Deep Learning for Non-Invasive Identification, Social Network Analysis and Behavioral Recognition of Japanese Macaques: Toward a Comprehensive AI-Driven Primate Society Study

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The use of deep learning in ecology and ethology offers transformative possibilities, enabling non-invasive and more efficient methodologies for individual identification and behavioral analysis on video. A first study focused on the development of tools with deep learning to automatically detect and identify individual Japanese macaques (Macaca fuscata) with the goal of generating a reliable social network based on co-occurrences of individuals across video data. Utilizing YOLOv8n models, we have achieved face detection with 98.3% accuracy and individual recognition at 87.9% accuracy within the Kōjima Island population. These advances pave the way for automated, large-scale analysis of primate social structures across several populations and over different seasons (Paulet et al., 2024).

Building on these identification tools, initial steps have been taken to extend this approach toward automated behavioral recognition, targeting complex behaviors such as grooming and stone-handling. Early trials using the recently released software LabGym show promise (Ardon & Sueur, 2024). This ongoing research forms the foundation of a broader thesis project, aimed at improving individual recognition and network analysis tools in the perspective of investigating organisational and behavioral diversity within and across groups of japanese macaques. By integrating cutting-edge AI technologies, we aim to significantly enhance the study of social and cultural dynamics in primate populations, offering new, scalable insights into their social complexity.

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