

LSL on Android: Open-Source Apps for Mobile Multi-Sensor Streaming, Recording, and Viewing

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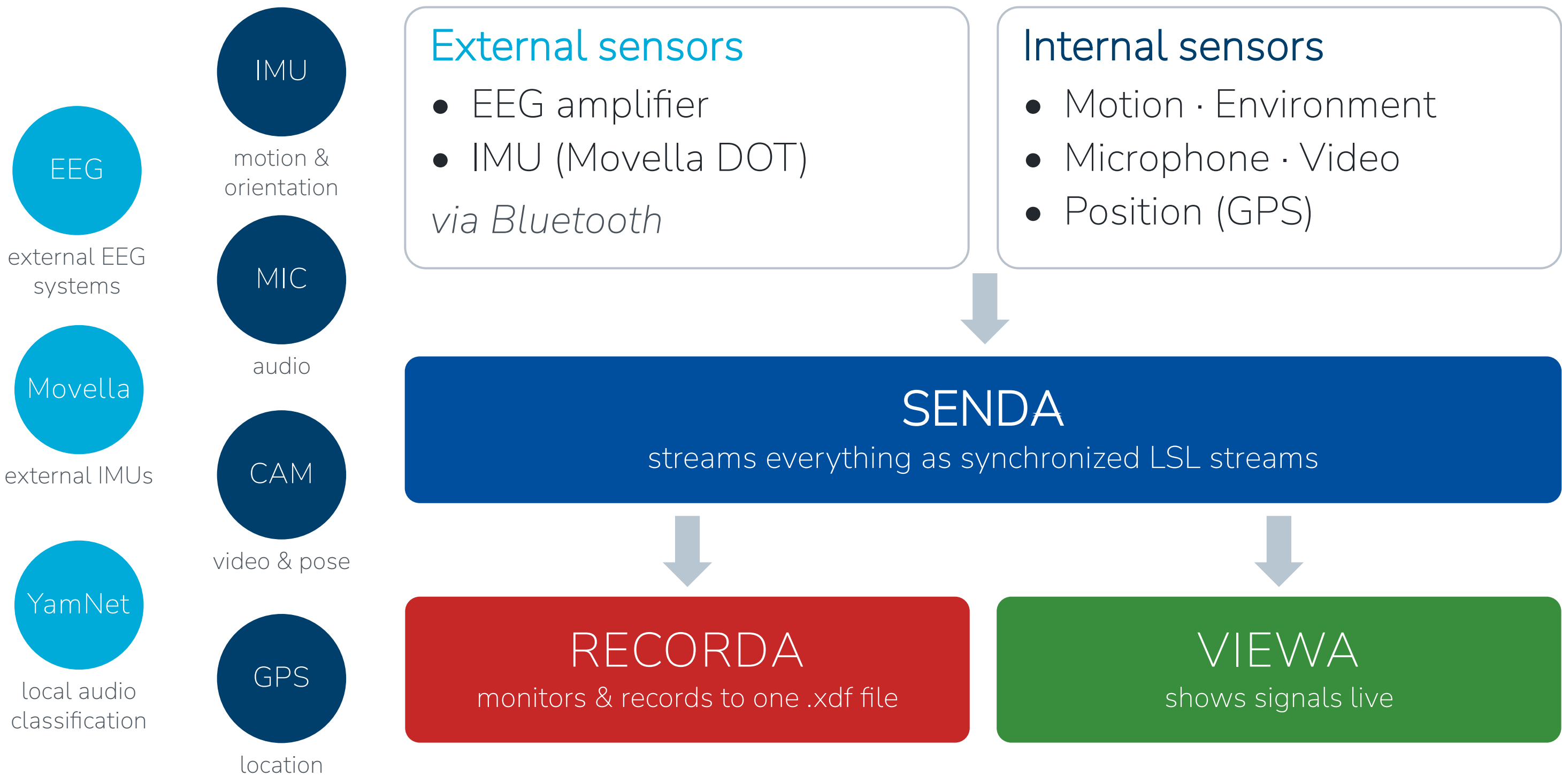
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INTRODUCTION

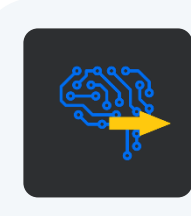
Mobile brain–body imaging (MoBI) requires multi-sensor measurement setups that are precisely time-synchronized and portable, which is hard to achieve with laptop-based equipment.

Modern smartphones solve some of these challenges and carry many sensors we need: inertial measurement units (IMU), microphones, cameras, and GPS. In addition, they can connect to external sensors and allow for complete research setups outside of the lab.

We built three open-source Android applications that directly implement the **Lab Streaming Layer (LSL)** on Android and work seamlessly with existing setups.



METHODS

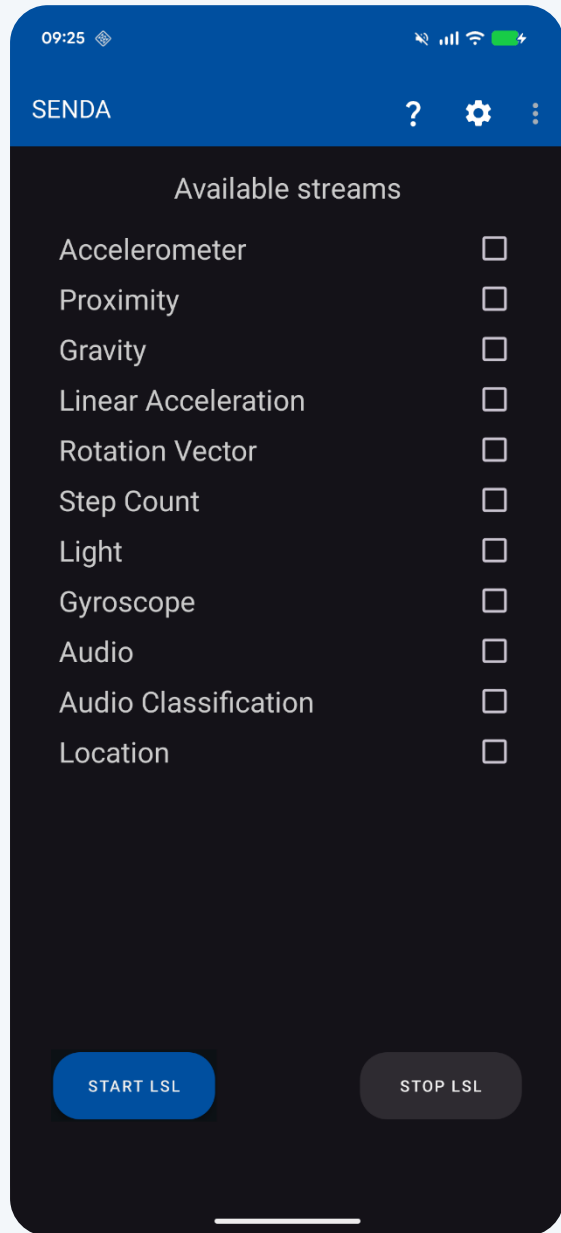
**SENDa**
Stream sensors as LSL streams

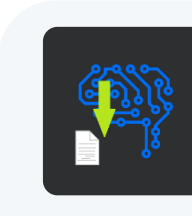
Converts internal and external sensor signals into LSL streams. Offers on-device audio classification with a local YAMNet as well as the integration of external sensors that are connected via Bluetooth.

How to use it

- Launch SENDa — select the sensors to stream
- Tap START LSL to begin (background service)
- Any capable app on the network can discover the streams

github.com/NeuropsychOL/SENDa



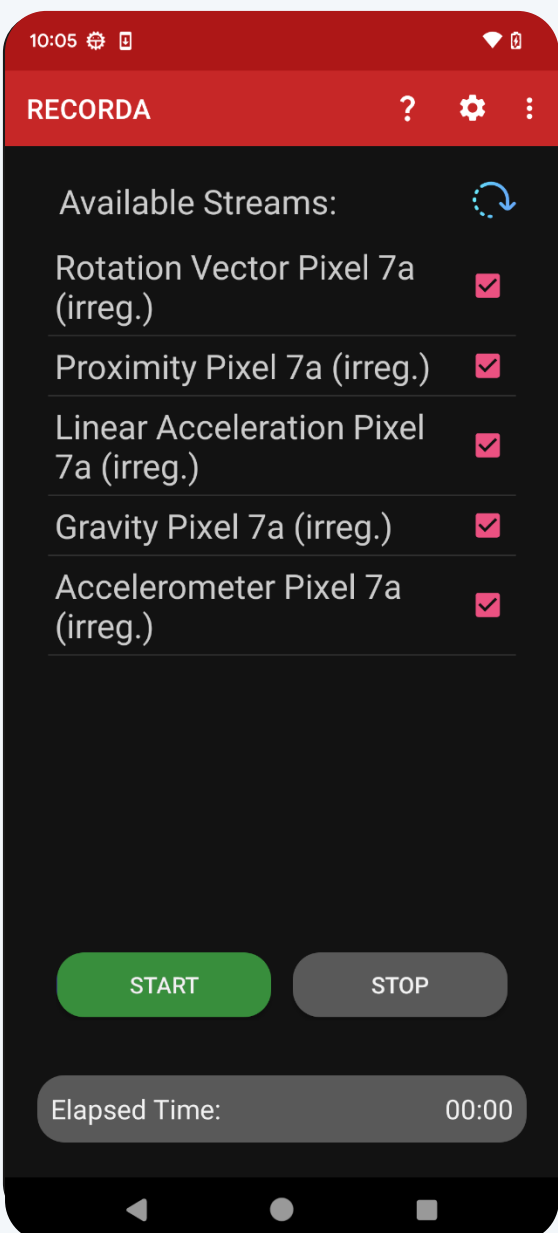
**RECORDa**
Record to .xdf on phone

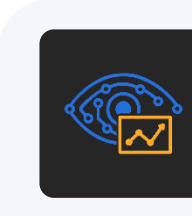
Records all LSL streams into the standard .xdf format directly on Android. Live stream-integrity feedback highlights laggy or unresponsive streams for real-time monitoring.

How to use it

- Tap Refresh to discover streams on the network
- Select streams to record, then tap Start
- Tap Stop — a synchronized .xdf file is saved

github.com/NeuropsychOL/RECORDa



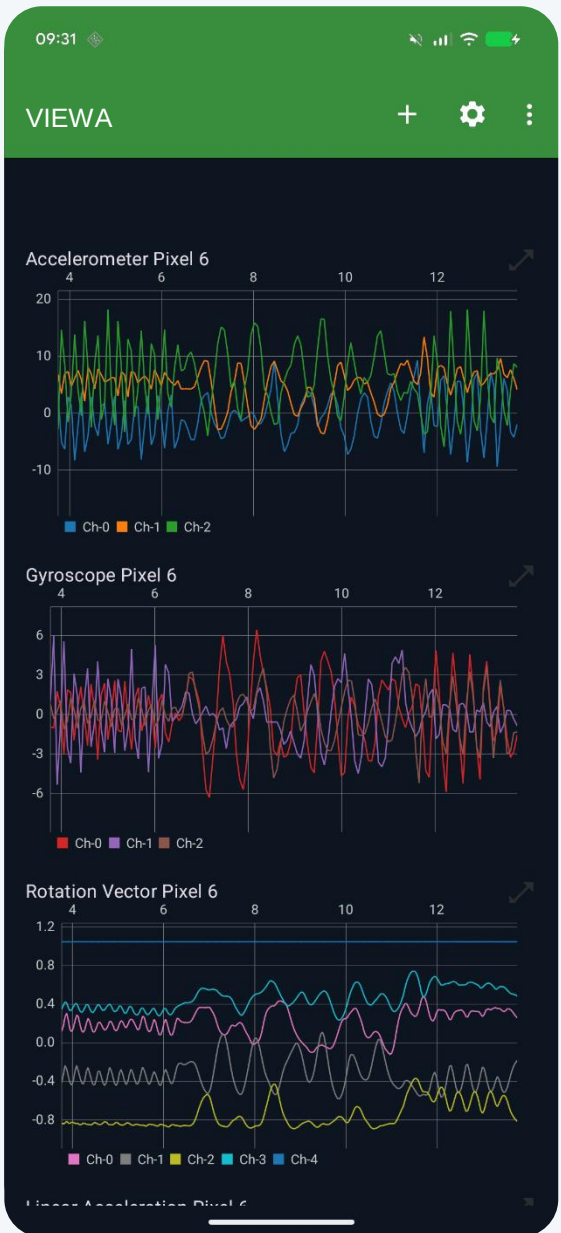
**VIEWa**
Watch LSL streams live

Gives a live visualization of marker and time series LSL streams detected in the network. Visual inspection can be used to monitor data, spot flat channels, bad contacts, or dropped sensors.

How to use it

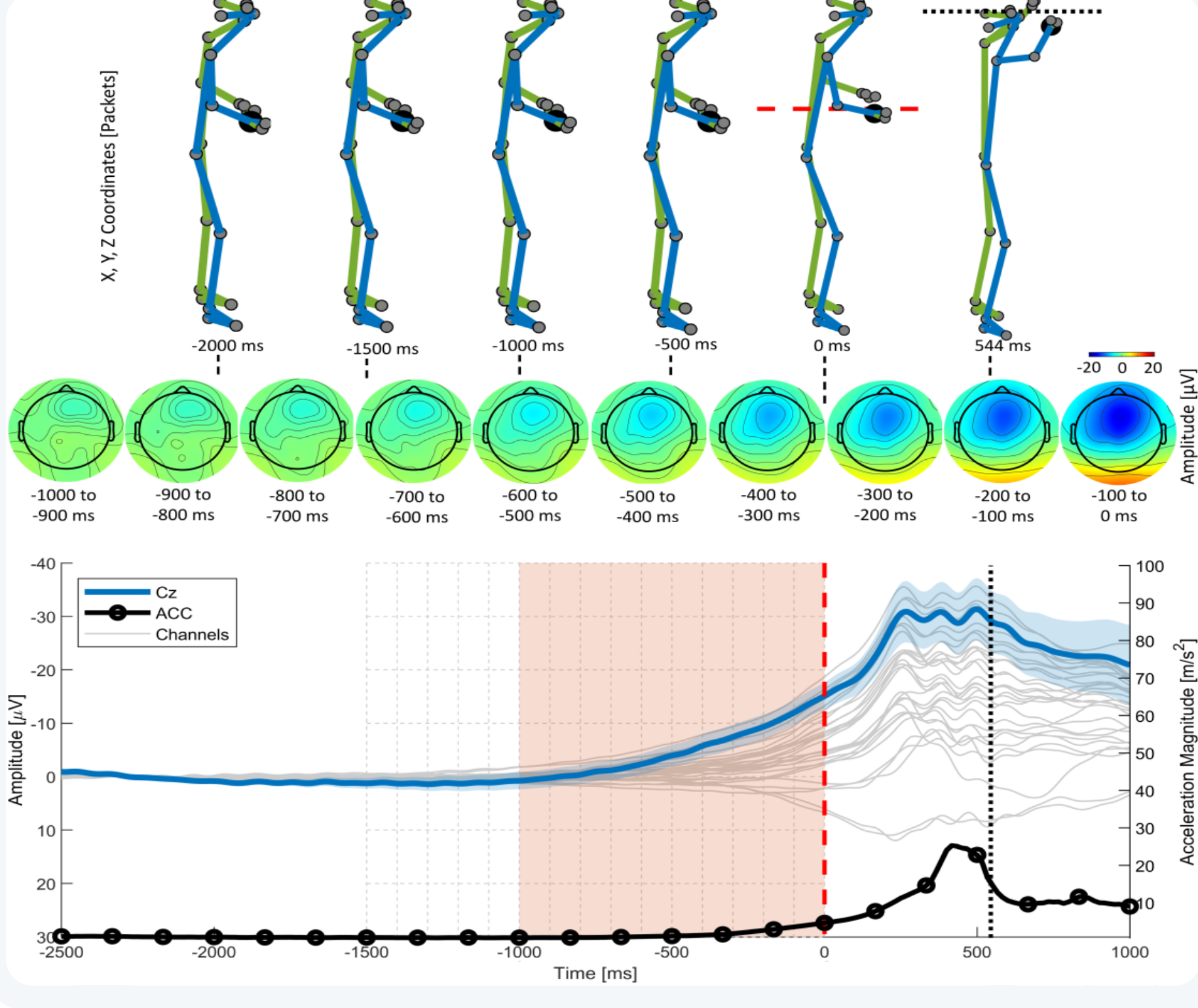
- Launch VIEWa on the same network as your streams
- Select a stream to plot it in real time
- Use alongside RECORDa to sanity-check a session live

github.com/NeuropsychOL/VIEWa

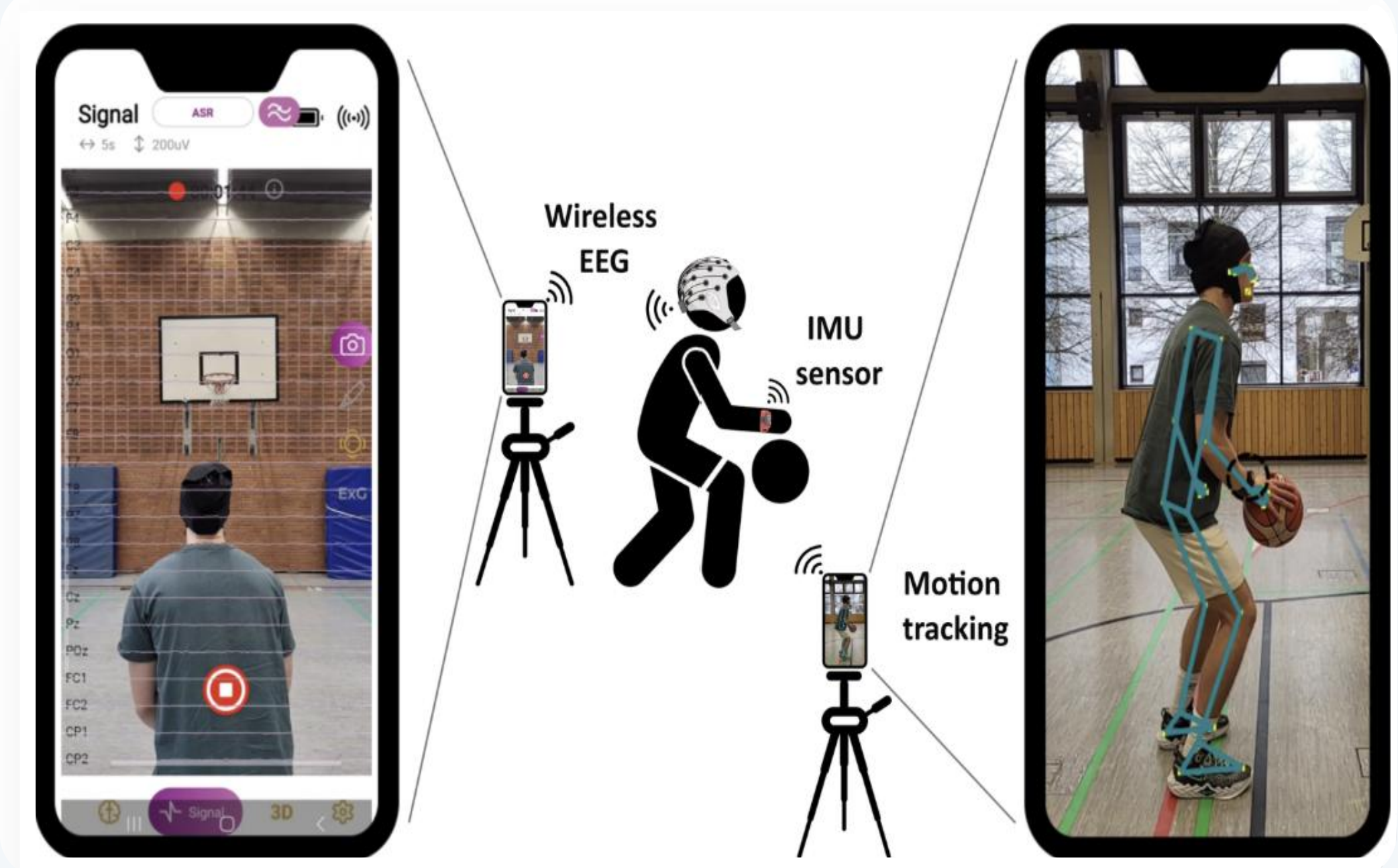


RECENT APPLICATIONS

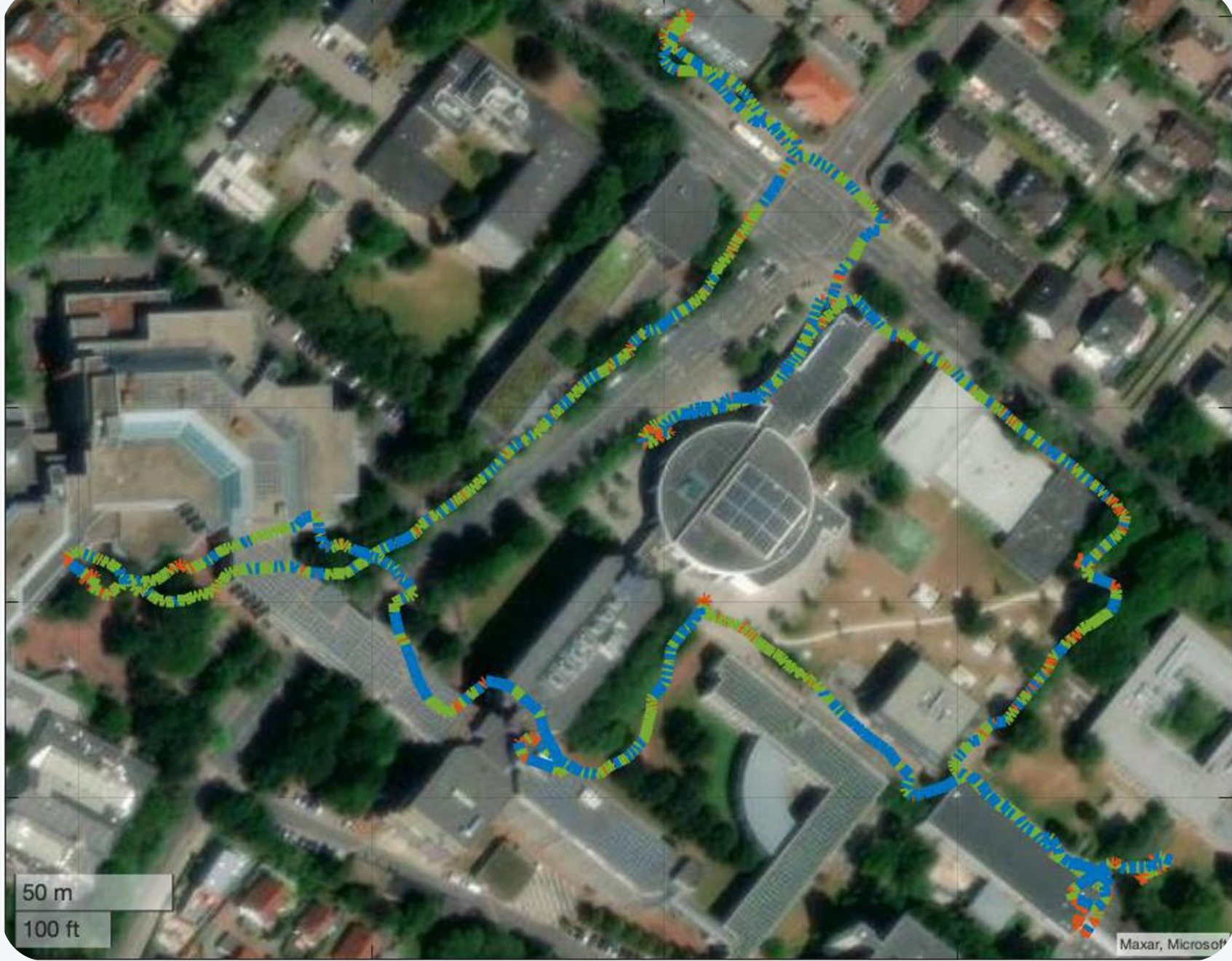
Altamirano et al. 2026
Grand average readiness potential during basketball throw



Haupt et al. 2026
Setup for pose dection and throw onset detection using smartphones and IMU sensors only.



Haupt et al. 2026
A track on the campus captured with smartphone GPS sensors. Color indicates walking speed.



DISCUSSION

Summary

- All three apps are free, open source (GPL-3.0), and actively developed at github.com/NeuropsychOL.
- Release APKs can be downloaded and sideloaded onto any Android 8.0+ device, then integrated into existing setups or used standalone.
- Community contributions are welcomed through issues and pull requests, and the project should be cited in future work.

LIMITATIONS

- The development team is small, so support for new phones and OS versions, as well as bug fixes take some time
- GPS, audio-classification, and motion-tracking require further validation
- network troubleshooting must be done for every new setup independently

