TRACKING THE DEVELOPMENT OF GOAL-DIRECTED MOVEMENT

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INTRODUCTION

- Controlling the environment is rewarding, independently of tangible outcomes (e.g., food, money)[1]. Value-free action-effects reinforce further actions, both in adults and infants, termed *Motivation from Control*.
- The study of reinforcement via value-free perceptual changes in infants was primarily lab-based[2, 3].
- In this ongoing project we aim to provide an **ecologically-valid measurement of the development of Motivation from Control**, and more generally –**goal-directed, intentional movement**.
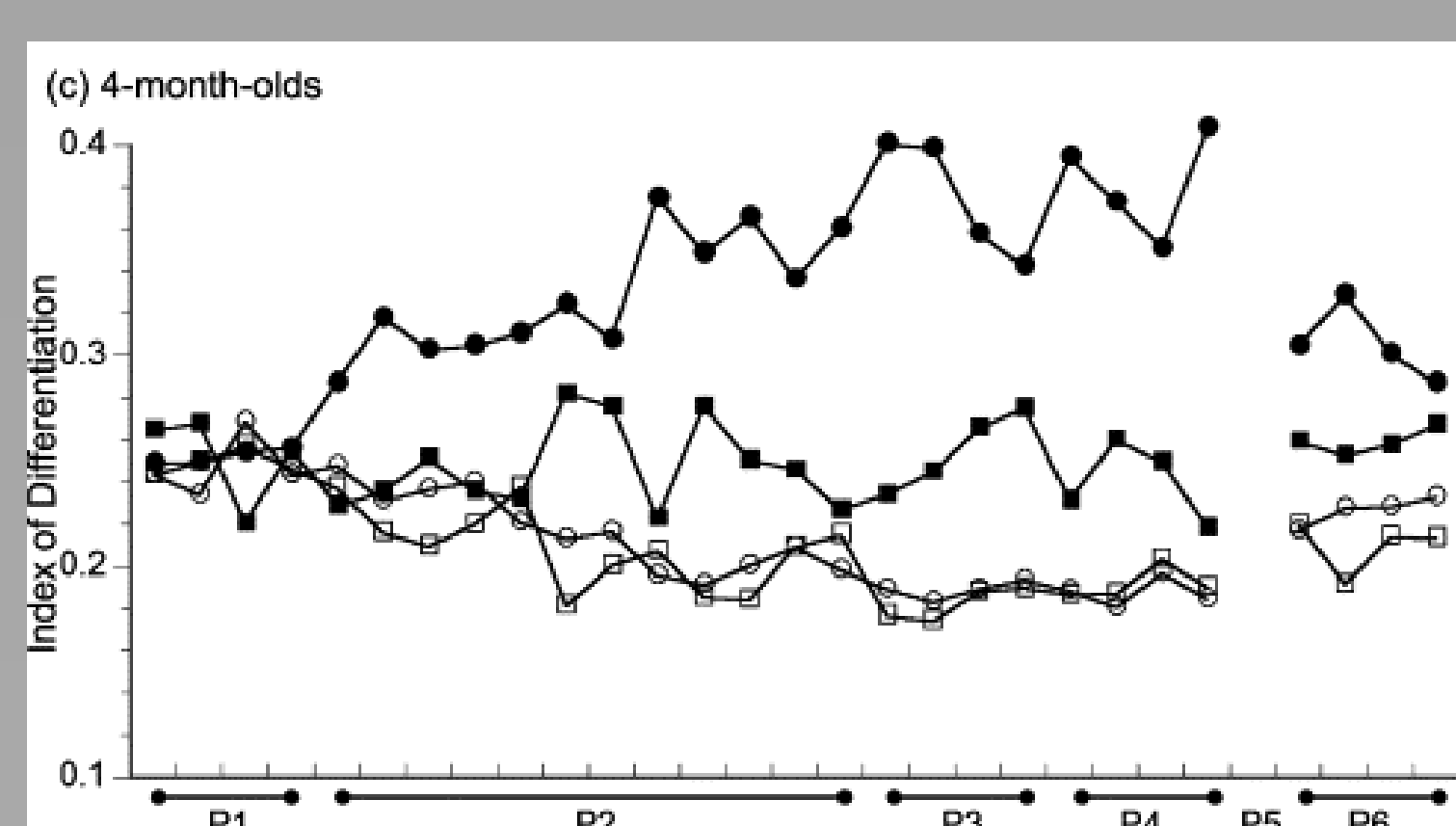

FIG 1. LEFT - PRIOR STUDIES TYPICAL SET-UP[2]. RIGHT – TYPICAL RESULTS, ACUIRED LIMB DIFFERENTIATION[3].

METHODS

- **DATA COLLECTION** Parents to infants (ages 2-6 months) are recruited via posts on social networks, schedule a video call to receive instructions and fill informed consent, and submit a 10-minute long of video of their infant children, during unstructured playing with a toy mobile.
- **PRE-PROCESSING** (1) trimming portions including – irrelevant actions (e.g., infant is being placed on mat), privacy-violating (a sibling enters the scene), etc. (2) Tagging mobile and infant face using Label-Studio, (3) Face and mobile segmentation using Detectron2 (4) Using face position estimations for anonymization on public dataset, (5) Using mobile position estimations for analysis, (6) Extracting whole-body pose-estimations using MediaPipe[4].
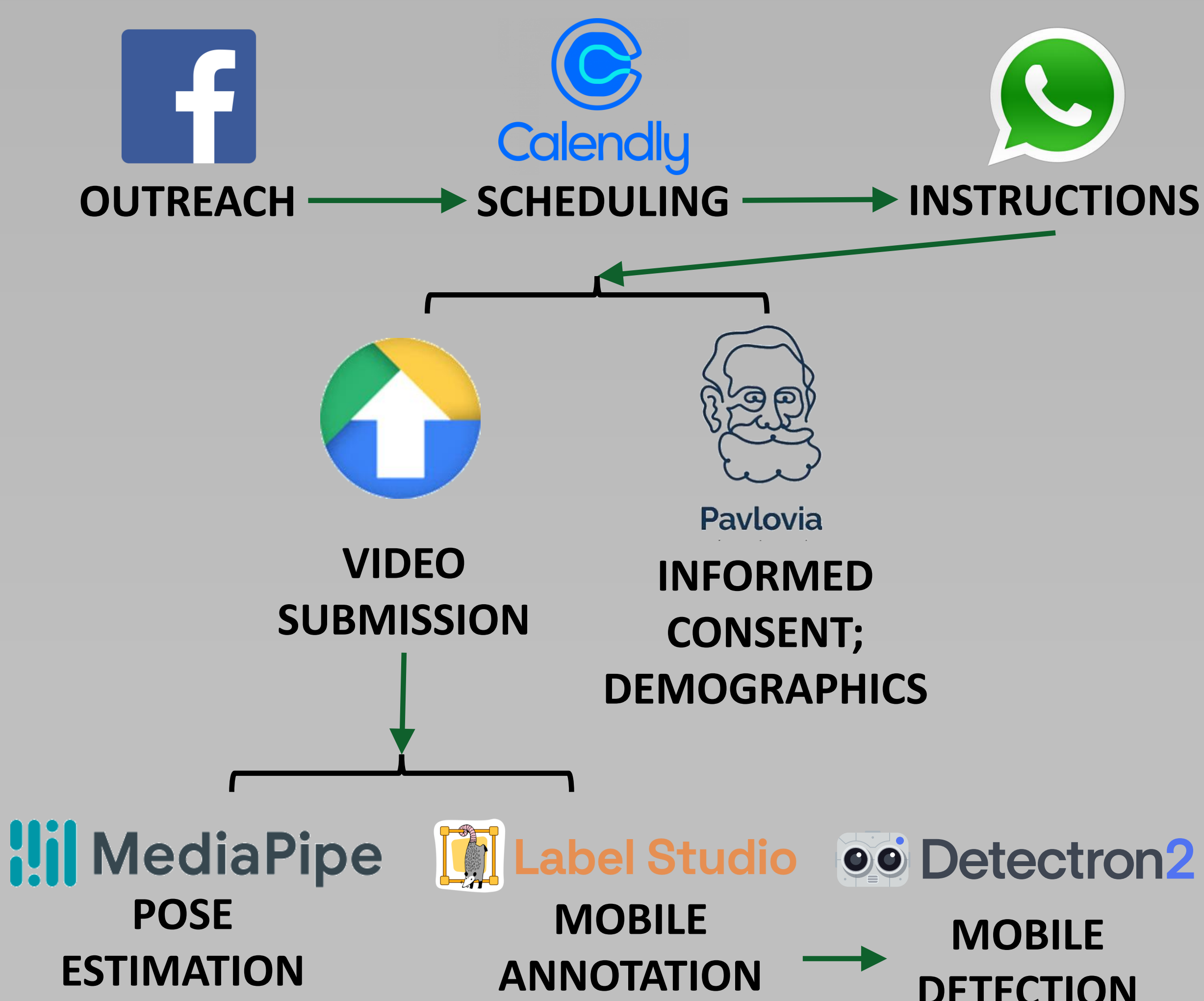

FIG 2. DATA COLLECTION AND ANNOTATION PIPELINE.

PLANNED ANALYSIS

- Pose estimation of infant and mobile acquired from data will be used to replicate and extend previous findings (e.g., interlimb differentiation course of development).
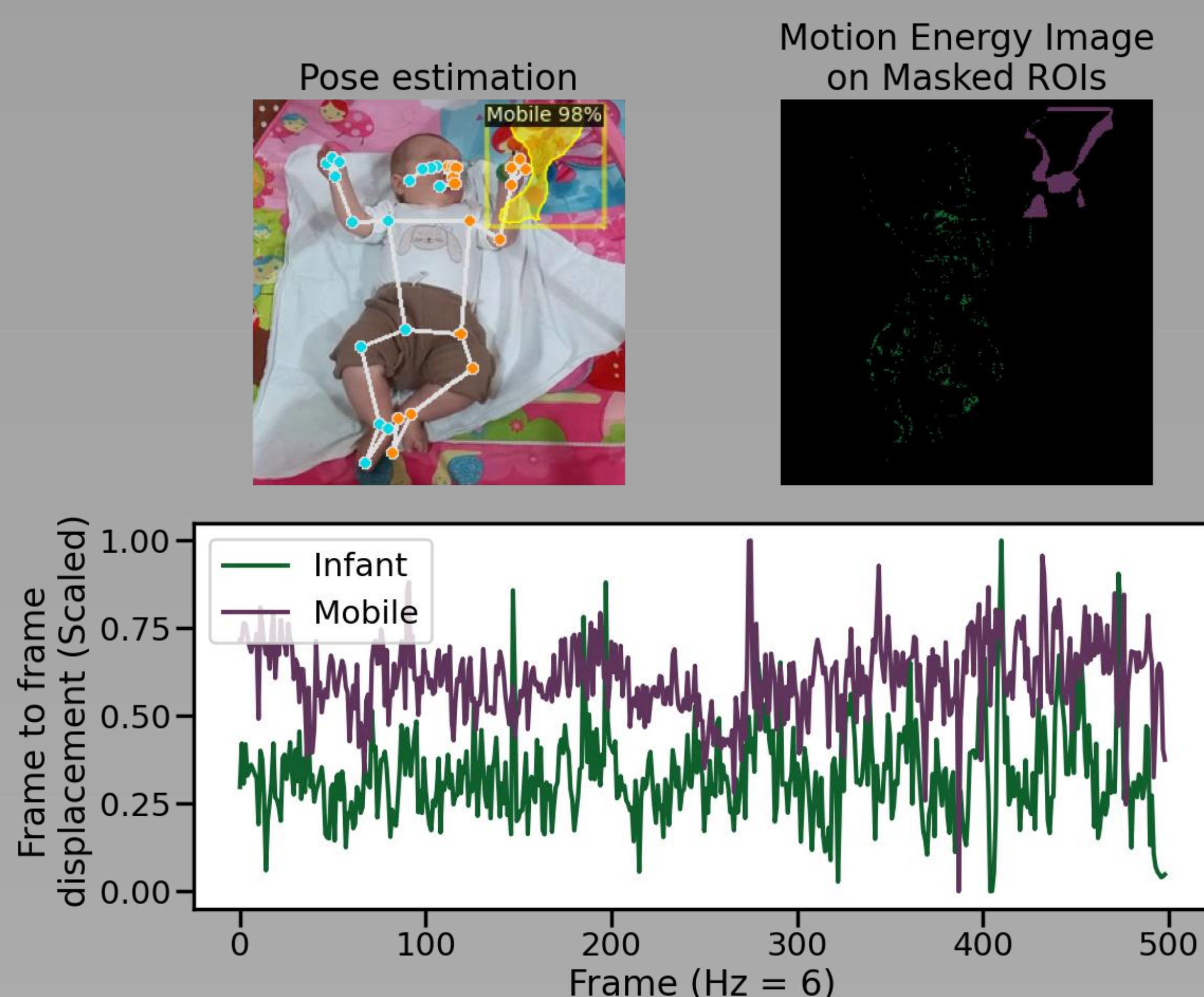

FIG 3. TOP LEFT – PRE-PROCESSED DATA. TOP RIGHT – FRAME TO FRAME DISPLACEMENT OF INFANT AND MOBILE. BOTTOM – DISPLACEMENT OF INFANT AND MOBILE OVER ~80 SECONDS.

SUMMARY

- Potentially, we can gain insight on how different reinforcement processes participate in the emergence of goal-directed movement in the first year of life.
- The current exploration offers high level of ecological validity, which will either corroborate or undermine previous findings.
- The curated dataset will be released as an **open dataset** including - anonymized videos, anthropometrics and age information (planned N = 150).

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2. Adler, S. A., Inslicht, S., Rovee-Collier, C., & Gerhardstein, P. C. (1998). Perceptual asymmetry and memory retrieval in 3-month-old infants. Infant Behavior and Development, 21(2), 253-272.
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GitHub