Hackathon Problem Statement: Rider Telemetry Challenge

Overview

Participants must build a wearable telemetry system that attaches to a rider's helmet, jacket, and/or pants and captures real-time motion and location data. The system must display live information on a mobile app and store all readings with timestamps.

The app should also detect whether the rider is on a scooter, a motorcycle, or not riding, based on posture and motion. All prototypes must be fully demonstrable on the test track during the hackathon.

Data to Capture (Minimum Requirement)

Teams may use any number of sensors of their choosing, but their system must at least measure and record the following:

- **Acceleration (3-axis):** Detect motion, braking, lean, and body orientation.
- **Deceleration (derived from acceleration):** Detect stops or harsh braking.
- **Speed:** From GPS or IMU integration; used to validate ride segments.
- **GPS Position (latitude, longitude, timestamp):** For track matching, ride path, and scoring.
- **Timestamped Data Storage (mandatory):** All sensor data and GPS points must be stored locally on the mobile app for evaluation.

Test Procedure

Each prototype will be tested using the following sequence:

Start → Walk → Bike/Scooter → Walk → Scooter/Bike → Walk → End

- The helmet, jacket, and pants used for the test will be displayed before the hackathon begins.
- Teams must design their mounts using only these items.
- The preset track will be shared with all teams in advance.
- Prototypes must function through the entire test without losing data, power, or attachment.

Evaluation Criteria

Category	Description
Sensor Stability	Sensors stay attached and functional throughout the entire test.
Mounting Quality	Secure attachment that leaves no stains, marks, or residue on the displayed gear.
GPS Data Volume	More GPS points captured results in a higher score.
GPS Accuracy	Lower average deviation from the reference track results in a higher score.
Vehicle Type Detection	Correct identification of scooter, motorcycle, or walking.
Bill of Materials(BoM)	Lower hardware cost results in a higher score.
System Weight	Lighter assembly results in a higher score.
Battery Endurance	Must last for both rides and the idle time between.
App UX/UI	Clear, intuitive display of live data and map.
Data Storage	All data (sensor and GPS) must be stored locally with timestamps for verification.
Demonstratability	Prototype must perform live during the test without post-processing or external tools.

Innovation Challenge	Most creative idea built on top of the core requirements that can be demonstrated live.

Innovation Challenge

Teams are encouraged to go beyond the mandatory requirements and add an innovative feature that enhances rider experience, safety, data analysis, or usability, as long as it can be demonstrated live during the final test.

Examples include, but are not limited to:

- Additional insights derived from motion or GPS data.
- Visual, audio, or haptic feedback to the rider.
- Smart data visualization, gamification, or scoring mechanisms.
- Compact or modular mounting designs.
- Energy optimization or intelligent sensor activation logic.

Innovation will be judged on:

- **Originality:** Novel or unique idea or approach.
- **Relevance:** Builds meaningfully on the base system.
- **Demonstrability:** Clearly shown during the test or demo session.

Constraints and Expectations

- Only the displayed helmet, jacket, and pants may be used for mounting sensors.
- All mounts must be non-permanent and leave no stains or damage.
- The system must run on a single battery charge for both rides.
- All data must remain local to the app (no cloud upload).
- The setup must be safe, compact, and easily removable.

End Goal

By the end of the hackathon, each team must demonstrate:

1. A working prototype attached to the provided riding gear.
2. A live app display on the app showing:
    - Real-time acceleration, deceleration, speed, and GPS map.
    - Correctly detected riding state (scooter, motorcycle, walking).
3. A stored data log in the app containing all readings with timestamps.
4. A brief explanation of the design, cost, accuracy, and any innovative feature implemented.