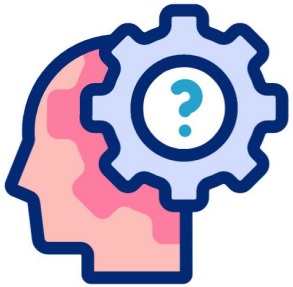
Gym Tracker

Presentation

- **Problems & possible solutions**
- **Our solution**
- **App development**
- **Conclusions**
- **Demo**

Problems

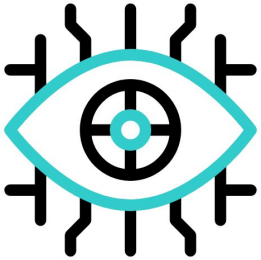


- **Monitoring is subjective**: Many individuals lack access to professional trainers, and even when they do, feedback can still be subjective.
- **Cost of personal trainers**: Hiring a personal trainer is expensive, making it difficult for many to access personalized workout guidance.
- **Home workouts lack feedback**: Users often struggle to ensure they're performing exercises correctly, leading to poor results or injuries.
- **Wearable devices**: Wearable technology has shown promise in fitness tracking but often lacks detailed exercise recognition.

Exercise Tracking Challenges

- **Precision vs. tolerance**: Movement recognition needs to be precise for accuracy but tolerant enough to handle natural variations in form.
- **Feedback**: To offer guidance, processing must be instantaneous, most of the time and therefore computally demanding.
- **Comfort vs. sensor accuracy**: Wearables must balance being comfortable to wear while maintaining high sensor data fidelity.

Possible Solutions



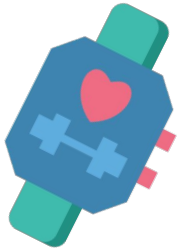
Computer vision systems:

- *Strengths*: Accurate pose estimation and form analysis.
- *Weaknesses*: Privacy concerns, fixed location dependency, and high computational requirements.

Smartphone accelerometers:

- *Strengths*: Accessible due to wide smartphone ownership.
- *Weaknesses*: Limited placement options, lower-quality sensors.

Possible Solutions



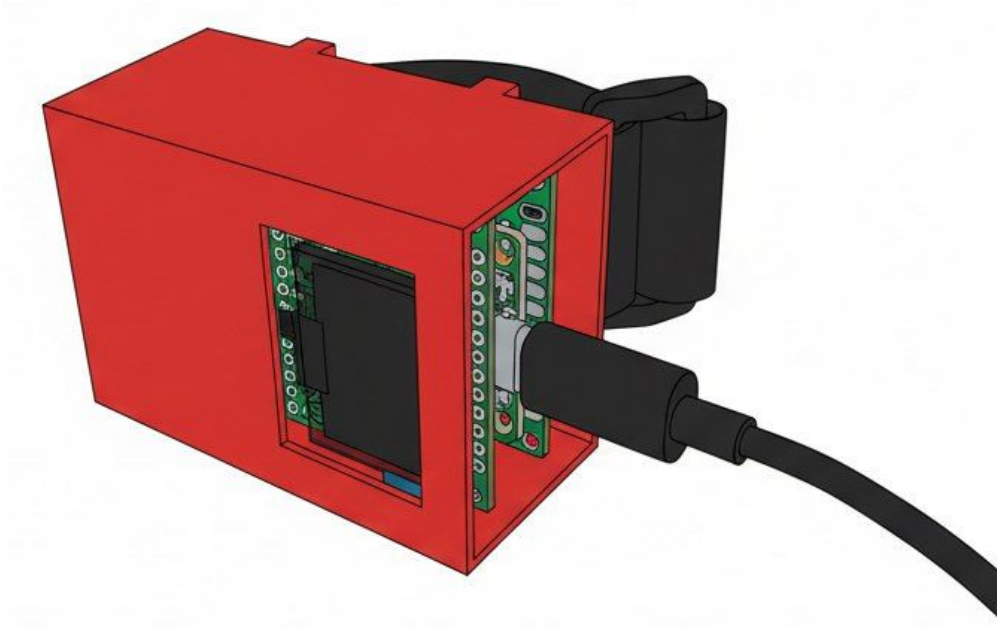
Commercial fitness trackers:

- *Strengths*: Easy to wear, tracks basic metrics.
- *Weaknesses*: Closed ecosystems, limited exercise variety, and lack of advanced feedback mechanisms.

Custom wearable sensors:

- *Strengths*: Tailored for specific exercises, open development, and flexibility in placement.
- *Weaknesses*: Additional hardware costs and setup complexity.

Our Solution



Tecnologies

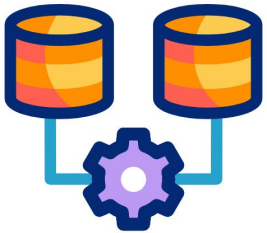
1. **ESP32-based dual sensor system**:
    - ESP32 microcontroller for its processing power and built-in Bluetooth connectivity.
    - Supports real-time wireless data transmission.
2. **MPU6050 IMU sensors**:
    - 3-axis accelerometer and gyroscope for motion data.
3. An **oled** screen for direct feedback
4. **3D Printed Shell.**

Hardware

- **Sensor fusion algorithm**: Combines two IMU sensors (accelerometer and gyroscope) in order to produce, as faithfully as possible, accurate motion metrics.

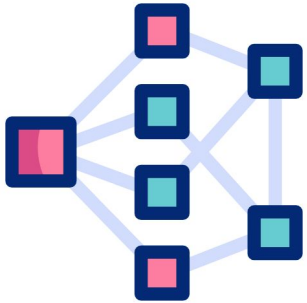
- Devices communicate through the **I2C protocol**.

Software: Detection System



- **Dataset**: Collected data for three exercises:
  - *REST*: Represents periods of inactivity or minimal movement to establish baseline metrics.
  - *CURL*: Cyclical bicep movement with moderate acceleration and rotation.
  - *ARNOLD_PRESS:* A complex exercise involving both high acceleration and rotational activity.

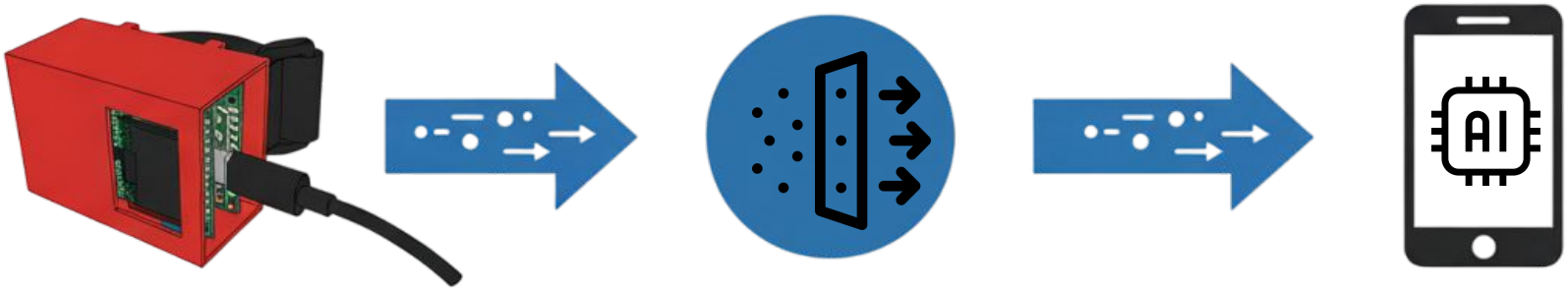
Software: Detection System



- **Machine Learning Model**:
  - *Model*: A lightweight Random Forest classifier was selected for its balance between accuracy and computational efficiency.

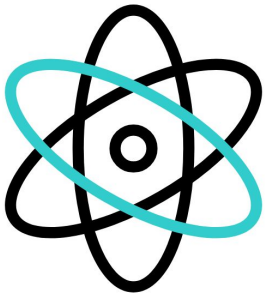
- Moreover, the model was trained with circa 50.000 samples.

Software: Detection System



Software: App – React Native

- Real time AI assistant in exercise recognition during execution.
- Feedback on form and movement quality.
- Workout Schedule.



Get Started

Let's personalize your fitness journey

Tap to change profile picture

Name

John

Weight (kg) 70

Height (cm) 175

Experience Level

Beginner | Intermediate | Advanced

Let's go →

By continuing, you agree to our Terms of Service & Privacy Policy

Welcome Back,

Andrea

Today's Workout

Find out today's workout!
Tap to see the scheduled exercises

AI-Training Assistant

Start AI Training Session
Real-time exercise tracking and analysis

AI-Correction Exercises

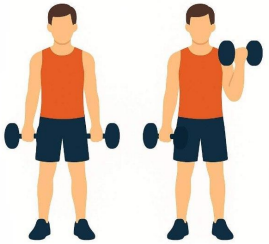
Curl
Biceps, Forearms

Connect Device First

View Training History

Recent Sessions

No training sessions yet. Start your first AI-guided workout!



Curl

Upper Body

Beginner | 15 min

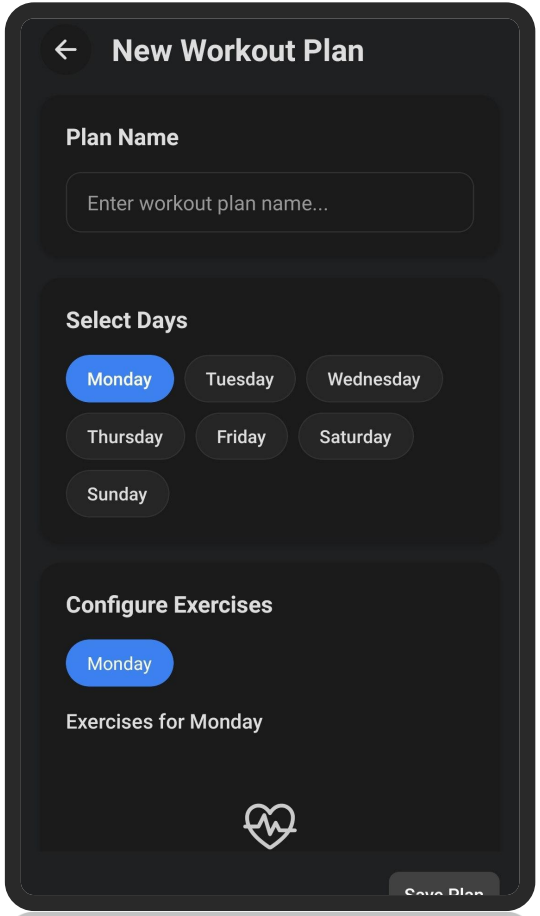
Description

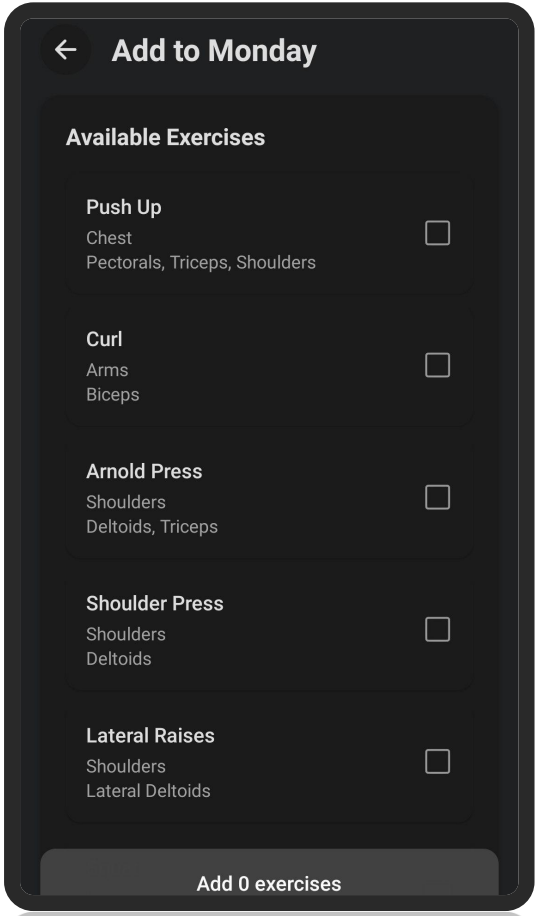
Curls are an isolation exercise that primarily targets the biceps muscles. This classic movement helps build arm strength and definition while improving grip strength.

Steps

1. Stand with your feet hip-width apart, holding dumbbells or a barbell with an underhand grip.
2. Keep your elbows close to your sides and

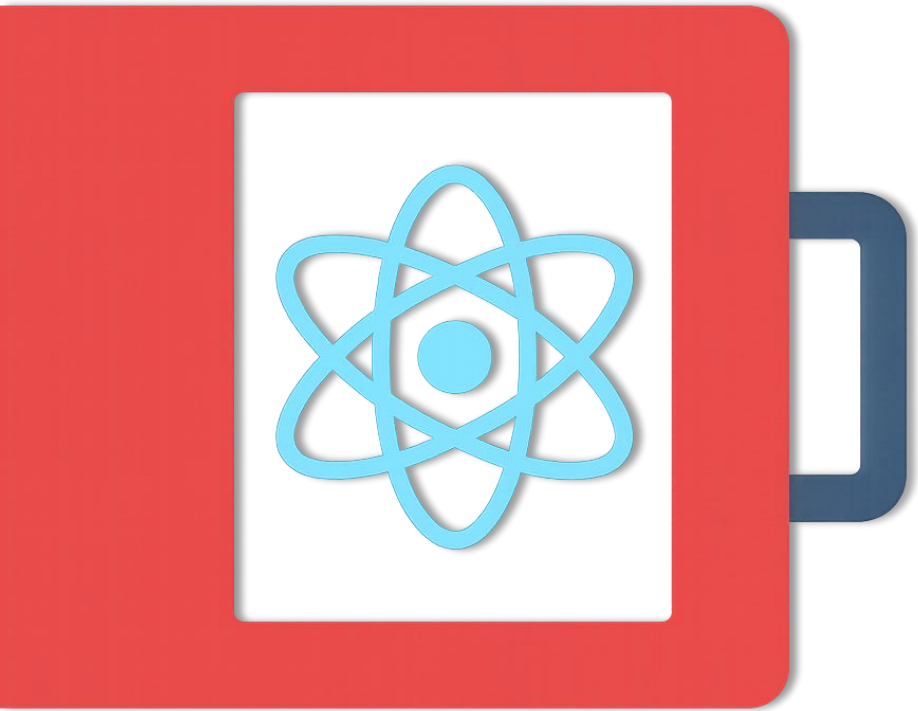
Connect Bluetooth First


New Workout Plan
Plan Name
Enter workout plan name...
Select Days
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
Configure Exercises
Monday
Exercises for Monday


Add to Monday
Available Exercises
Push Up
Chest
Pectorals, Triceps, Shoulders
Curl
Arms
Biceps
Arnold Press
Shoulders
Deltoids, Triceps
Shoulder Press
Shoulders
Deltoids
Lateral Raises
Shoulders
Lateral Deltoids
Add 0 exercises

Future Works

- **Expanded Exercise Library**:
  - Extend support to over 20 exercises.
  - Allow users to define custom exercises.
- **Enhanced Feedback**:
  - Provide further insight and analysis on the exercises execution.
- **Hardware Optimizations**:
  - Introducing battery module
  - Multi-point sensor setups for complex movements



Thank You!

Live Demo