Translational Data Science

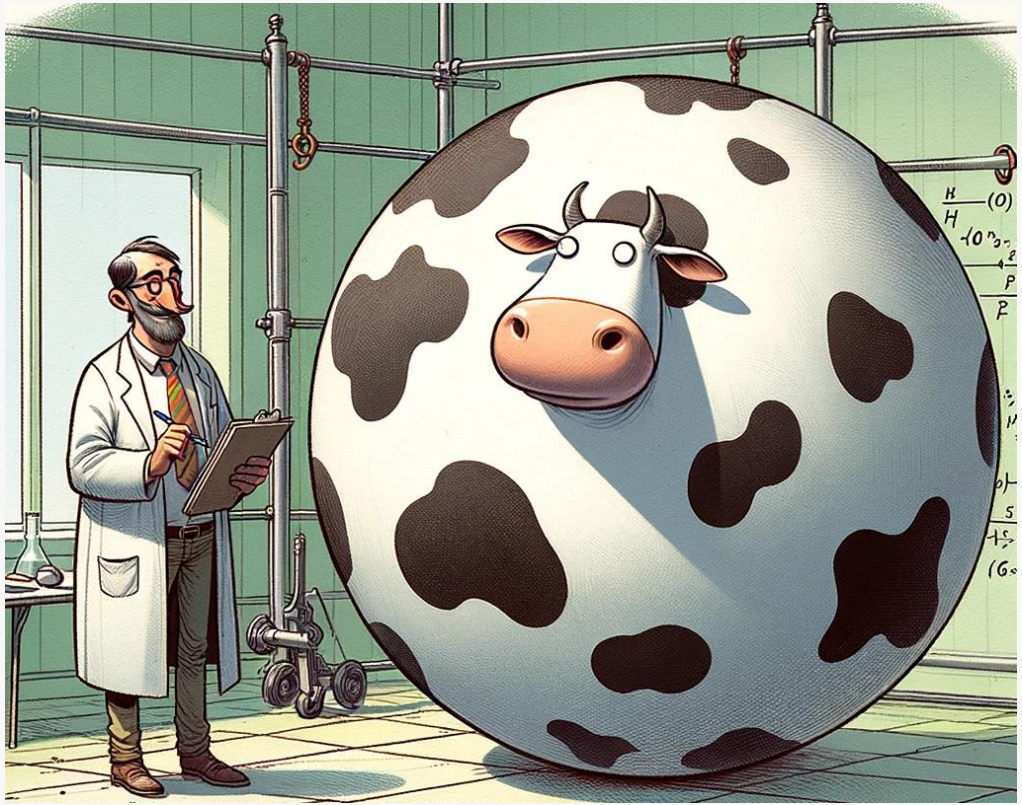
Ali Neishabouri
Head of Data Science
ActiGraph

Kim Rejndrup
Chief Product Officer
ActiGraph

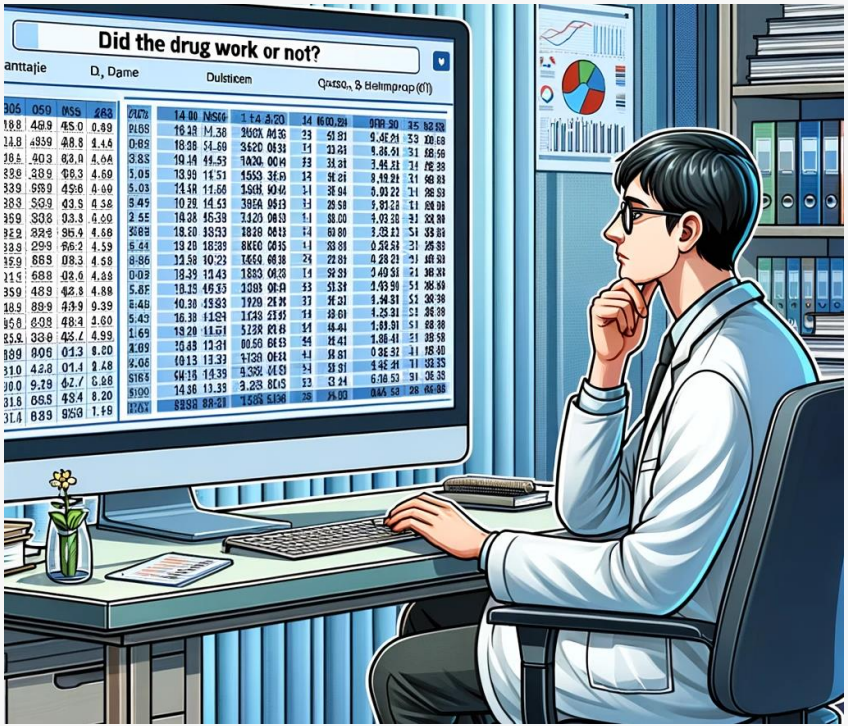
Algorithms

ADDS 2024

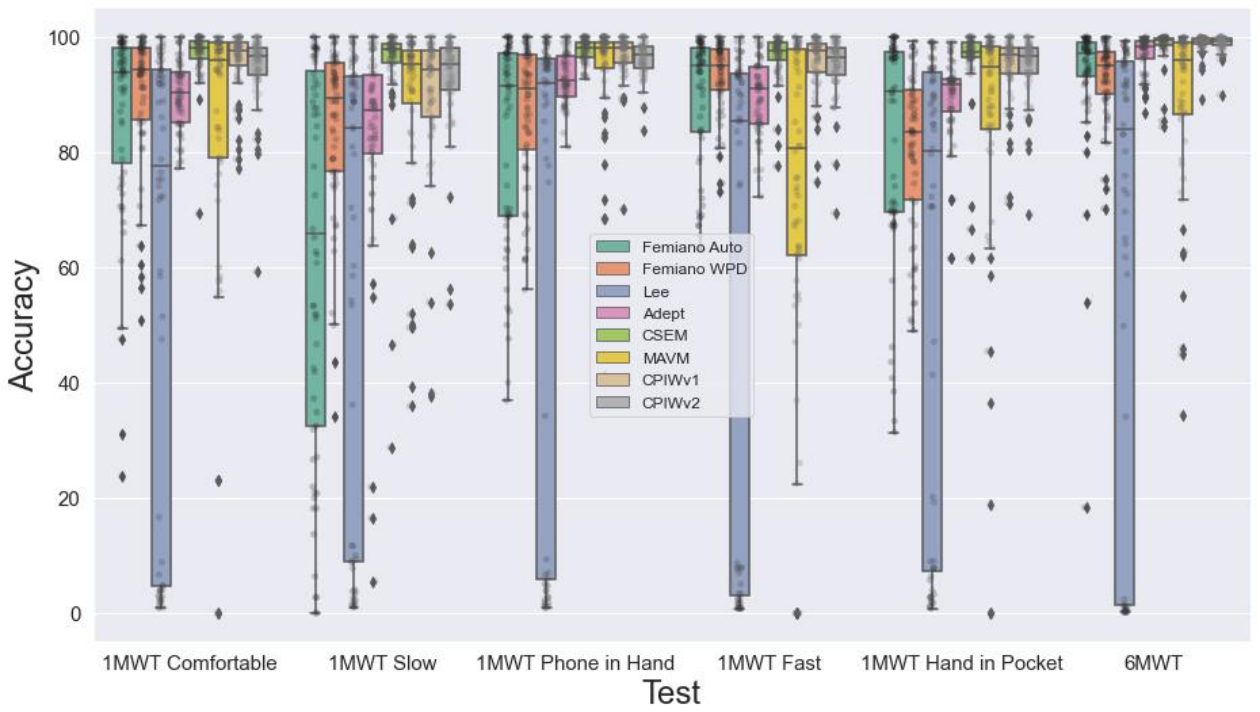
If they are spherical

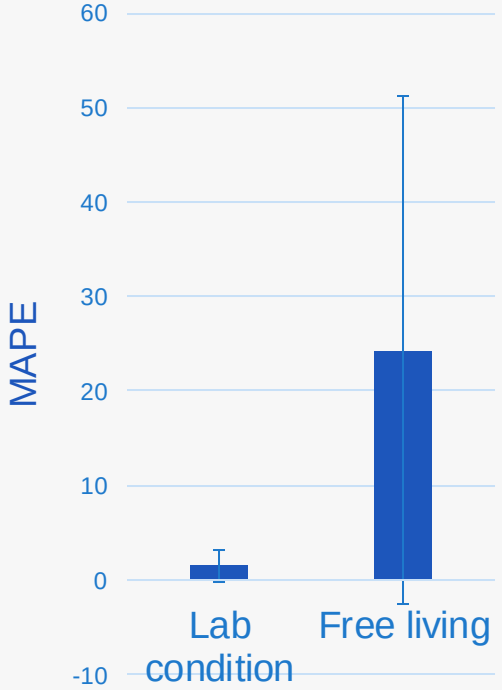


From wearable data to the answer



No shortage of algorithms





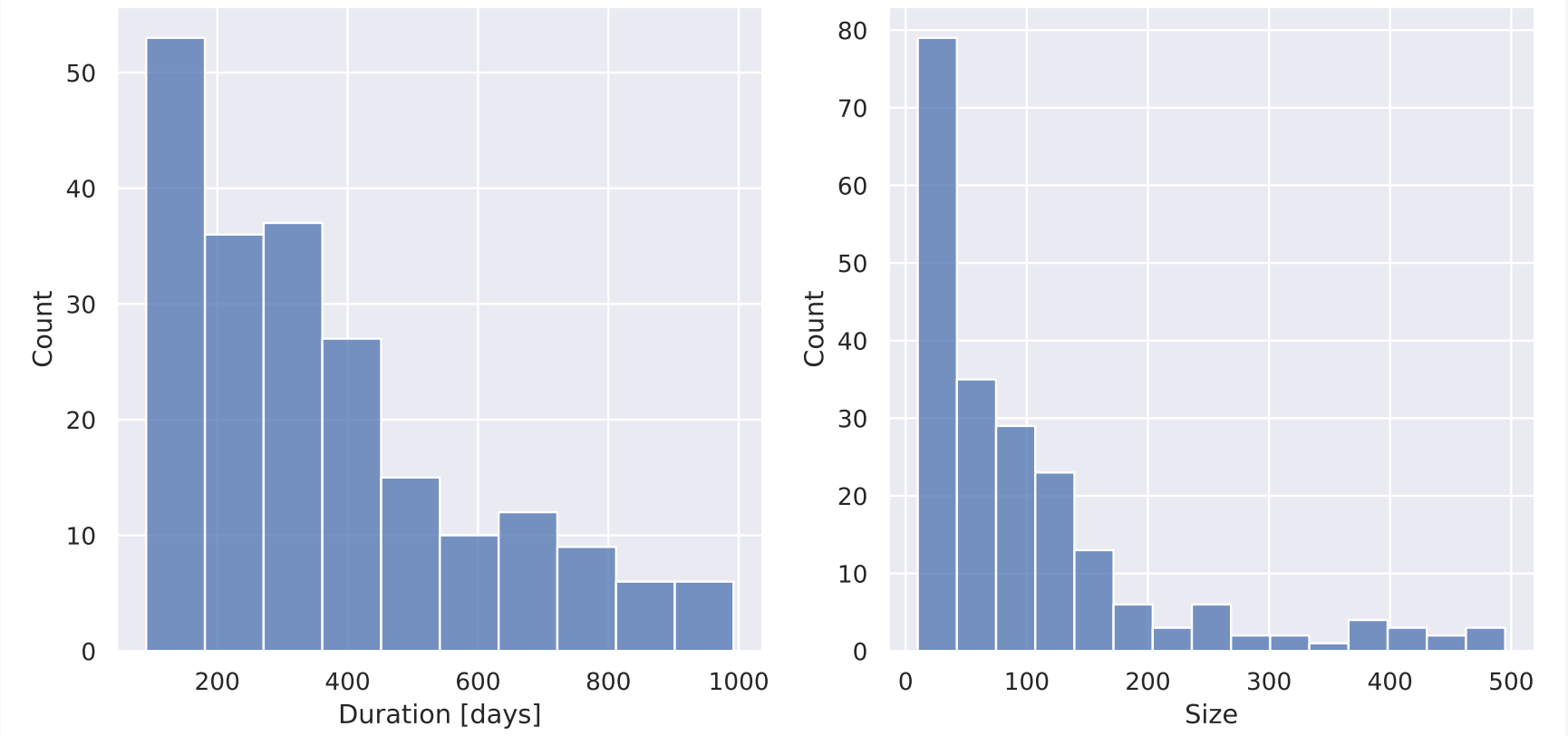
Rakesh Pilkar, Dawid Gerstel, Ethan Toole et al. Performance analyses of step-counting algorithms using wrist accelerometry, 08 December 2022, PREPRINT (Version 2) available at Research Square [https://doi.org/10.21203/rs.3.rs-2183645/v2]

Have to deal with real world data

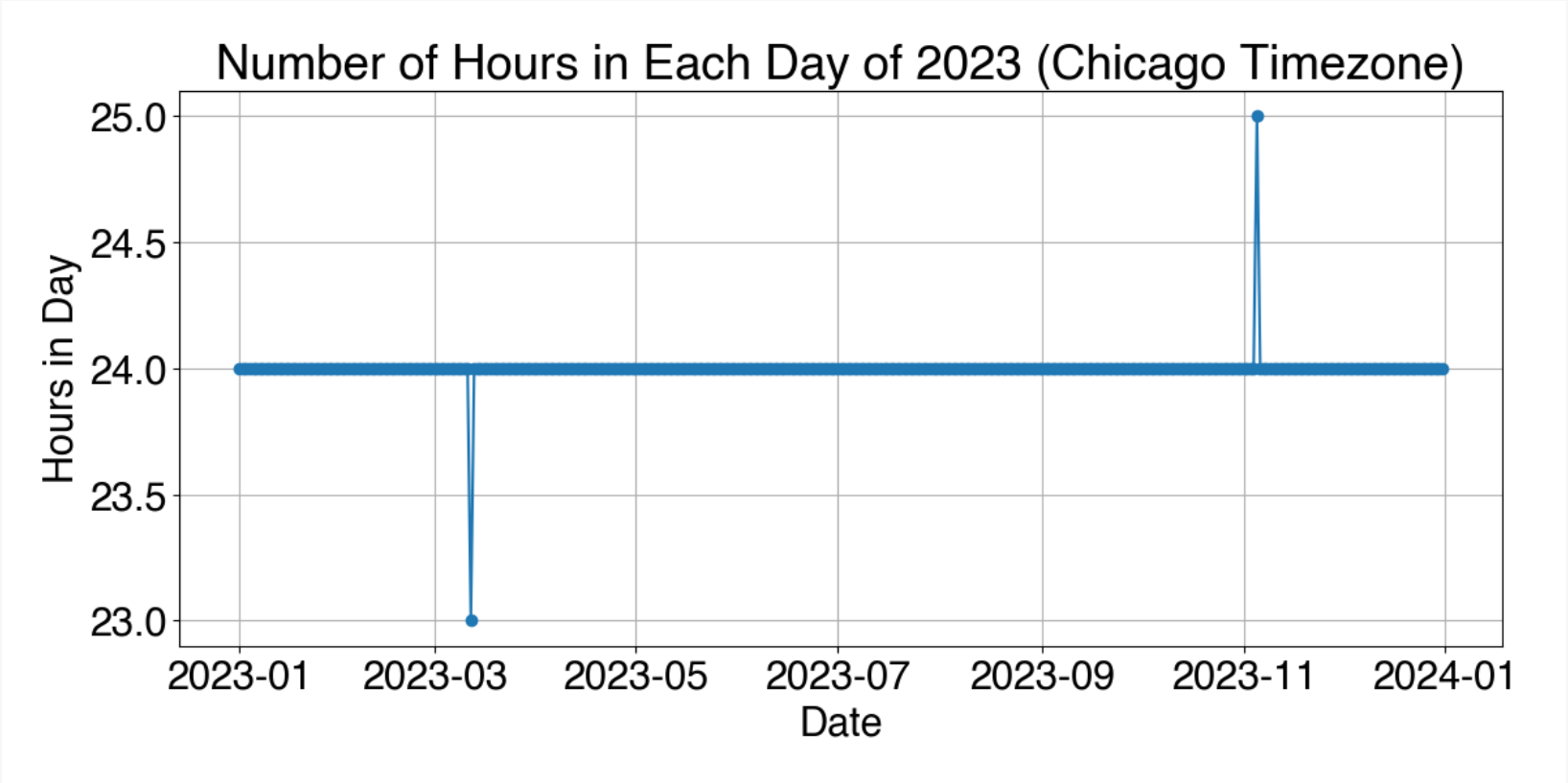
- Deal with gaps*
- Detect non-wear*
- Detect walking*
- Detect steps*
- Find bouts*
- Aggregate over bouts/days*

*Each of these steps involves trade-offs and choices by the data scientist.

ActiGraph scale: Study size and duration in CentrePoint



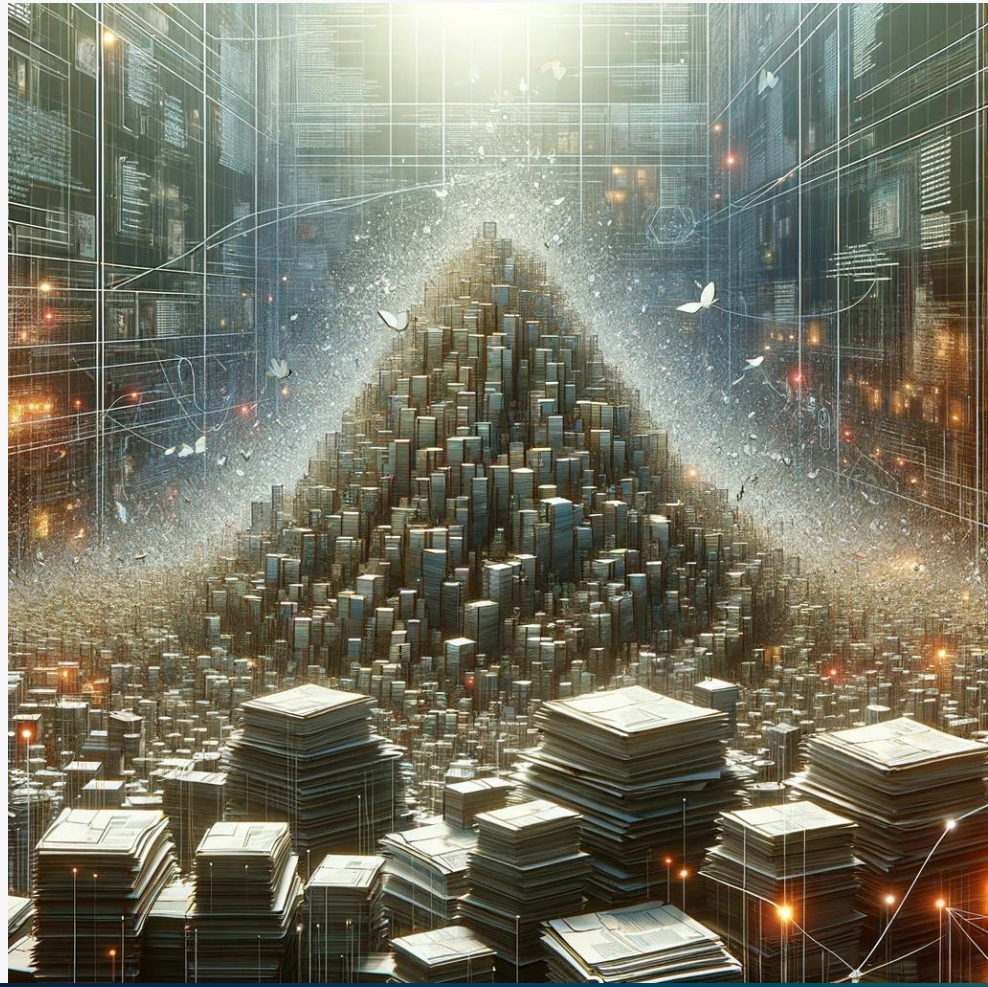
Be careful with time



Performance matters

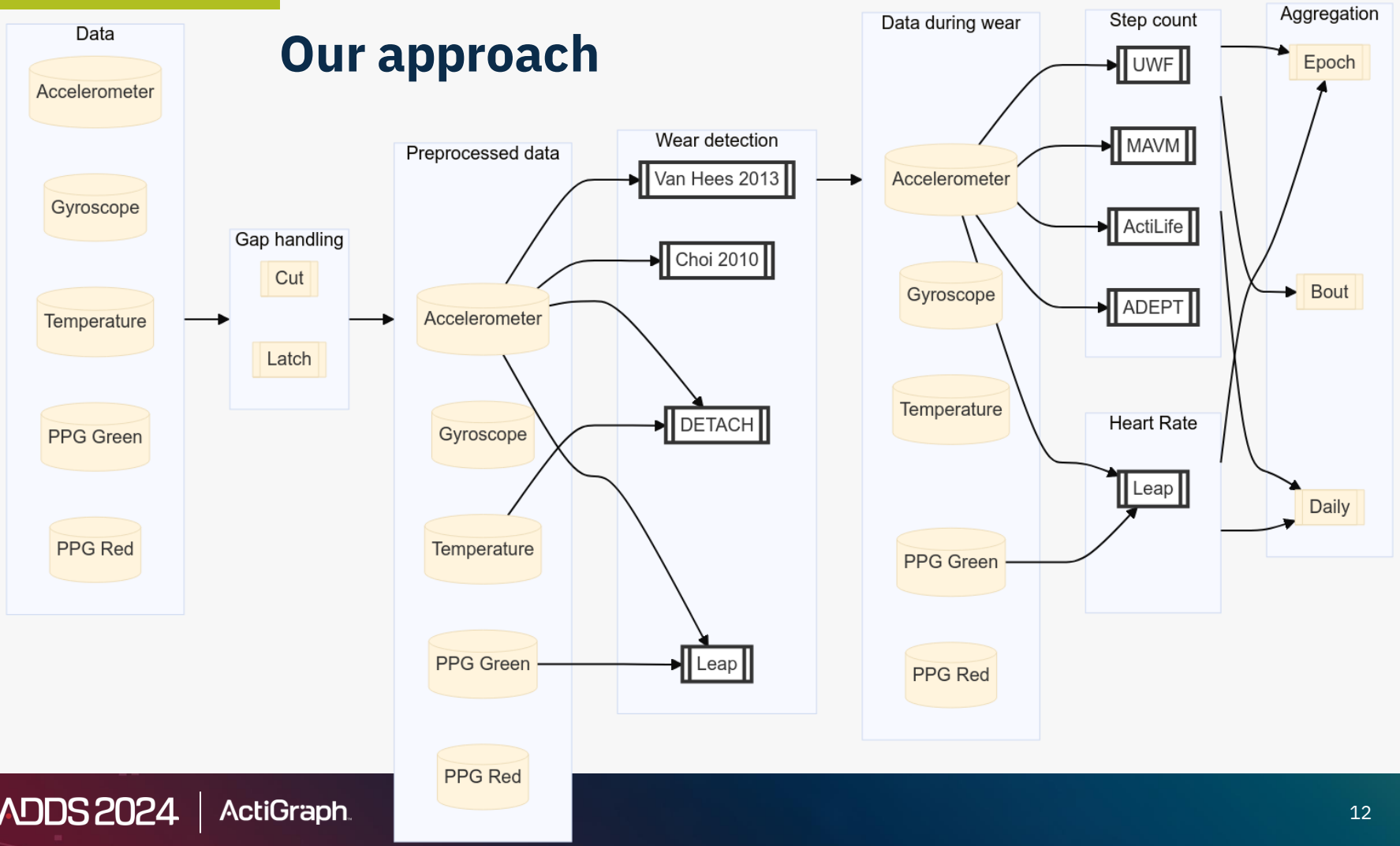
- 64 bit timestamps
- 32/64 bit values (times 3 axes)
- 32Hz

13 Gb per month

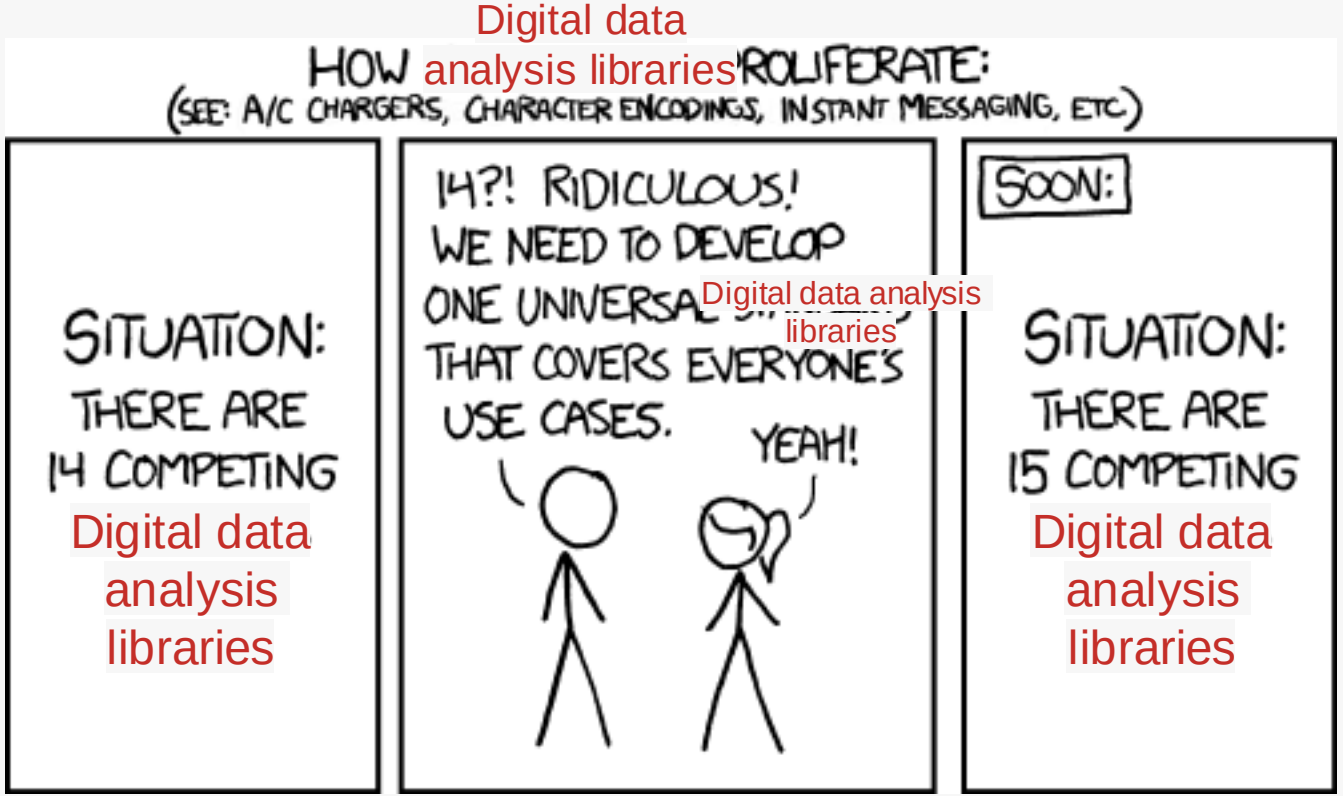


Does it work for my population?

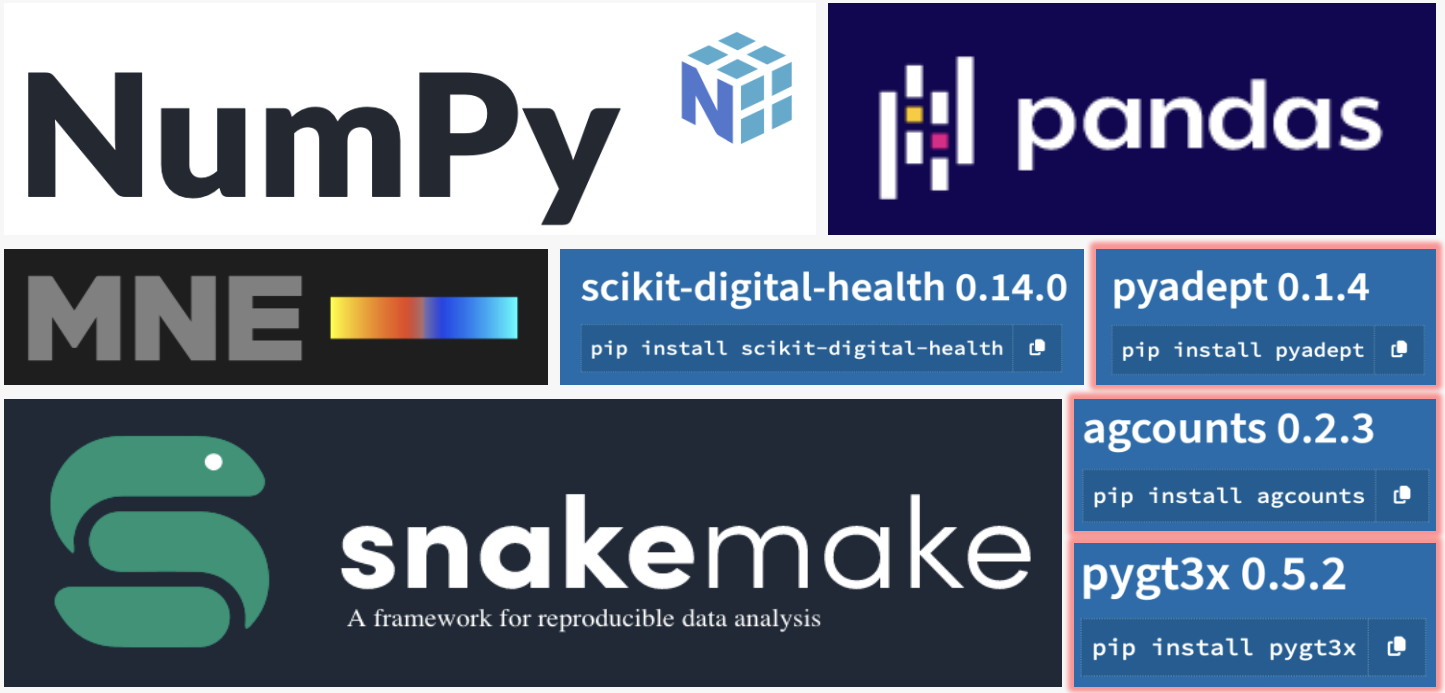
Our approach



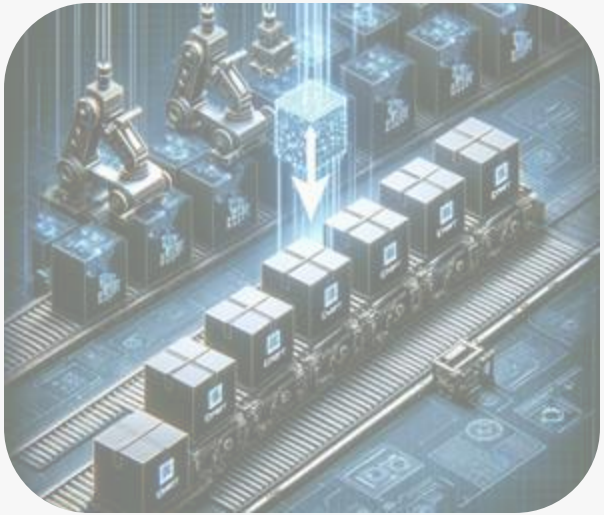
Don’t reinvent the wheel

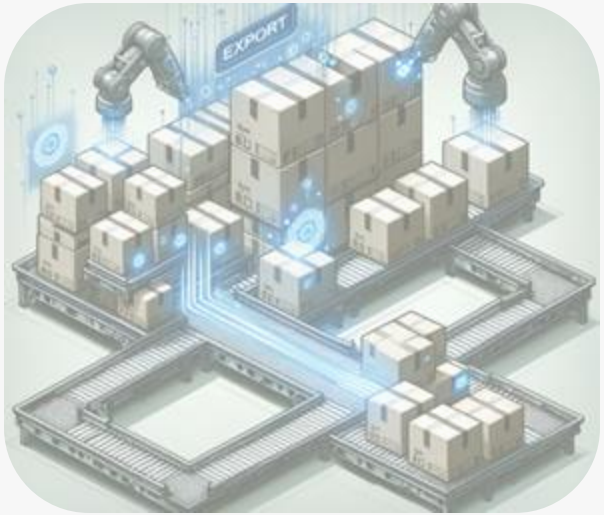


Version everything



The ideal platform





Platform

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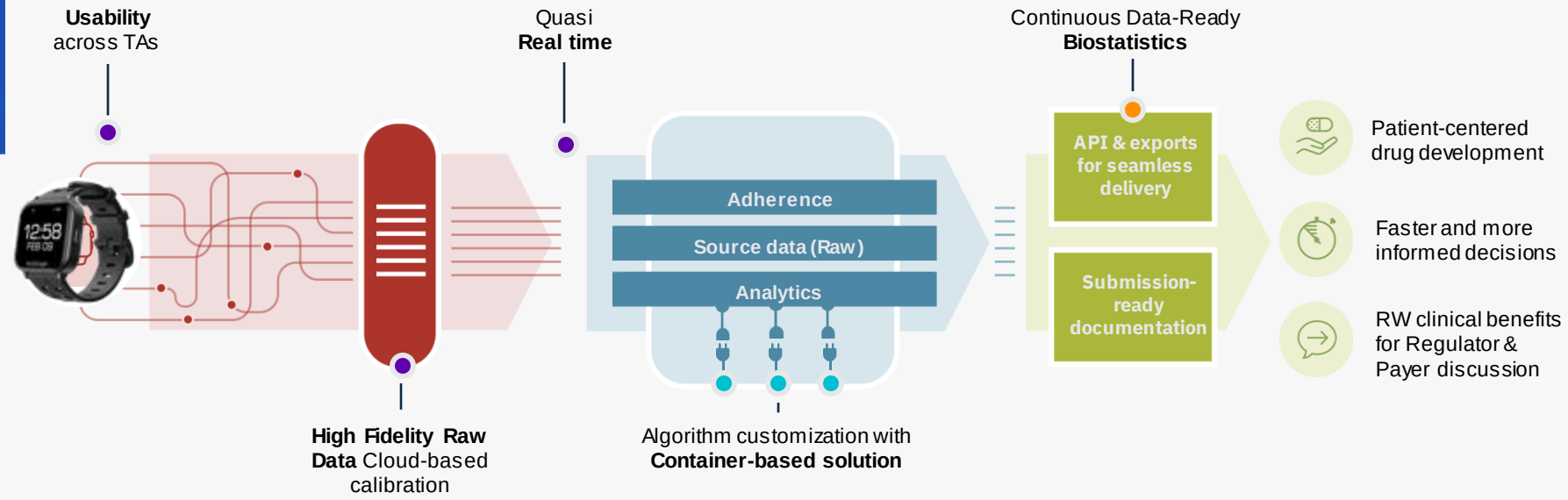
ActiGraph End-to-End DHT Ecosystem

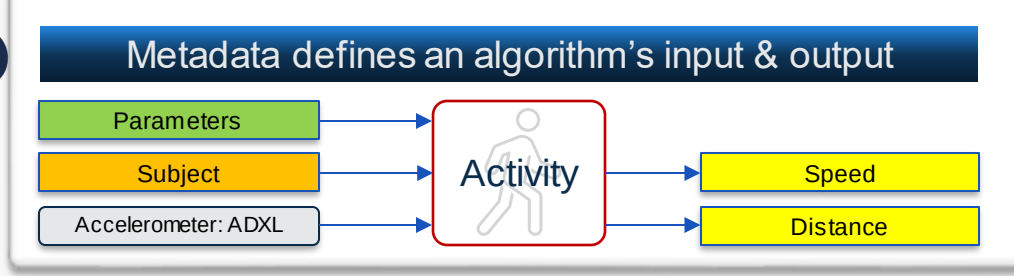
Fully Integrated and Fit-For-Purpose Solutions



Why restrict data scientists to container-based algorithms?

- GAMP 5
- GxP
- 21 CFR Part 11
- Electronic Source Data in Clinical Investigations
- Guideline on computerised systems and electronic data in clinical trials
- GDPR
- HIPAA

Algorithms



Processing within a study per Subject and Program Instance

Execute Algorithm

Parameters

Subjects

Accelerometer: ADXL

Read Adapter

Container

Input Files

Parameters

Subjects

ADXL

Activity

Output Files

Speed

Distance

Write Adapter

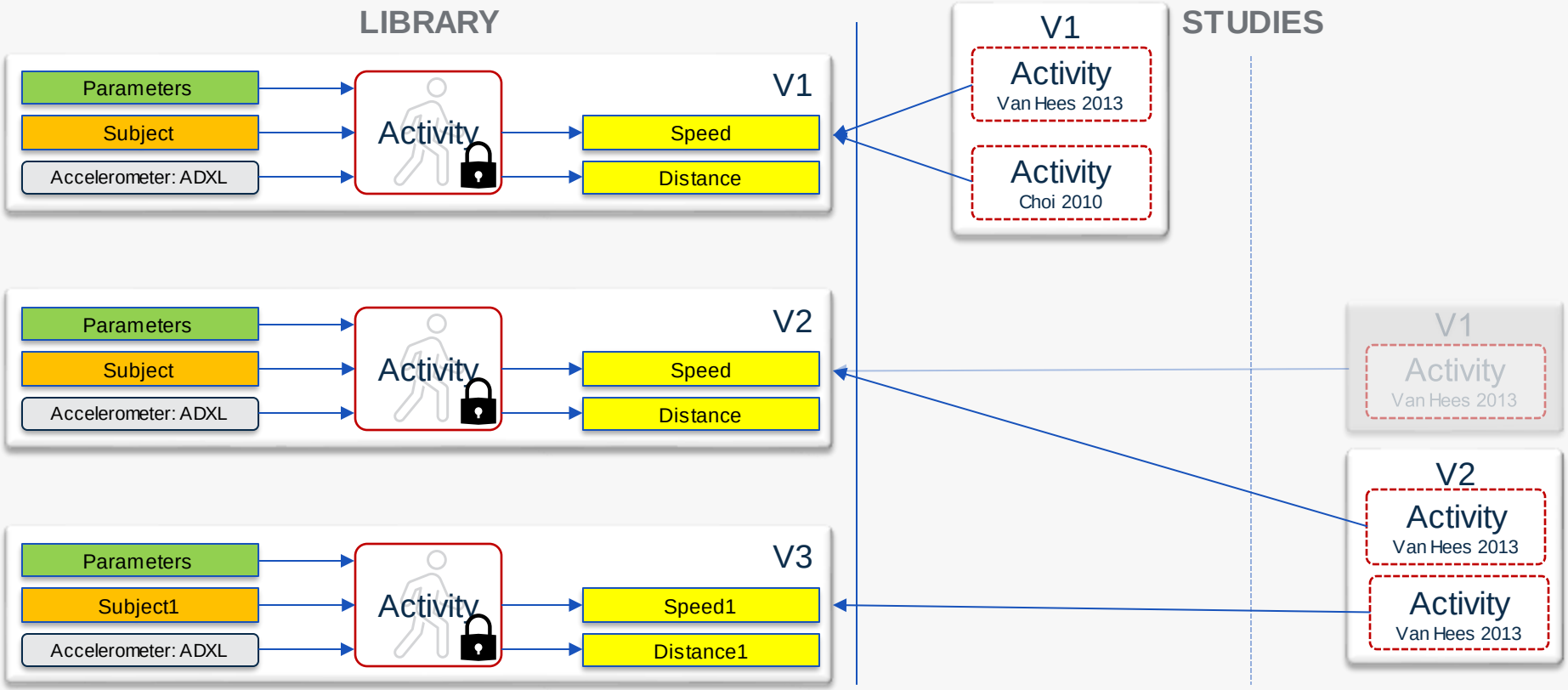
Speed

Distance

Platform provides metadata for input datasets

Data Scientists provide metadata for output datasets

Versioning


LIBRARY
STUDIES
Parameters
Subject
Accelerometer: ADXL
Activity
Speed
Distance
V1
V2
Parameters
Subject
Accelerometer: ADXL
Activity
Speed
Distance
V3
Parameters
Subject1
Accelerometer: ADXL
Activity
Speed1
Distance1
V1
Activity
Van Hees 2013
Activity
Choi 2010
V1
Activity
Van Hees 2013
V2
Activity
Van Hees 2013
Activity
Van Hees 2013

Roadmap 2024

API: Output/Raw Data
LEAP Sensor modes

Simpler to deploy studies

Incremental processing

Self-Service Export

CENTREPOINT

Q1 **Q2** **Q3** **Q4**

FIPS Compliant

ActiLife 6
Data Analysis Software

LEAP/CPIW
Accelerometer support

LEAP
IMU Support

LEAP
PPG 25 Hz green HR

Questions?

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Thank You for Your Time.

ali.neishabouri@theactigraph.com
kim.rejndrup@theactigraph.com