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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 similarity. 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 underlying 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 stereotyped movements. Our method achieves this through leveraging ideas from statistical physics, non-linear dynamics, and information theory. The rigorous behavioral metrics resulting from this technique allow us to explore questions in animal behavior ranging from speciation, to aging, to the control of locomotion, thus providing further insight in the interplay between genes, neurons, and behavior.

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