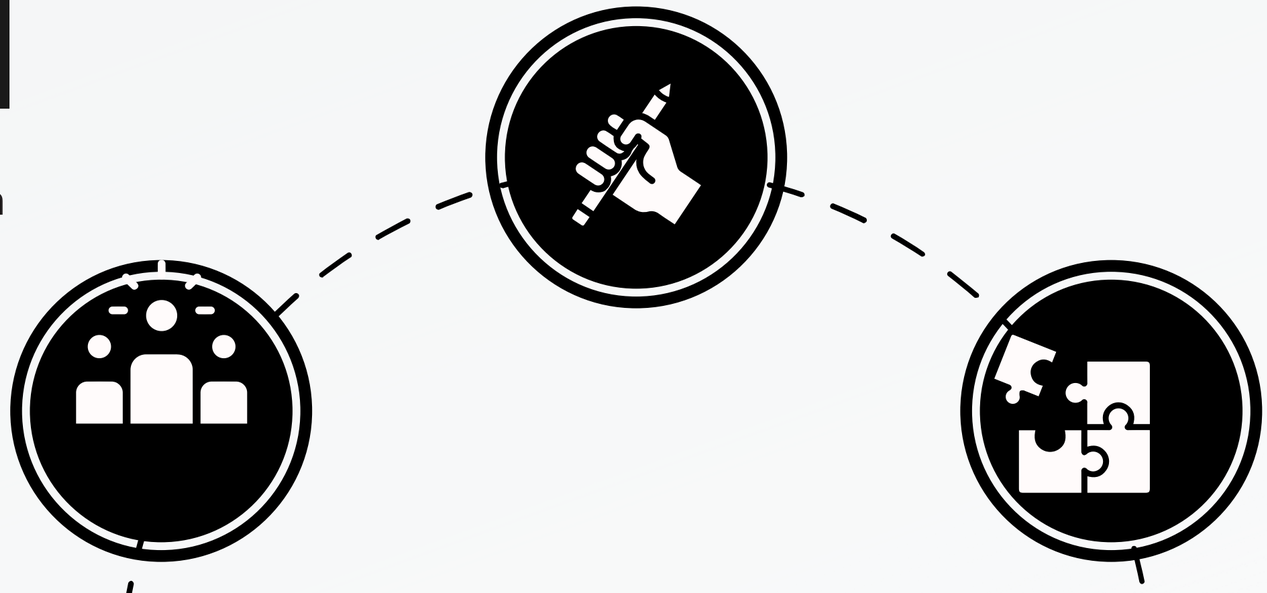
ML models can assess HRV patterns in ECG signals, providing insights into autonomic nervous system activity and overall cardiac health.

Heart Failure Prediction

ML models can analyze ECG signals to predict the risk of heart failure or identify patterns indicative of decreased cardiac function

Long QT Syndrome Detection

ML models can detect prolonged QT intervals in ECG signals, which may indicate a risk of ventricular arrhythmias



Stress and Anxiety Assessment

ML models can assess ECG signals for features related to stress or anxiety levels, providing insights into mental well-being and potential cardiovascular risks.

CONCLUDING REMARKS

This project aims to create a wireless ECG monitoring system using Arduino Uno, enabling real-time transmission of ECG data for health analysis. By combining hardware design, wireless communication, and ML techniques, the system has the potential to provide valuable insights into cardiac health and facilitate timely interventions. Further optimization and validation of the ML model will be necessary to ensure accurate and reliable health analysis

REFERENCES

Include a list of relevant books, research papers, websites, and resources that were consulted during the project planning and implementation phase

MIT-BIH Arrhythmia Database: Contains ECG recordings of different arrhythmias

PhysioNet: Provides a wide range of ECG datasets for various applications, including arrhythmia detection and cardiovascular research

PTB Diagnostic ECG Database: Includes ECG recordings from healthy individuals and patients with various cardiac conditions

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THANK YOU