

Meet the team



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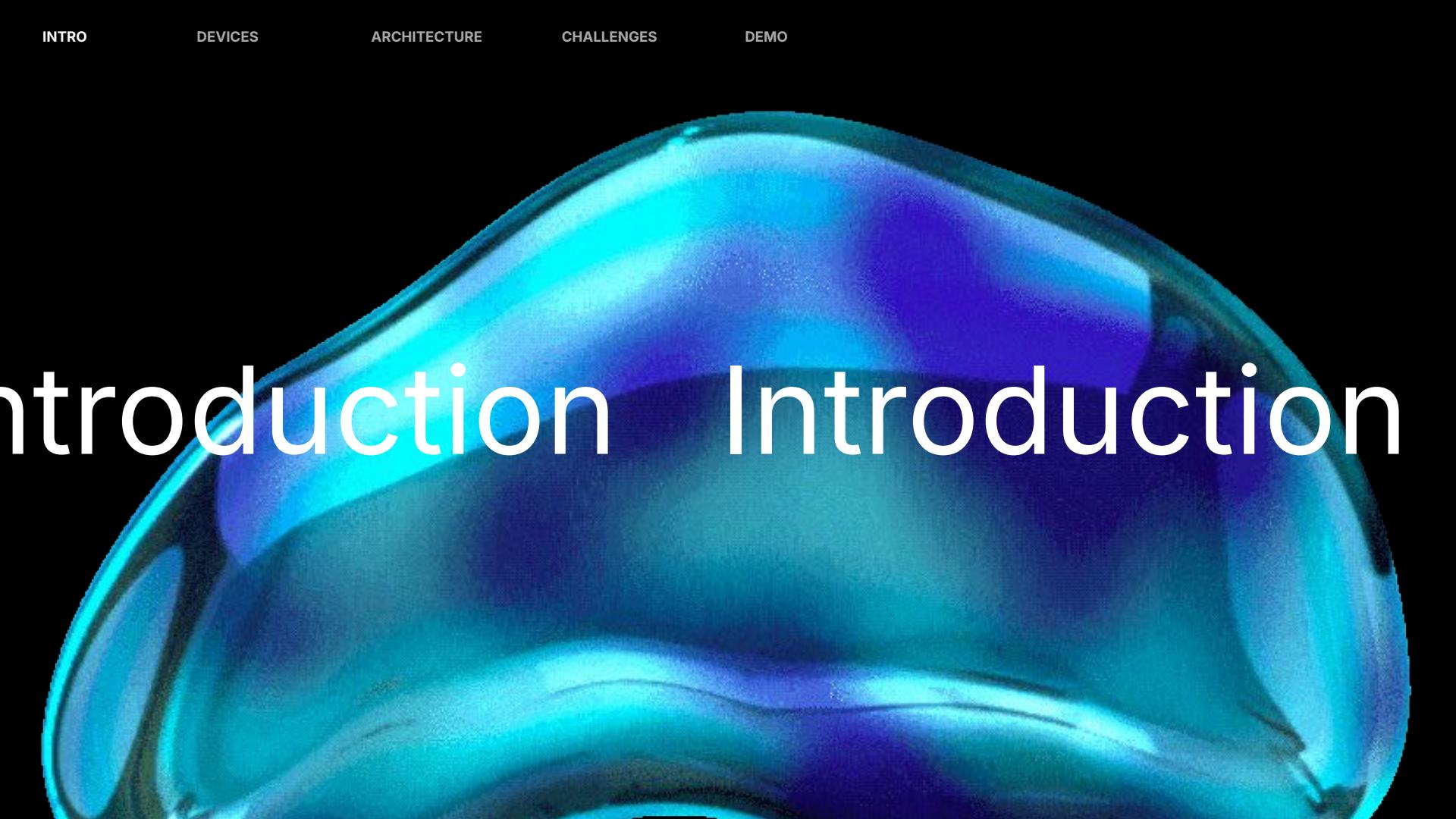
INTRO

DEVICES

ARCHITECTURE

CHALLENGES

DEMO



Introduction

What is it?

A two-device smart system designed to guide, monitor, and analyze workouts:

SAFE Personal Trainer Hub

- Tracks form using camera + AI pose estimation
- Provides AI feedback and real-time workout stats

SAFE Personal Trainer Armband

- Monitors heart rate and counts reps
- Sends live data wirelessly to the Hub via bluetooth



Accessible, affordable,
and safe personal
training for all.



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DEVICES DEVICES DEVICES

The Hub (RPi5)

- Brain of the system
 - Captures video
 - Passes video to pose estimation/form analysis loop
 - Displays real-time stats passed from armbands
 - Functionality wrapped in user-friendly GUI



The Hub Device List

Raspberry Pi 5 — Processes video, runs CV-model, hosts the user interface, and stores workout data.

Touch Screen — Displays live video, stats, and feedback; enables user interaction.

Camera (Raspberry Pi Camera V3) — Captures user movement for analysis.





The Armband (Pico)

- Wearable device that monitors the user's heart rate and movement.
- Automatically counts repetitions during exercises.
- Allows the user to wirelessly start and end workouts.
- Transmits data via Bluetooth to the Hub for real-time display and analysis.

The Armband Device List

Raspberry Pi Pico — Collects sensor data and manages Bluetooth communication.

Heart Rate Monitor — Tracks heart rate to assess workout intensity and safety.

Accelerometer — Detects motion to count repetitions.

Button — Lets the user start/stop workouts remotely.



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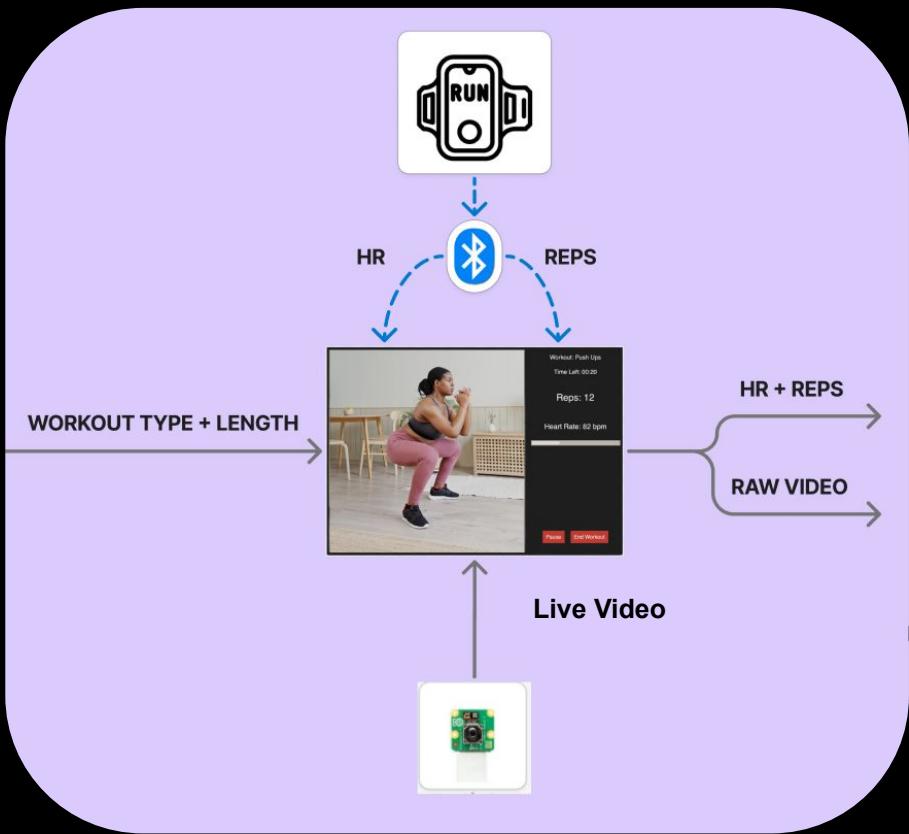
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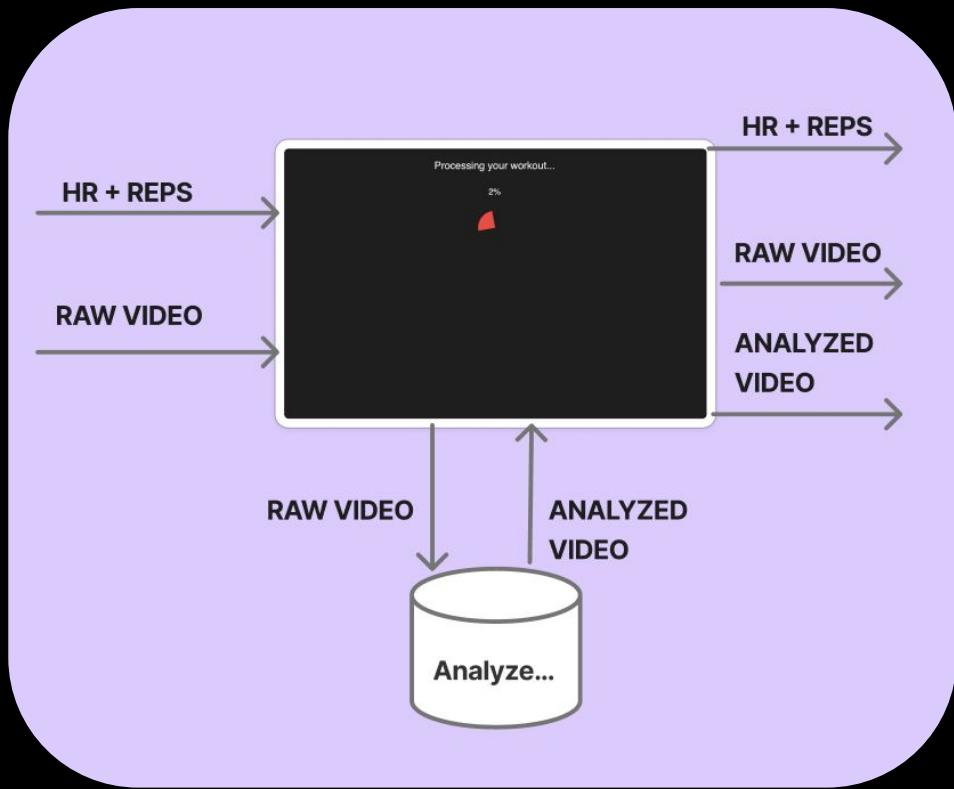
JURE ARCHITECTURE AR



System Architecture & Data Flow



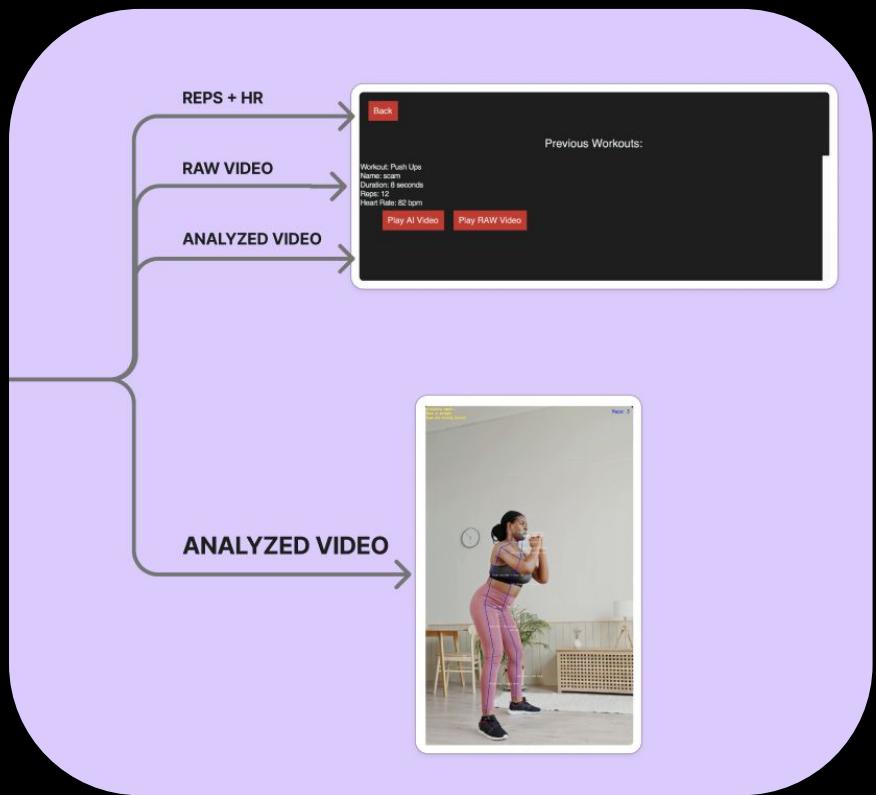
– During Workout –



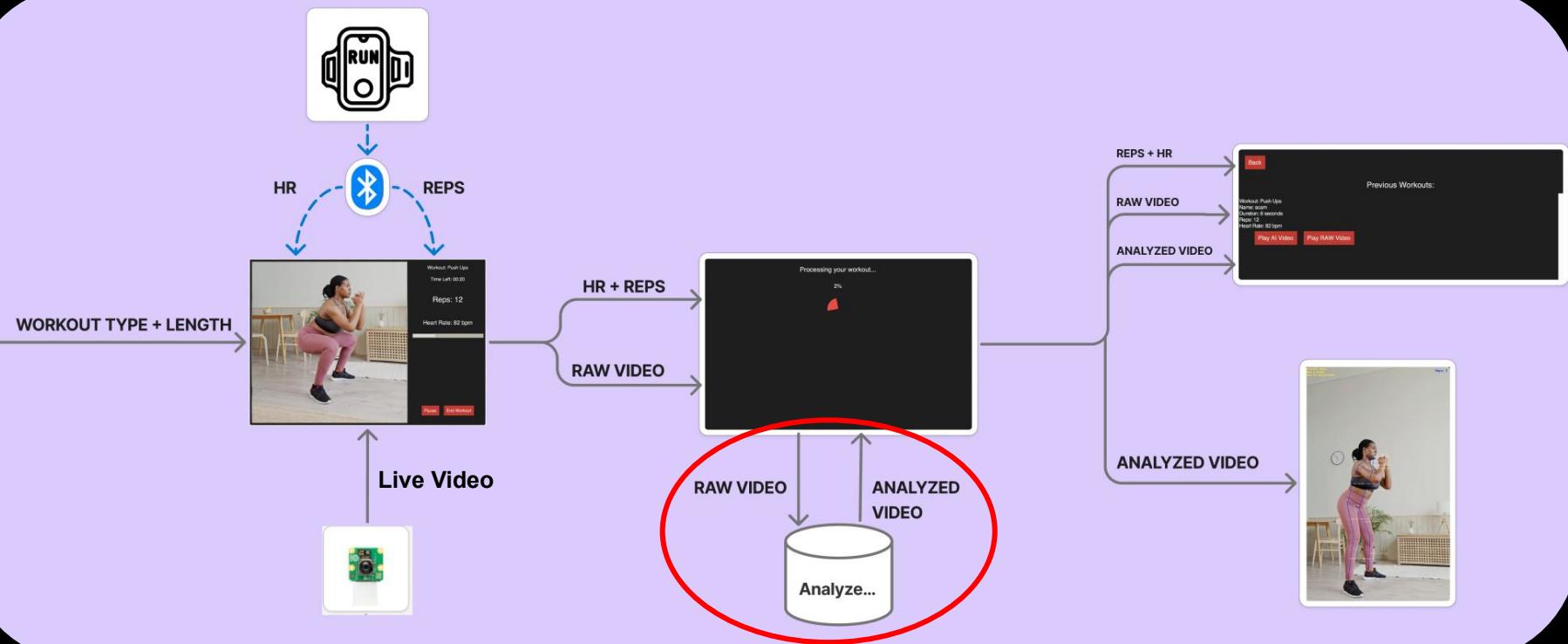
System Architecture & Data Flow

– Data Processing –

System Architecture & Data Flow



– Post Processing –



Video Processing

Step 1: Call MoveNet model API to perform pose estimation.

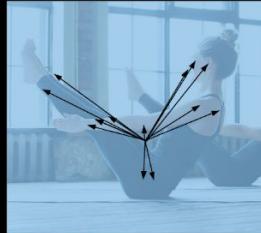
Step 2: Use key points to draw angles + evaluate form.



MoveNet



- Lightning 4 pretrained model → more efficient for the Pi
- 17 key points
- Output per keypoint = (X, Y, confidence)



Form Evaluation



- Joint angle calculation
 - Hip-knee-ankle for squats
 - Shoulder-elbow-wrist for push-ups
- Posture alignment measurement
 - Hip-shoulder vs. vertical/horizontal for back/plank
- Threshold-based feedback

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Challenges Challenges Challenges



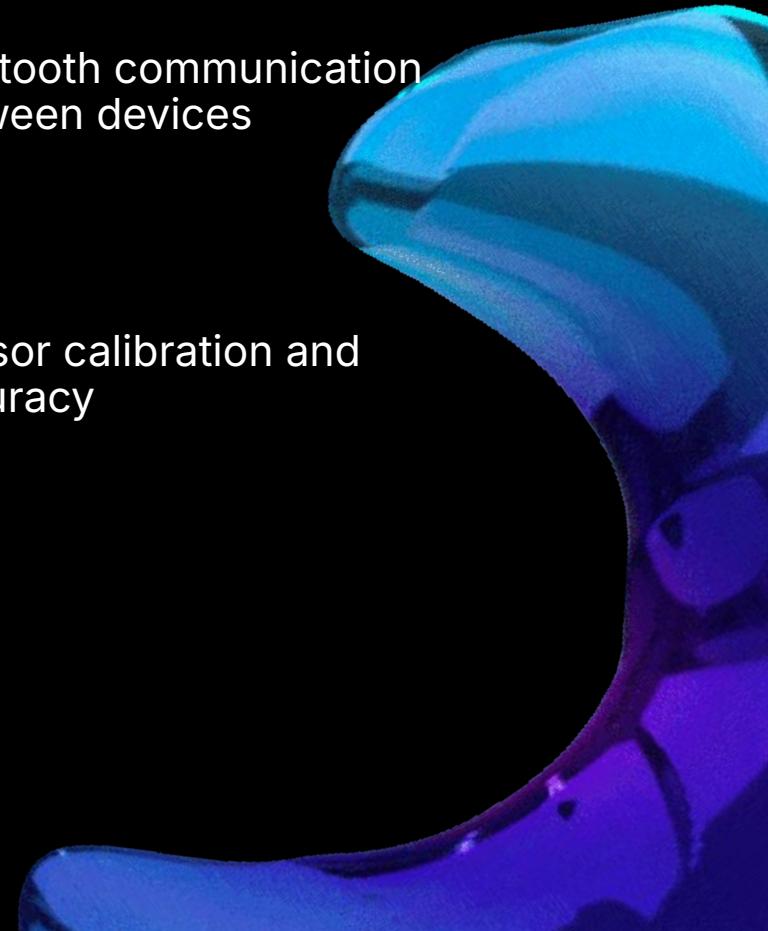
Migration to Raspberry Pi Environment

Model Inference Performance on RPi 5

Memory Footprint during Post-Workout Analysis

Bluetooth communication between devices

Sensor calibration and accuracy



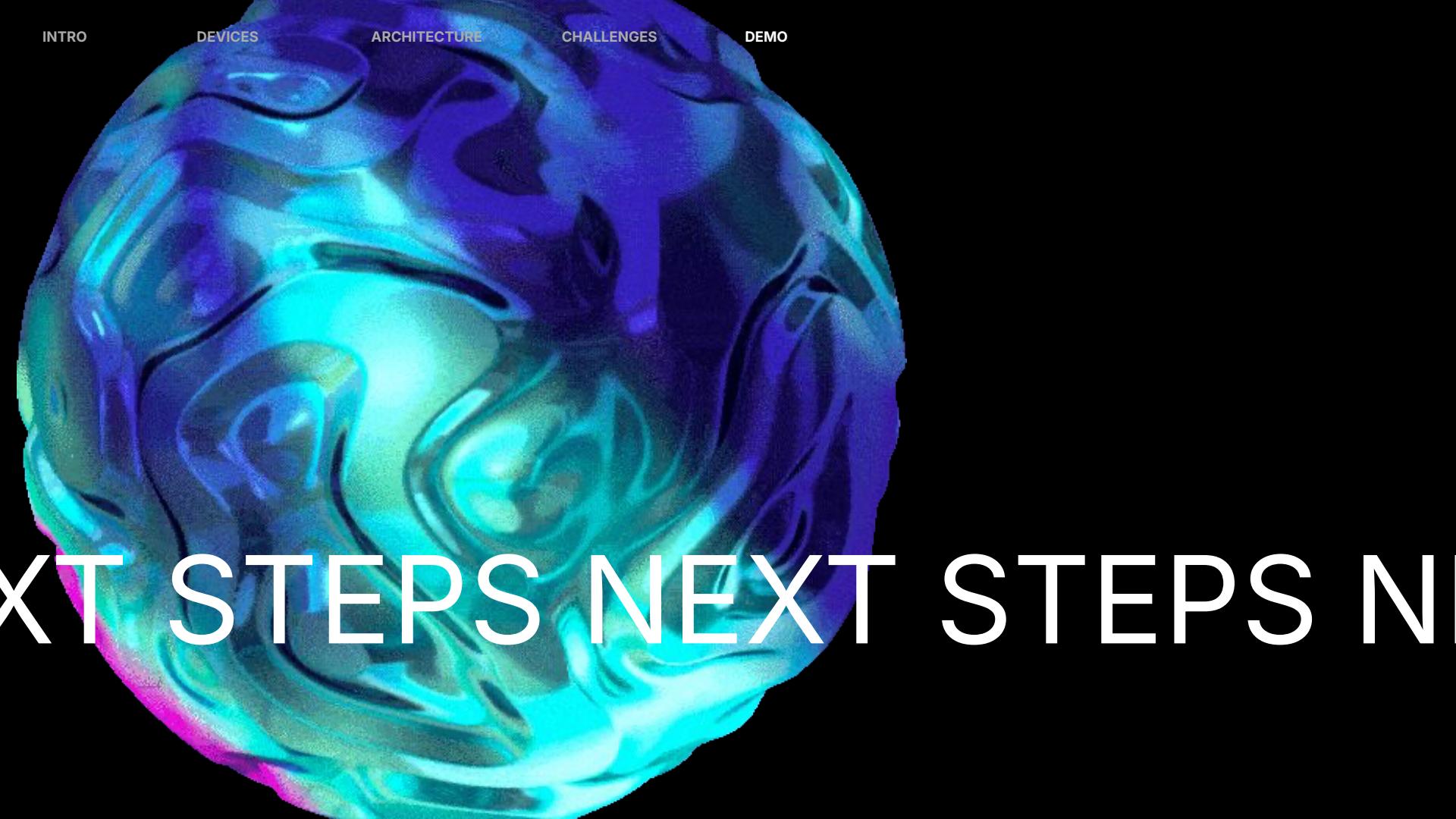
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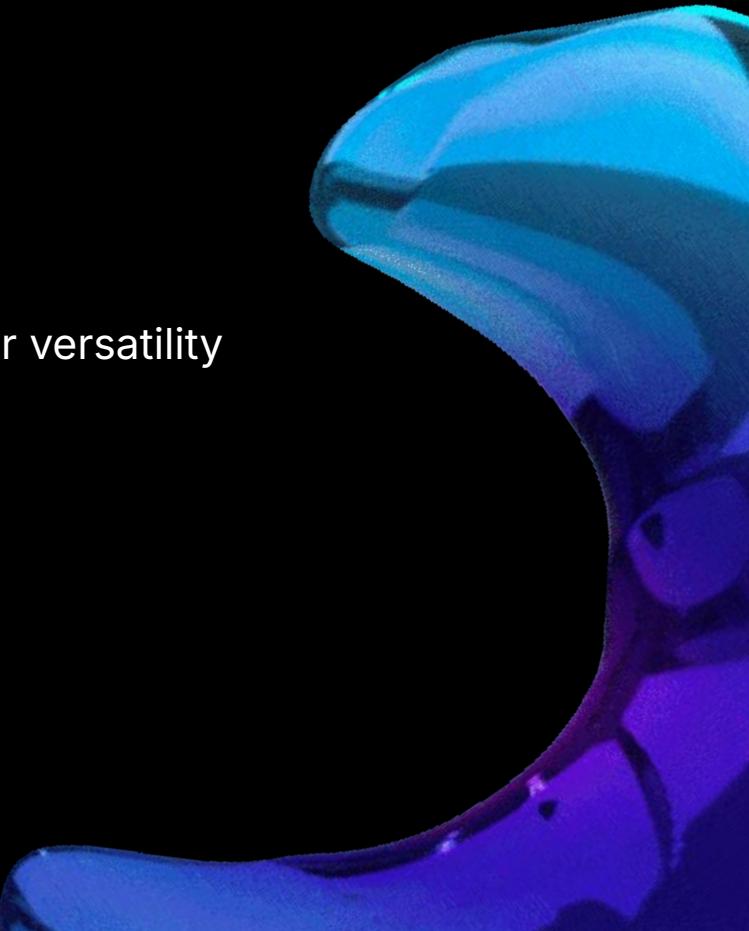
CHALLENGES

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A large, abstract circular graphic in the background features a vibrant, swirling pattern of blue, purple, and teal colors, resembling liquid or a nebula. It is positioned on the left side of the slide.

NEXT STEPS NEXT STEPS N

- Improve Heart Rate Sensor to ensure accuracy
- Increase screen size + brightness
- Improve Camera Quality
- Continue to tweak the form evaluation model for versatility



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THANK YOU

Resource Page

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