# Pocket IMU Lab

Turn your phone into a mini IMU lab. Visualize orientation in 3D, count steps, and export motion data as CSV — all in a single HTML file you can host on GitHub Pages.

Pocket IMU Lab Thumbnail

## ✨Features

- **3D Orientation Viewer** — Real-time phone orientation rendered with Three.js
- **Sensor Permissions UX** — One-tap flow for iOS/Android
- **Calibrate Zero** — Set a custom reference pose
- **Step Counter** — Simple peak detection on acceleration magnitude
- **Data Logger** — 50 Hz sampling; Start/Stop; **Export CSV**
- **Local-first** — No backend, no API keys; perfect for GitHub Pages

## 🌳Quick Start

1. Copy `index.html` (in this repo) to your project root.
2. Open it on a **real phone** (sensors are needed).
3. Tap **Enable Sensors** and grant permissions.
4. (Optional) Tap **Calibrate Zero** while holding the phone in your reference pose.
5. Tap **Start** to log; **Export CSV** when done.

> **iOS tip:** On Safari/Chrome iOS, you must explicitly allow Motion & Orientation access when prompted.

## 🕊️CSV Format

`imu_log.csv` columns:

```
t, alpha, beta, gamma, ax, ay, az, steps
(s) (deg)  (deg) (deg)  (m/s^2)
```

- `t` — seconds since logging start - `alpha, beta, gamma` — Z-X-Y intrinsic angles (DeviceOrientation spec) - `ax, ay, az` — acceleration (including gravity fallback); units m/s² - `steps` — running step count from a simple peak detector

### How It Works

- **Orientation:** Uses `deviceorientation` (alpha/beta/gamma) and applies calibration offsets before rotating a 3D “phone” model.

- **Steps:** Computes accel magnitude, subtracts ~g, then detects peaks with hysteresis to increment a count. This is intentionally simple and great for improvement PRs.
- **Logging:** A 50 Hz interval samples the latest sensor values into an in-memory buffer; exports a CSV blob.

## 🦠Tech

- **Three.js** (rendering)
- **Tailwind CSS** (styling)
- Vanilla JS (no build tool, no deps)

## Deploy to GitHub Pages

1. Create a new repo (e.g., `pocket-imu-lab`).
2. Add `index.html` and this `README.md`.
3. Add `pocket-imu-thumbnail.png` (provided in this repo) for a nice preview.
4. Commit & push.
5. Repo → **Settings** → **Pages** → *Deploy from branch* → `main` → `/ (root)`.
6. Open the Pages URL on your phone.

## 🌀Ideas for Extensions

- Motion trail for orientation (quaternion or Euler over time)
- Low-pass/Biquad filtering + step detector improvements
- CSV **import & charting** inside the app
- Map phone orientation to a simple robot arm or camera rig in the scene

## Contributing

PRs and issues welcome! Please keep the project dependency-free.

## 🦤License

MIT — do whatever you want, attribution appreciated.