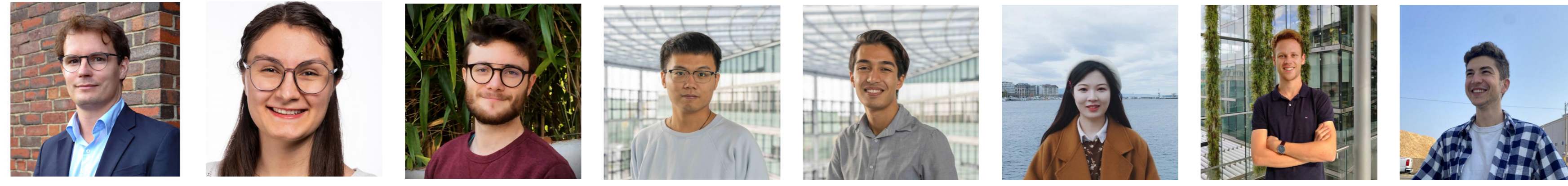
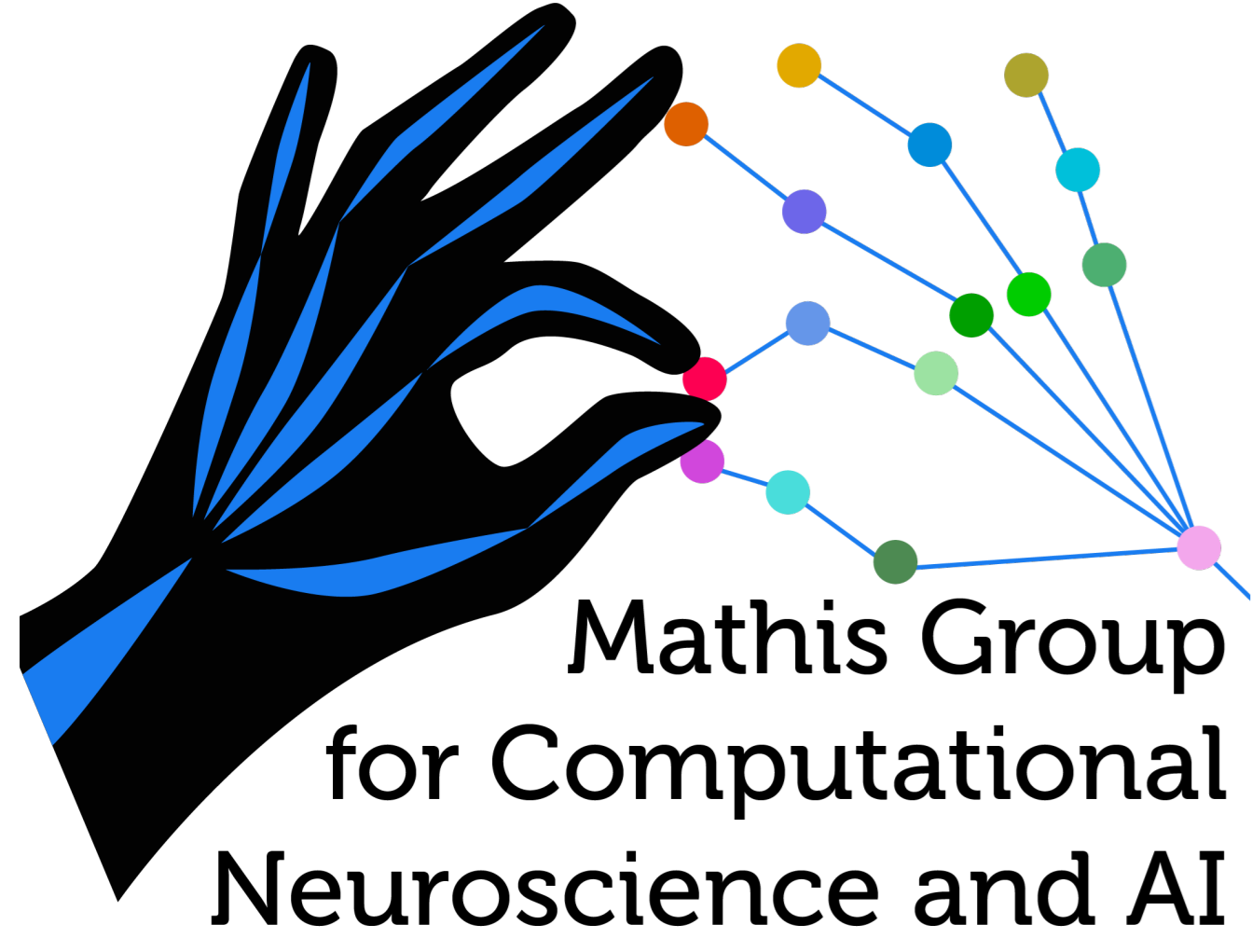


Deep learning for measuring behavior

We develop **computer vision** and **machine learning** tools for the analysis and quantification of **behavior** including **pose estimation**, **animal re-identification**, **action segmentation**...

Join **us** and **Mackenzie Mathis' lab** in Geneva!



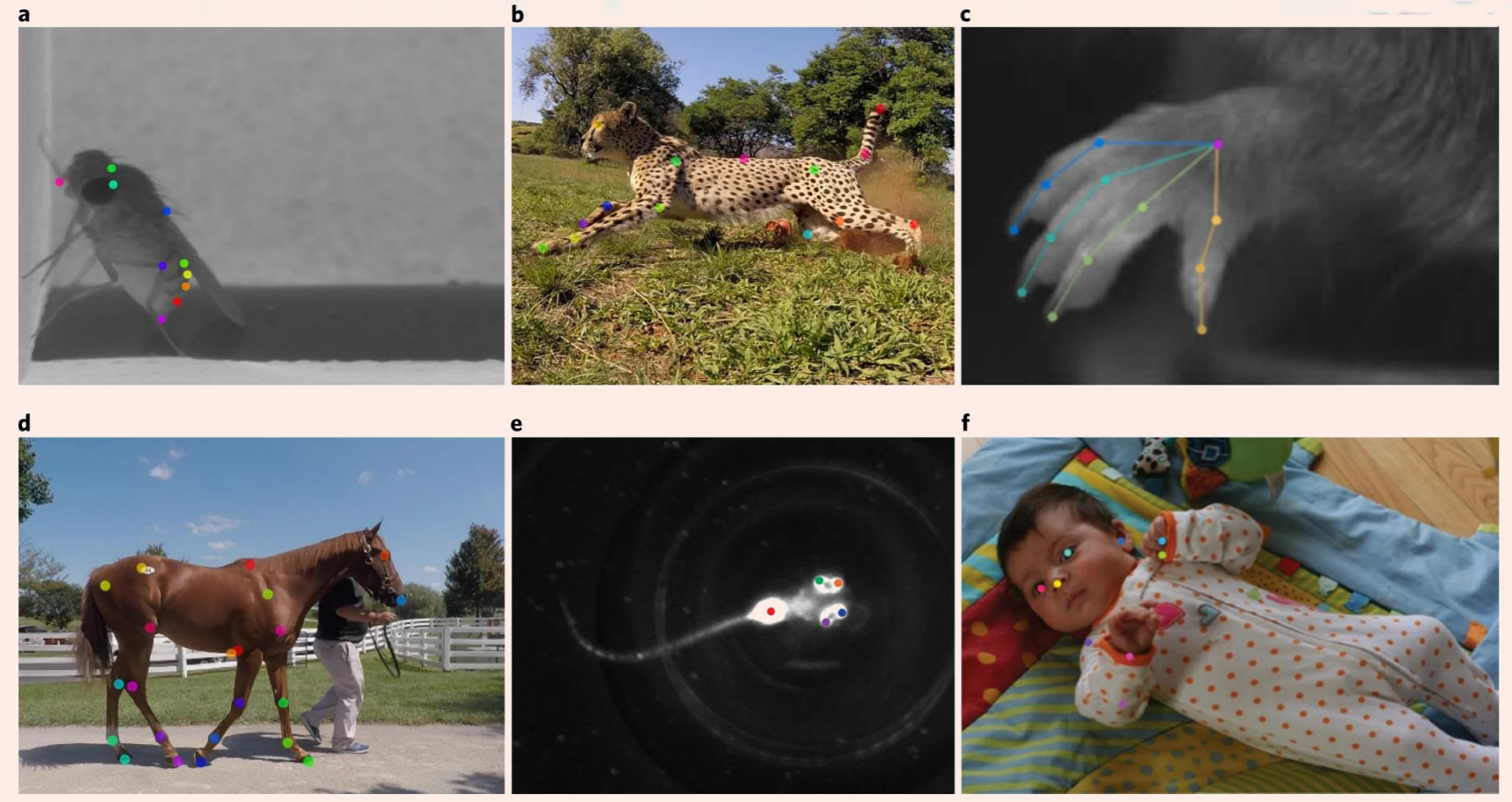
Pose estimation



DeepLabCut™: a software package for animal pose estimation

DLC: Efficient deep learning for single and multi-animal pose tracking and identification

downloads: 635k | downloads/month: 18k | pypi package: 2.3.9 | Python package: passing
License: LGPL v3 | code style: black | GitHub: 4.2k | issue resolution: 12 d | open issues: 2%

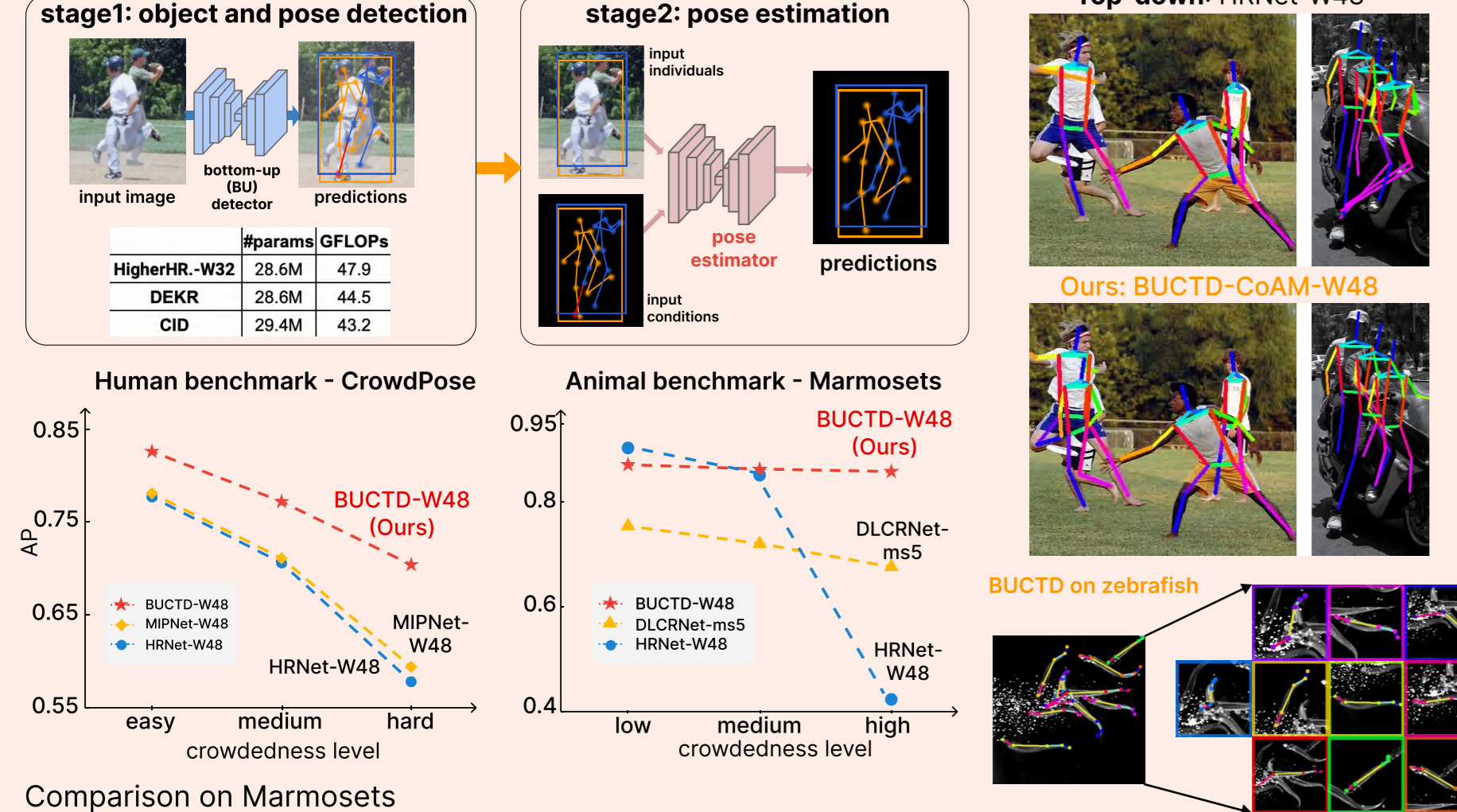


Mathis, A., et al. "DeepLabCut: markerless pose estimation of user-defined body parts with deep learning." *Nature neuroscience* 21.9 (2018): 1281-1289.
Nath, T., et al. "Using DeepLabCut for 3D markerless pose estimation across species and behaviors." *Nature protocols* 14.7 (2019): 2152-2176.
Lauer, J., et al. "Multi-animal pose estimation, identification and tracking with DeepLabCut." *Nature Methods* 19.4 (2022): 496-504.



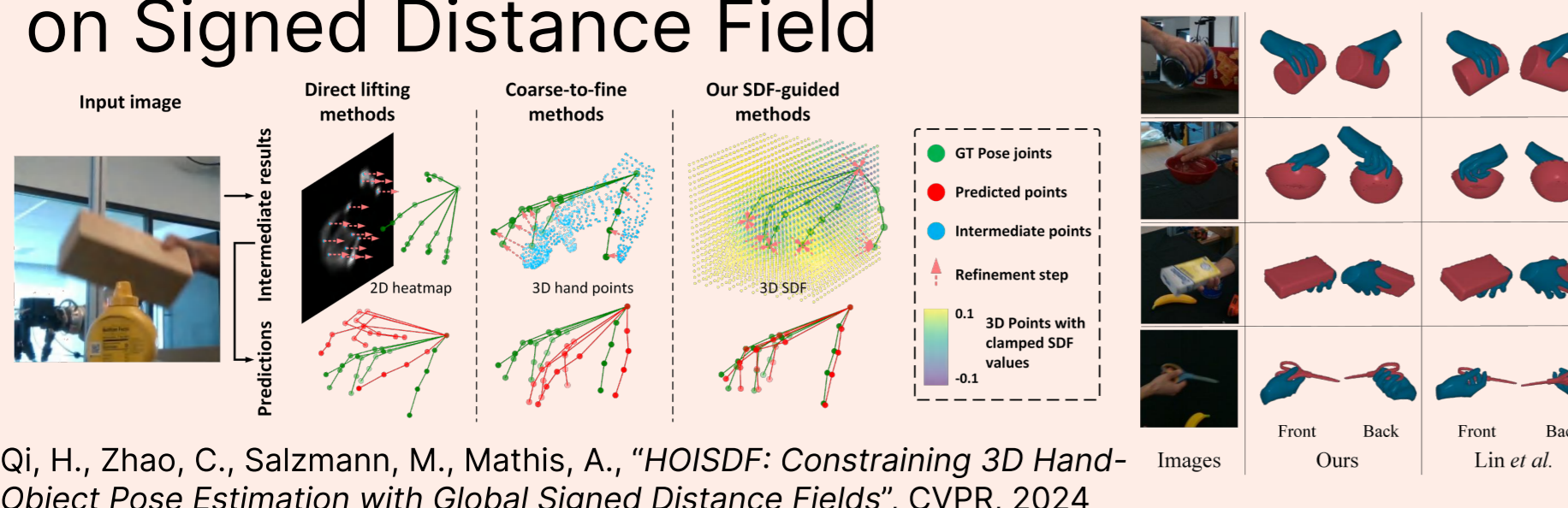
BUCTD: overcoming the detection information bottleneck and ambiguity in pose estimation

Bottom-Up Conditioned Top-Down (BUCTD) method



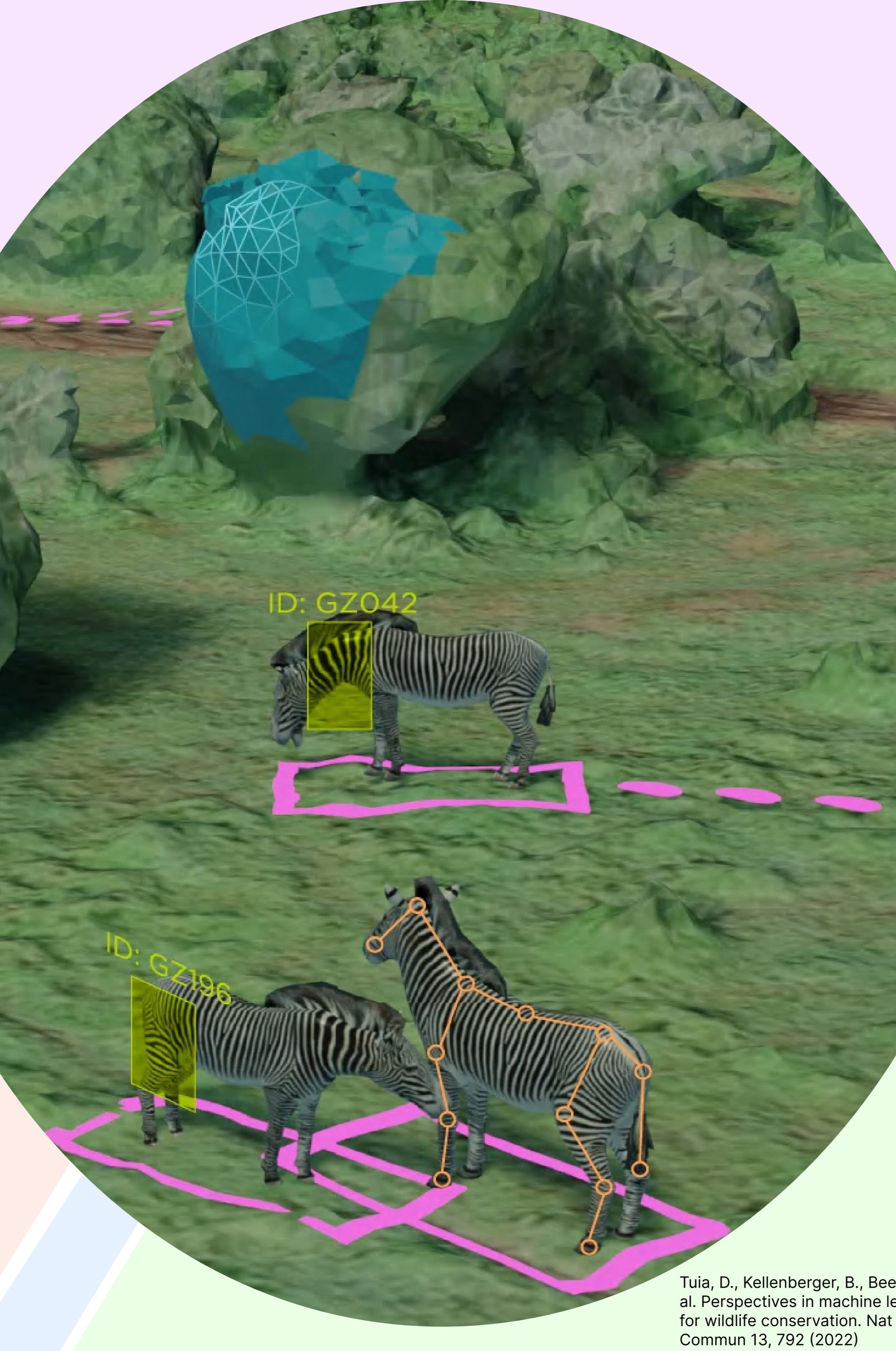
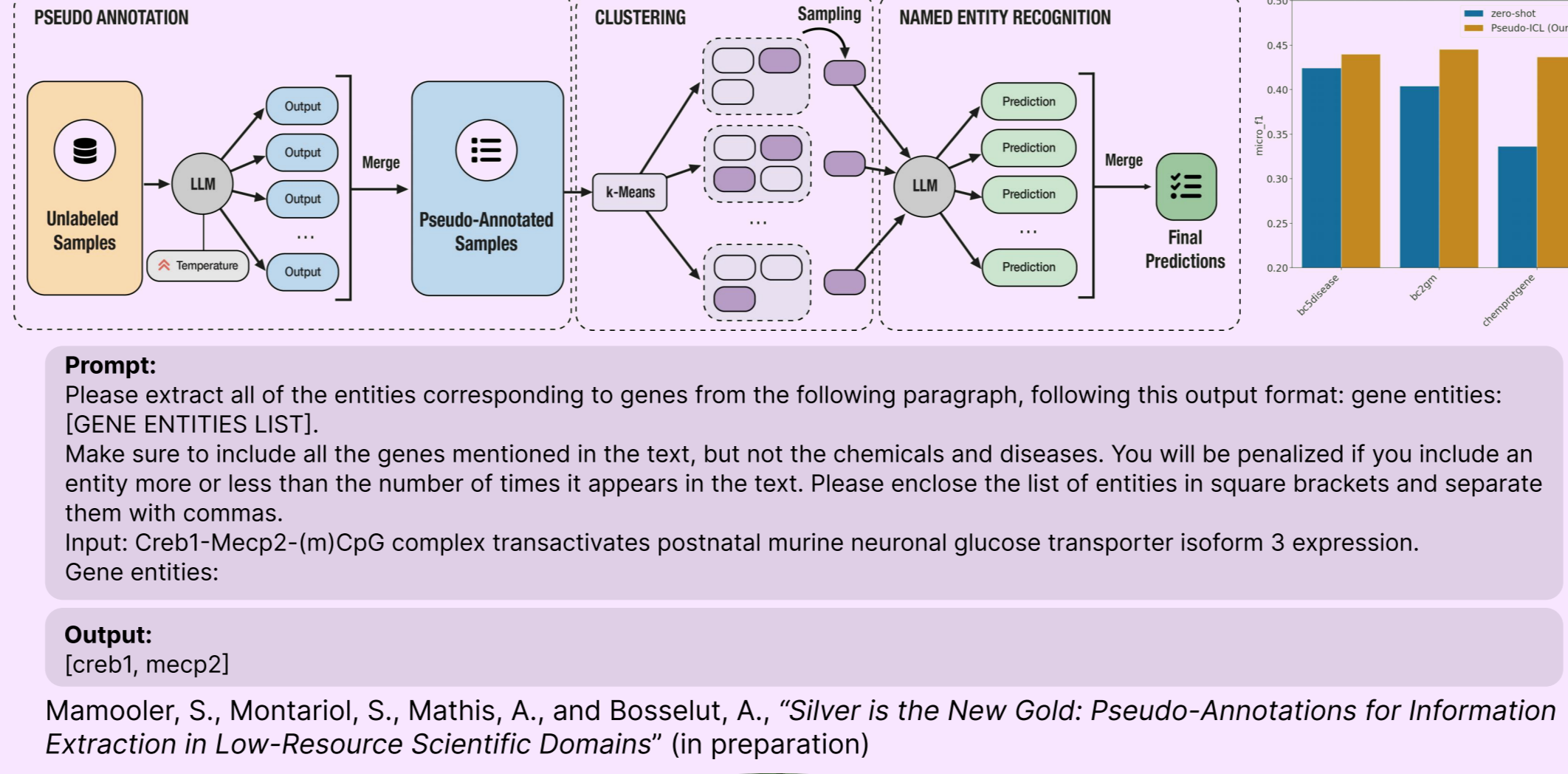
Zhou, M., Stoffl, L., Mathis, MW, Mathis, A., "Rethinking pose estimation in crowds: overcoming the detection information bottleneck and ambiguity", *ICCV*, 2023

HOISDF: Hand object pose estimation based on Signed Distance Field



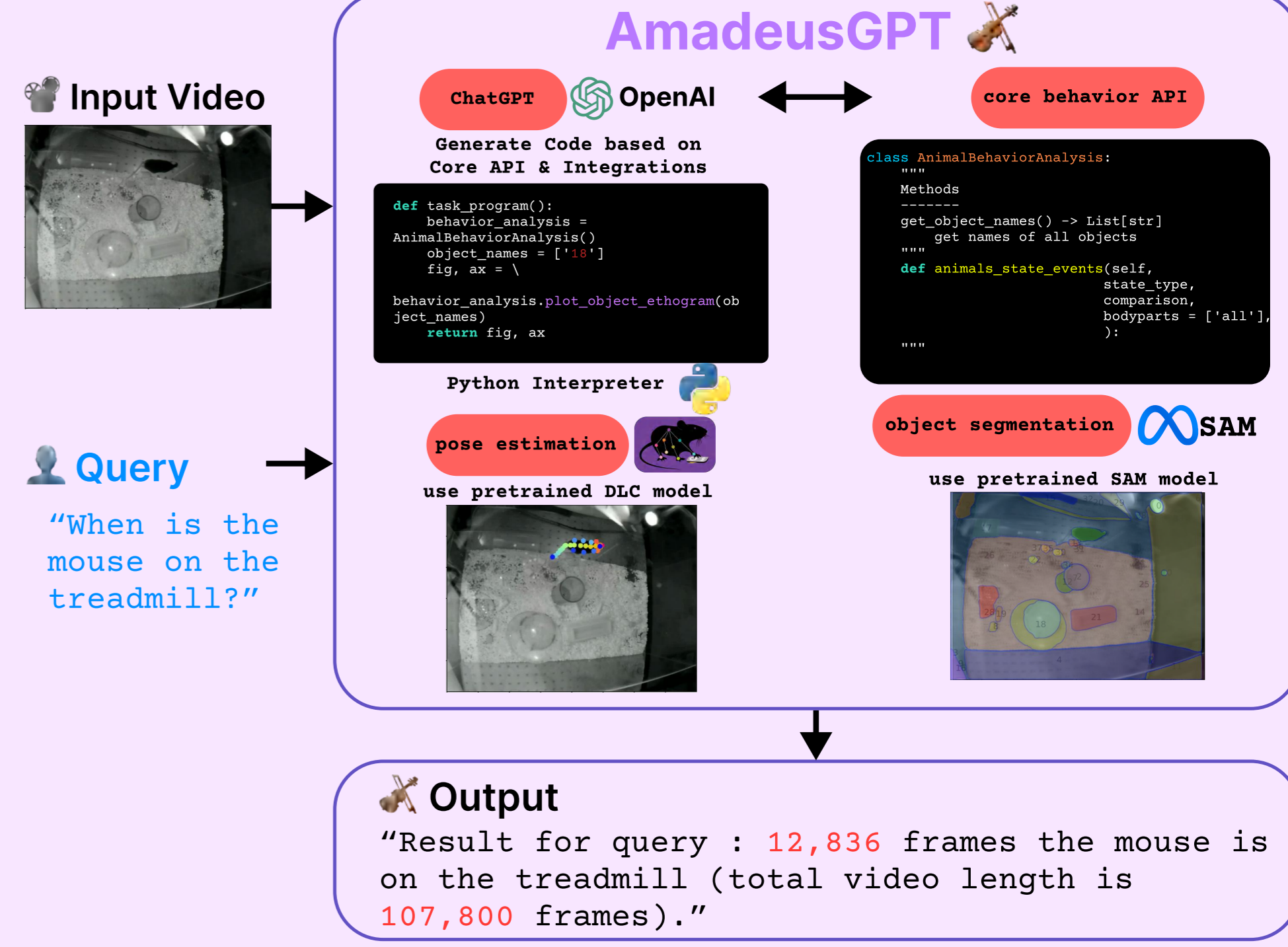
AI4Science with language models

Pseudo-ICL: In-context gene and disease extraction with pseudo-annotation

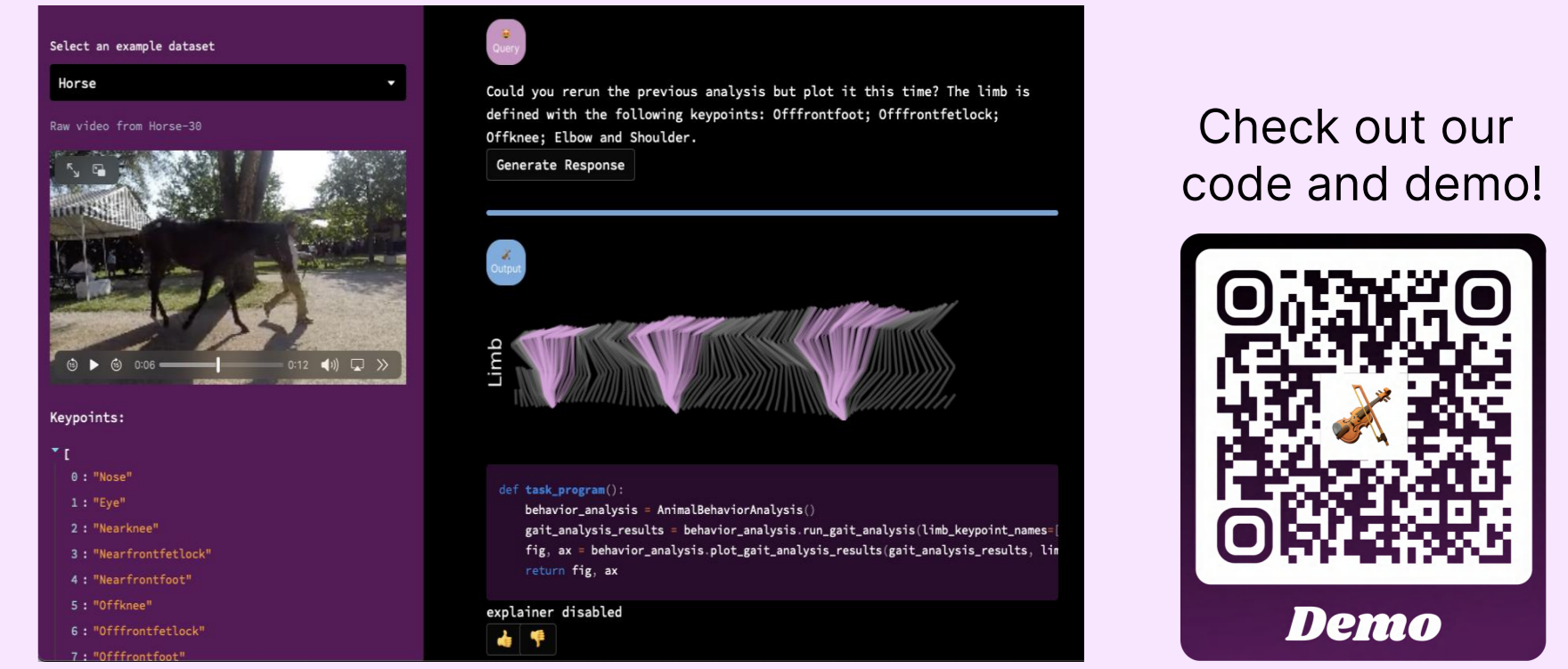


AmadeusGPT

AmadeusGPT: a natural language interface for interactive animal behavioral analysis
Language to code execution



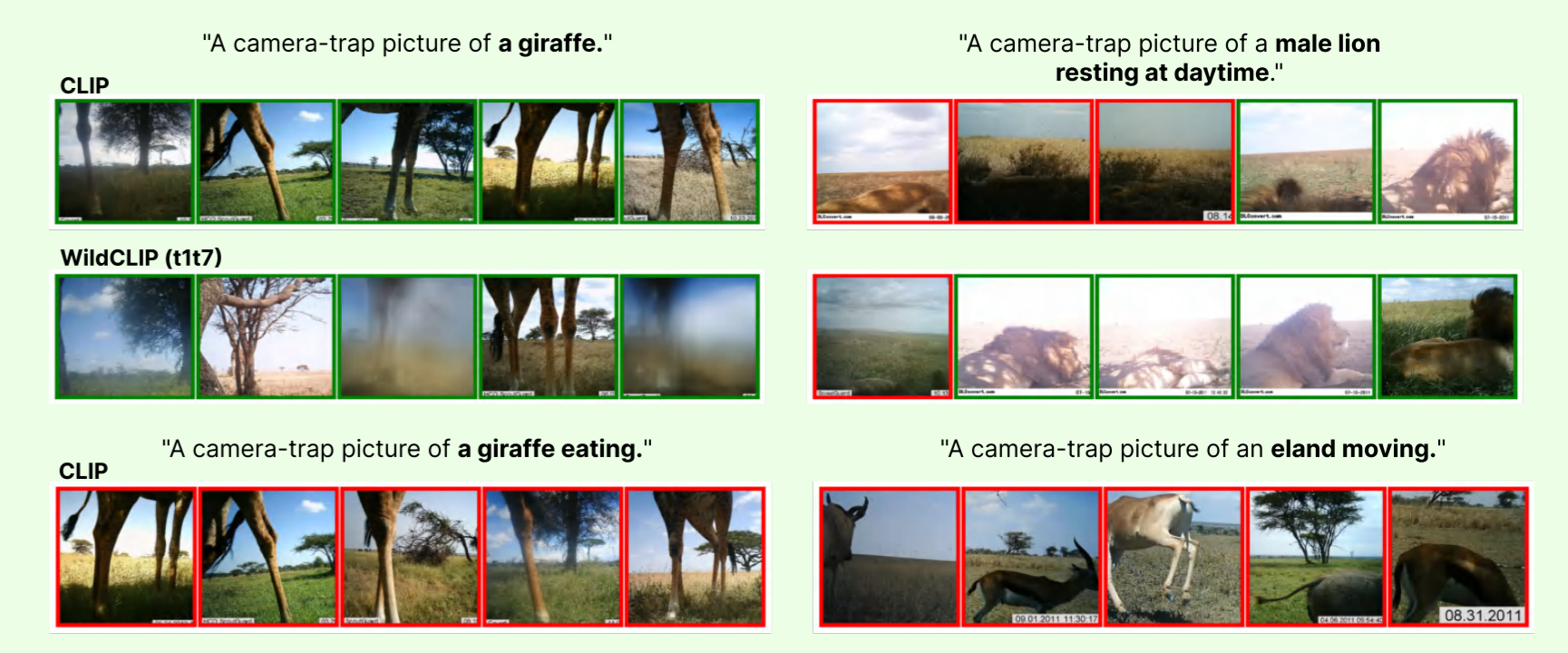
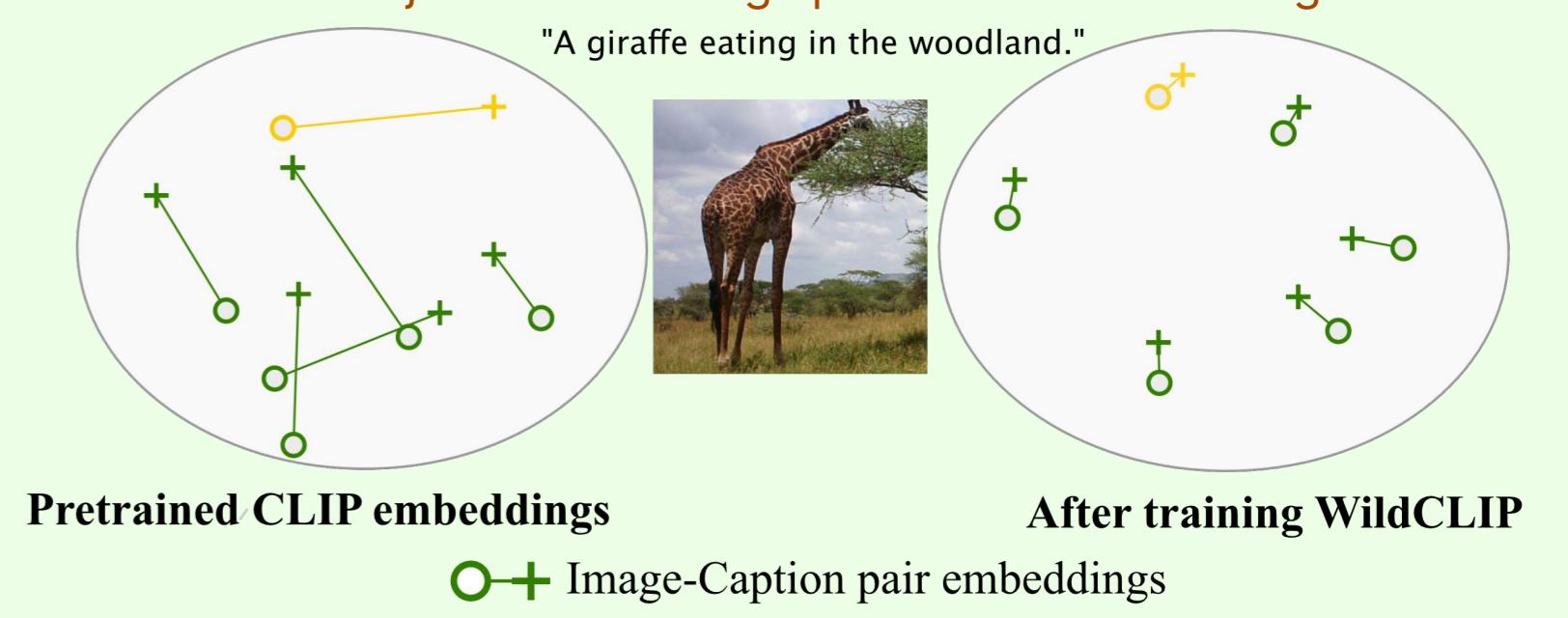
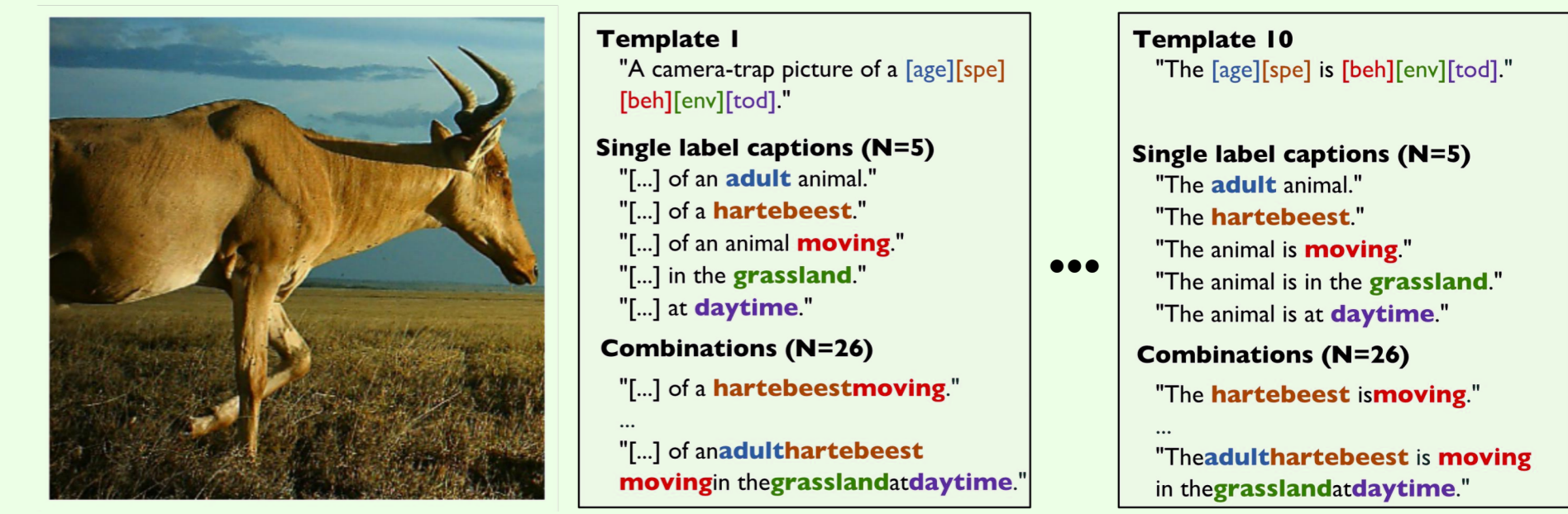
Demo app on walking horse



Action segmentation

WildCLIP Retrieving events of interest from camera trap images with domain-adapted vision-language models

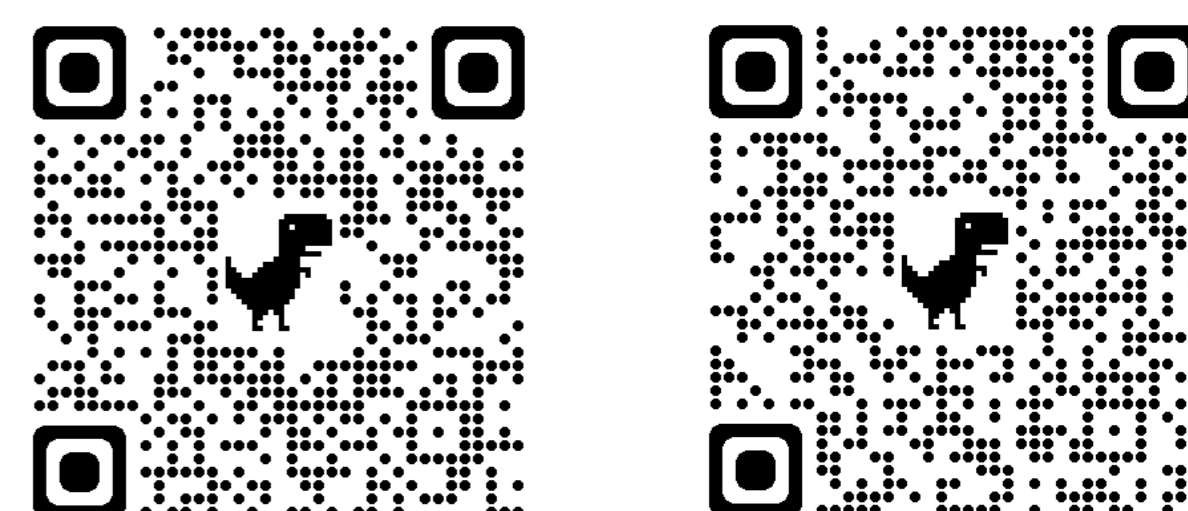
First, we create many image-caption pairs...



Gabeff, V., Russwurm, M., Tuia, D., & Mathis, A. (2023). WildCLIP: Scene and animal attribute retrieval from camera trap data with domain-adapted vision-language models. *International Journal of Computer Vision* (in press)

We love open source!

Check out our website!



EPFL SMART KITCHEN Home-based functional assessment platform for neurological patients

200 TB of DATA | 200 Cooking sessions | 50 participants involved

A. EPFL Smart Kitchen Platform

B. Multi-modal dataset

C. 3D Human Reconstruction

Analysis

Statistics

Romero J, Tzionas D, Black M J. Embodied hands: Modeling and capturing hands and bodies together[J]. 2022.
Loper M, Mahmood N, Romero J, et al. SMPL: A skinned multi-person linear model[M]//Seminal Graphics Papers.2023.

DLC2ACTION What is my cat doing?

DLC2Action is an easy-to-use python toolbox to perform action segmentation from body kinematics. Supporting diverse pose data formats, the toolbox allows you to extract kinematic features and tidily run trainings, evaluations and predictions from a set of supervised Deep Learning models. The toolbox is associated with a User Interface to manually annotate actions of interest from videos.

Feature Engineering: Coordinate, Speed, Acceleration, Angular velocity, Angular acceleration, Inter-distances, Intra-distances, Transfomers

State-of-the-art models: TCNs, MLP, Transfomers

Visualization functions: Ground Truth, CDF, Tensorizer, EDCN, MS-TCN, Tensorizer

Annotation Interface

DLC2ACTION

Many metrics | Tested on benchmarks | Manage Experiments | Dataset Partitions | Feature Engineering | Hyperparameter search | Visualization functions | Annotation Interface | State-of-the-art models | Multi-input formats | Tested on benchmarks

Sequence-to-Sequence methods

Kozlova*, Bonnetto*, Poulsen, Mathis, "DLC2action: A flexible, powerful and easy-to-use toolbox for action segmentation", (in preparation)

Check out the project: <https://github.com/amathislab/DLC2Action>