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A Separable Two-Dimensional Random Field Model of Binary Response Data from Multi-Day Behavioral Experiments

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Abstract

Background: The study of learning in populations of subjects can provide insights into the changes that occur in the brain with aging, drug intervention, and psychiatric disease.

New Method: We introduce a separable two-dimensional (2D) random field (RF) model for analyzing binary response data acquired during the learning of object-reward associations across multiple days. The method can quantify the variability of performance within a day and across days, and can capture abrupt changes in learning.

Results: We apply the method to data from young and aged macaque monkeys performing a reversal-learning task. The method provides an estimate of performance within a day for each age group, and a learning rate across days for each monkey. We find that, as a group, the older monkeys require more trials to learn the object discriminations than do the young monkeys, and that the cognitive flexibility of the younger group is higher. We also use the model

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