

# Developing an ECG Sensor and Smartphone Application to Monitor the Cardiac Health of Remote Patients

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An electrocardiogram (ECG) is a method used to monitor the cardiac health of patients, but ECG is typically collected in the presence of a clinician. The primary goal of this project was to create an electrocardiogram (ECG) measurement device that is connected to a compatible software application, which can output data sufficiently accurate to be used for patient-administered medical monitoring in a remote setting. A 3-Lead ECG device was developed using an ESP32 microcontroller and an AD8232 module, which is an integrated signal conditioning block for ECG. In order to confirm the reliability of the device's collected signal, we compared it to verified ECG signals from the Physionet ECG database. An Arduino program was uploaded to the ESP32 that initializes data transmission. The ECG device communicates with the software application wirelessly by sending data through Amazon Web Services (AWS), a cloud-based computing service that can securely analyze, organize, and direct data to its final destination. In AWS, lambda functions were created based on previously researched Signal Quality Indices (SQIs) to categorize the signal as Excellent, Barely Acceptable, and Unacceptable. Depending on the signal's categorization, the smartphone application relays to the patient whether the ECG device needs to be adjusted and the signal re-collected. ReactNative was utilized as the framework for the mobile application. Distinction of our approach and device design from competing devices on the market lie in our novel IoT cloud computing methods, real-time feedback to the patient about signal quality, and patient data encryption methods.

