Social Comparison without Explicit Inference of Others' Reward Values:
A Constructive Approach Using a Probabilistic Generative Model

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Abstract (should be within 1st page)

Social comparison—the process of evaluating one's rewards relative to others—plays a fundamental role in primate social cognition. However, it remains unknown from a computational perspective how information about others' rewards affects the evaluation of one's own reward. With a constructive approach, this study examines whether monkeys merely recognize objective reward differences or, instead, infer others' subjective reward valuations. We developed three computational models with varying degrees of social information processing: an Internal Prediction Model (IPM), which infers the partner's subjective values; a No Comparison Model (NCM), which disregards partner information; and an External Comparison Model (ECM), which directly incorporates the partner's objective rewards. To test model performance, we used a multi-layered, multimodal latent Dirichlet allocation. We trained the models on a dataset containing the behavior of a pair of monkeys, their rewards, and the conditioned stimuli. Then, we evaluated the models' ability to classify subjective values across pre-defined experimental conditions. The ECM achieved the highest classification score in the Rand Index (0.88 vs. 0.79 for the IPM) under our settings, suggesting that social comparison relies on objective reward differences rather than inferences about subjective states.