

MASTER THESIS RESEARCH PROJECT PROPOSAL

Faculté des Sciences – Institut de Biologie Département de Cognition Comparée

Machine learning applied to the study of great ape communication

Supervisors: Dr. Emilie Genty, Michael Fuchs (PhD Candidate)

Start date: Feb 2024

Duration: 6-12 months

Location: University of Neuchâtel (Switzerland)

To apply: Send CV, copy of transcripts and short motivation letter to Emilie Genty (emilie.genty@unine.ch) and Michael Fuchs (michael.fuchs@unine.ch)

Background

The study of our closest living relatives, the great apes, communication systems has been an important focus of research in the quest for understanding the building blocks that led to the emergence of human language. Great ape gestures, in particular, have been acknowledged as an important scaffold in the evolution of language because of the fundamental commonalities it shares with human language. Great ape gestures have thus been increasingly studied in the last 40 years. However, identifying and annotating great ape communicative gestures from video recordings of social interactions represents a labor-intensive, time-consuming, and tedious process that relies on the expertise of a handful of experts, and is vulnerable to observer bias.

Great apes gesture research would thus greatly benefit from easing the burden of intensive video coding thanks to the help of new machine learning tools.

These tools could facilitate the identification of relevant video segments containing social interactions, the classification of behavioral categories, and potentially even the coding of detailed aspects of movement and timing to automatically detect gestures.

Our project

In collaboration with the NCCR Evolving Language, we are implementing an innovative approach that involves the development of a state-of-the-art machine learning system. This system is designed for the automatic recognition of chimpanzee communicative gestures from videos recorded inside the chimpanzee enclosure at the Basel Zoo. This system is utilizing 3D pose estimation and skeleton-based action recognition techniques.

We are looking for a highly motivated student to help us on this project. By participating in our project, the selected candidate will gain hands-on experience in all stages of applied machine learning projects, from the annotation of video data to the training and evaluation of machine learning models.

Requirements

- A strong interest in the research question
- A proactive and independent mindset
- An excellent academic background
- Knowledge in programming (preferably in Python)

Useful additional skills

- Experience in machine learning
- Experience in annotating video data
- Prior use of pose estimation toolboxes (e.g., DeepLabCut)

Recommended reading

1. Genty E., Breuer T., Hobaiter C. et al. Gestural communication of the gorilla (*Gorilla gorilla*): repertoire, intentionality and possible origins. *Anim Cogn* 12, 527–546 (2009). <https://doi.org/10.1007/s10071-009-0213-4>
2. Byrne R.W., Cartmill E., Genty, E. et al. Great ape gestures: intentional communication with a rich set of innate signals. *Anim Cogn* 20, 755–769 (2017). <https://doi.org/10.1007/s10071-017-1096-4>
3. Genty, E., Fuchs, M. A Coding Scheme for Great Ape Signals in ELAN (2023). <https://greatapesgestures.github.io/>
4. Fuchs M., Genty E., Zuberbühler K., Cotofrei P. ASBAR: an Animal Skeleton-Based Action Recognition framework. Recognizing great ape behaviors in the wild using pose estimation with domain adaptation (2023). bioRxiv, <https://www.biorxiv.org/content/10.1101/2023.09.24.559236v1>
5. Lauer J., Zhou M., Ye S. et al. Multi-animal pose estimation, identification and tracking with DeepLabCut. *Nat Methods* 19, 496–504 (2022). <https://doi.org/10.1038/s41592-022-01443-0>