Human Activity Recognition System

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What is the problem?

Recognizing human activity in our world is a challenging problem that requires precise detection and classification of various activities, yet current approaches often lack the necessary **accuracy** and **reliability**, impeding the goals of **monitoring health** and **fitness activities, preventing injuries**, and **aiding the elderly or disabled**.

Solution!

The solution involves developing a comprehensive **Human Activity Recognition System** using **Machine Learning** that addresses the limitations of current approaches and provides accurate, reliable, and user-friendly activity recognition capabilities.

HAR System

Human Activity Recognition (HAR) model is the task of automatically detecting and classifying human activities based on sensor data, such as accelerometer and gyroscope readings.

Technologies

## Machine Learning **(IEEE KFS SB)**

- Data Pre-processing
- SVM Algorithm

Arduino Platform **(self-learned)**

- ESP8266 NodeMCU **(dev board)**
- MPU-6050 Sensor **(sensor)**
- Eloquent library **(loading model)**
- Web Server **(real-time)**
  - HTML and CSS
 - JavaScript
  - HTTP protocol

Support Vector Machine

- (SVM) is a supervised learning machine learning algorithm that can be used for both **classification** or **regression** challenges. However, it is mostly used in classification problems.
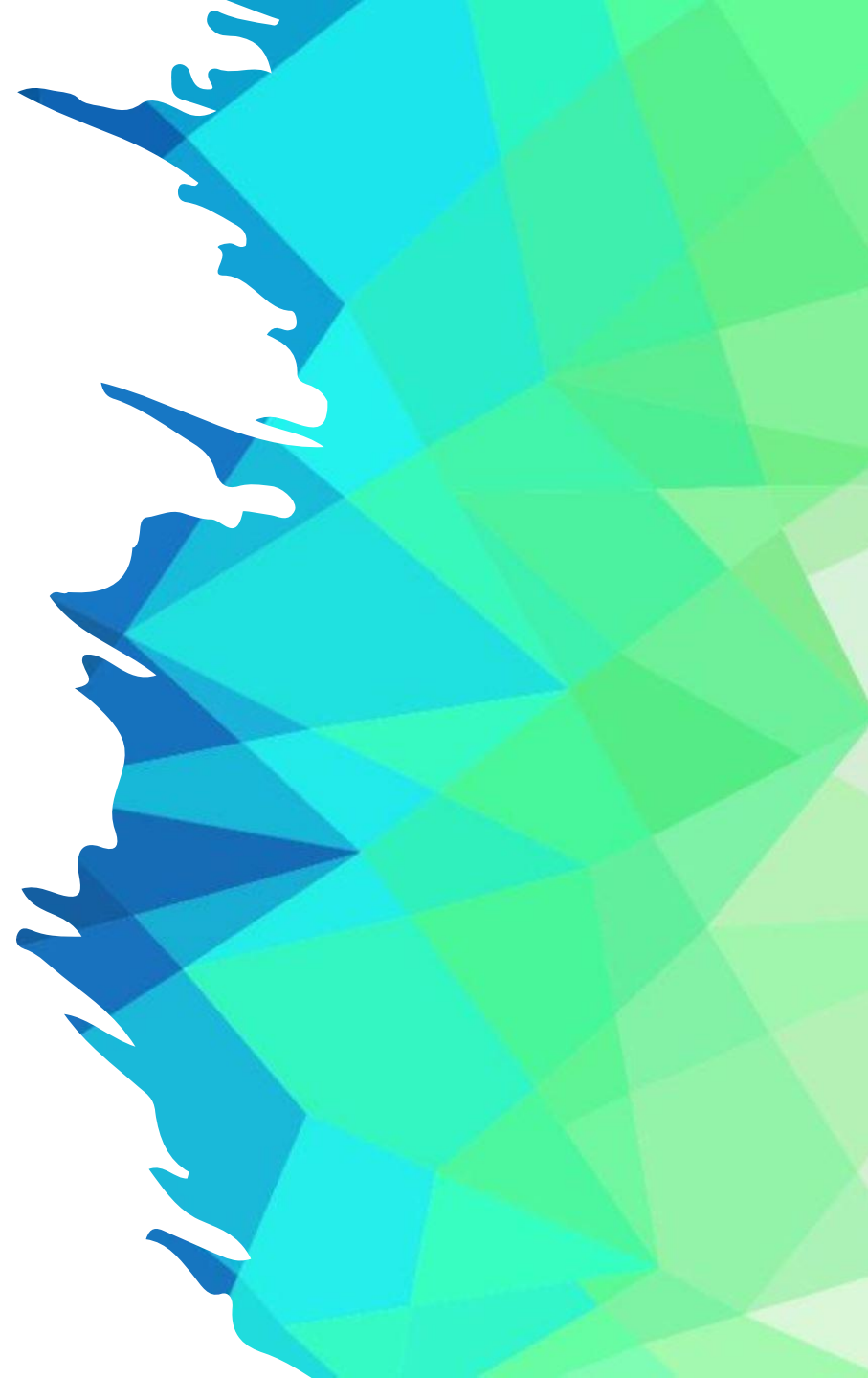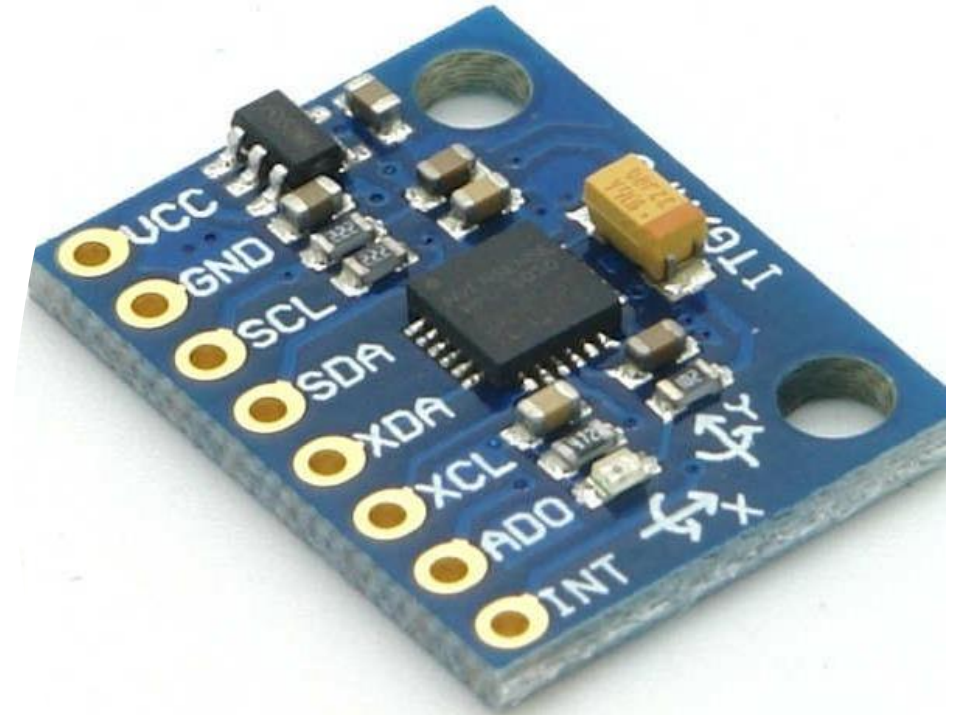
ESP8266 NodeMCU Development Board

The ESP8266 NodeMCU Development Board is a **low-cost** microcontroller board that features the ESP8266 **WiFi module**, allowing it to connect to the internet and perform various IoT and web-related tasks.
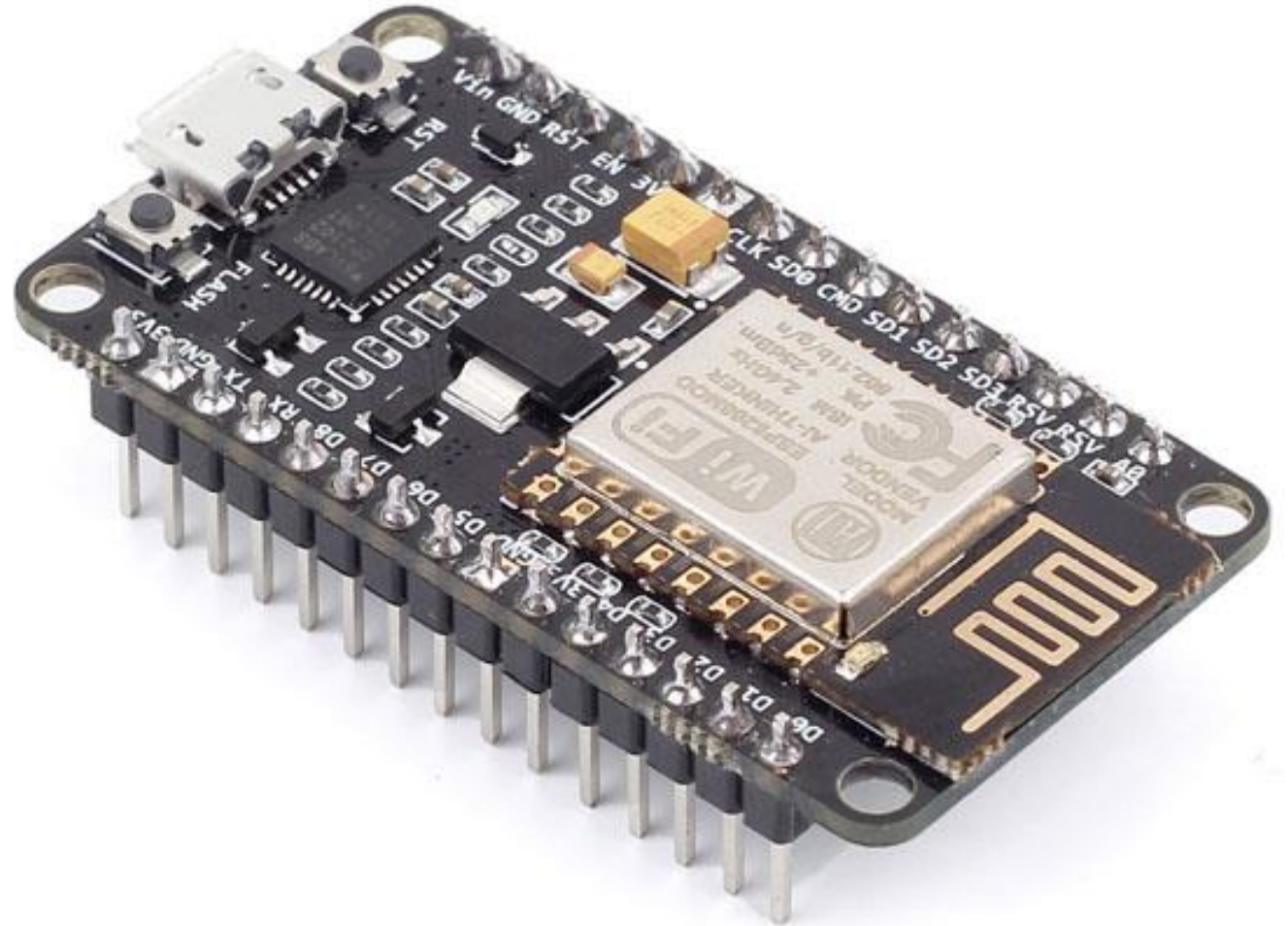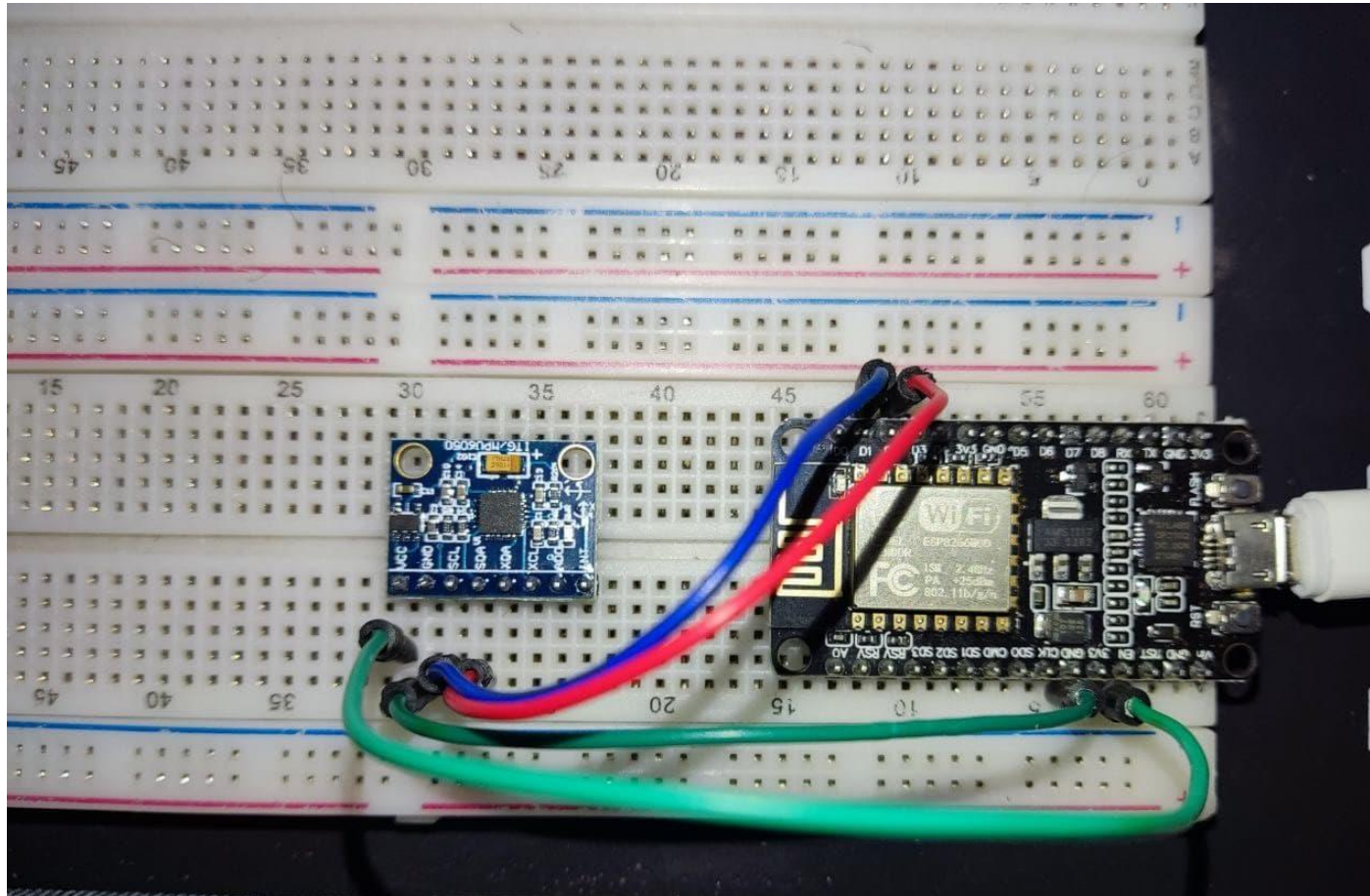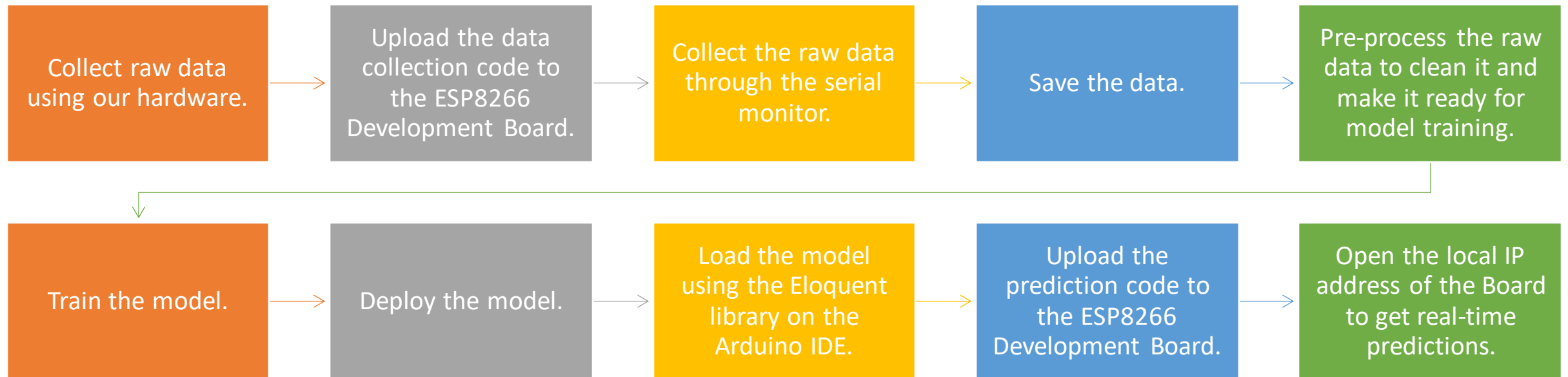
MPU-6050 Module

The MPU-6050 module is a 6-axis **accelerometer** and **gyroscope** sensor module that can measure **motion, tilt, vibration, and orientation** in various applications such as robotics, drones, and gaming.

HAR Device

Project Steps

Collect raw data using our hardware. → Upload the data collection code to the ESP8266 Development Board. → Collect the raw data through the serial monitor. → Save the data. → Pre-process the raw data to clean it and make it ready for model training.

Train the model. → Deploy the model. → Load the model using the Eloquent library on the Arduino IDE. → Upload the prediction code to the ESP8266 Development Board. → Open the local IP address of the Board to get real-time predictions.

Benefits/Goals of the HAR system

- Providing accurate and real-time data on their **health** and **fitness** activities, which can help them track their progress and achieve their goals more effectively.

- Providing guidance and feedback on proper form and technique during **physical activities**, which can help **prevent injuries** and improve performance.

- Assisting **elderly** or **disabled individuals** with safety and daily living activities.

What I have learned with IEEE

I had a simple background with machine learning, but I learned a new algorithm called **Support Vector Machine** and used it to train the model and more knowledge in data pre-processing.

Summary

My name is Ashraf Abdulkhaliq and this my project an Arduino-based human activity recognition system using an MPU-6050 accelerometer and ESP8266 NodeMCU development board, designed to provide real-time activity predictions and benefit users interested in tracking their physical activity.