CS3520 Project

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Project Title: Health Monitoring System

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Course: CS3520-Computer Organisation and Architecture 1

**Introduction**

The project focuses on the design of a Health Monitoring System that monitors patients’ health data and guides patients with their health issues if abnormalities are detected, and it provides tips to support self improvement and healthier habits.This system addresses the urgent healthcare challenges in Africa, especially in rural areas where medical facilities are scarce and healthcare services are sometimes beyond reach. By using affordable AI powered technology, our solution wants to make healthcare more accessible, affordable, and proactive. The ultimate goal of this project is to design a custom RISC-V based processor with built in AI capabilities tailored to the workloads of health monitoring applications. Such a processor will enable efficient handling of sensor data acquisition, lightweight AI inference, and secure communication, ensuring the system remains both energy-efficient and reliable for deployment in resource constrained environments.

### **Domain Analysis**

Mobile phones are the backbone of African technology, with most people able to own them due to their accessibility and affordability. The aim of this project is to design an **AI-powered, low-cost processor** based on the RISC-V architecture that can be embedded in mobile phones to assist communities in remote areas with **basic health monitoring**.

This solution is vital because it bridges the gap created by limited healthcare infrastructure, where clinics are scarce and mostly focused on chronic diseases. By leveraging mobile technology, the processor will empower users to stay up to date with their health while also providing healthcare centres with continuous patient data for follow-ups.

The primary healthcare tasks this processor should support are:

1. Monitoring vital signs such as heart rate, body temperature, and physical activity (e.g., step counting).
2. Early detection of anomalies in monitored health data.
3. Daily data logging for maintaining up-to-date health records.
4. Communication between patients and healthcare providers, allowing remote health monitoring and alerts in case of emergencies.

The processor must be **low-cost, energy-efficient, and customizable**, since it targets low-income communities with limited access to reliable electricity and internet.

### **Workload Requirements**

To support the above domain, the processor must handle the following computational tasks:

1. **Data Acquisition** – Collect data from health sensors (or simulate sensor readings in code).
2. **Signal Processing** – Clean, filter, and prepare raw sensor data for analysis.
3. **AI Inference** – Run lightweight machine learning models to classify and detect health anomalies.
4. **Communication** – Send results and alerts to remote servers or healthcare workers using lightweight protocols (SMS/USSD or internet if available).
5. **User Interaction** – Present results to the user in an understandable way (notifications, simple messages).

These workloads directly inform the design of the RISC-V processor’s instruction set, microarchitecture, and performance evaluation.