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Poster title: Using AI to infer behavioral states of *Dalotia c.*

Abstract: Animals are constantly interacting with members of their own and other species. Such interactions require animals to rapidly and reliably select appropriate behavioral responses towards a multitude of diverse species. Though such interactions play a critical role in survival, the behavioral processes and neural circuits that mediate animal-animal interactions remain poorly understood. The ability to track, quantify and model these interactions is essential for understanding the dynamics and neurobiology of animal-animal interactions. Here, we use the rove beetle species, *Dalotia coriaria*, a newly developed genetically and experimentally tractable system to study animal-interactions. *Dalotia* has an easily quantifiable and highly flexible abdomen, which it engages in a defense response against ant predators. We use machine vision to track and quantify the kinematics of a tethered beetle in the presence of an ant, when walking on a spherical treadmill. We use DeepLabCut (DLC), a machine-learning based markerless tracking software, to capture the motion of different body-parts of the beetle (keypoints), such as its antennae and flexible abdomen, permitting fine-scaled quantification of postural changes during ant-beetle interactions. We then cluster the beetle keypoints to identify behavioral motifs in latent space, and find that abdomen flexion occupies one of the major axes of variation, and offers a continuum that might be influenced by the intervention, offering us evidence that the beetle's response is elicited by the ant. We intend to use neuro symbolic programming to further interpret these clusters. Given that the communication between beetle and ant is mostly chemical, we have varied parameters of the ant, such as surface chemistry, to test the role of different sensory cues that the beetle uses in interacting with another species. This ongoing work aims to deconstruct the behavioral motifs and stigmergic patterns underlying this paradigm of interspecies social behavior.