Discovery of stereotypy through behavioral space embedding
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Princeton University — Most experiments in the neurobiology of behavior rely upon
the concept that animals frequently engage in stereotyped movements – behaviors
that an animal performs often and with great similarly. While these actions are
often the basis for mapping neural circuits and understanding the effects of genetic
manipulations, stereotypy is usually defined in an ad hoc manner, thereby limiting
the sensitivity and repeatability of subsequent analyses. Moreover, the underly-
ing assumption that an animal’s behavior can be described in terms of discrete
states typically remains unverified. In this talk, I will describe our novel method
for the identification and characterization of stereotyped behaviors. Using the fruit
fly *Drosophila melanogaster* as a model organism, we show that it is possible to
start from raw videos of a freely-behaving animal and statistically isolate stereo-
typed movements. Our method achieves this through leveraging ideas from statisti-
cal physics, non-linear dynamics, and information theory. The rigorous behavioral
metrics resulting from this technique allow us to explore questions in animal behav-
ior ranging from speciation, to aging, to the control of locomotion, thus providing
further insight in the interplay between genes, neurons, and behavior.