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Neural Decision Boundaries Predict Maximum Entropy Parameters JEFF FITZGERALD, TATYANA SHARPEE, UCSD, The Salk Institute for Biological Studies — Previous studies have shown that the response properties of neural networks can be well described by a pairwise maximum entropy model (PMEM). The coupling constants in this model can be calculated from experimental data, but it is unknown how they would need to change to optimally encode different distributions of stimuli. To determine the optimal coupling constants for a given stimulus distribution, we extended the model of neural decision boundaries to networks of neurons. This model of neural responses assumes stimuli that elicit a spike are separated from those that do not by a decision boundary. We demonstrate that the coupling constants of the PMEM which maximize information can be found from smoothness conditions on the decision boundaries. We considered exponentially distributed stimuli that mimic the large deviations found in signals in the natural environment and found that the optimal coupling constants between pairs of neurons are indeed non-zero, in agreement with experimental data.

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