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Relationship between higher-order correlations in stimulus and information in the receptive fields of visual neurons[1] RYAN ROWEKAMP, UCSD, TATYANA SHARPEE, Salk Institute — Neurons encode incoming signals in a series of spikes in the voltage trace across their cell membranes. This encoding is known to change in response to stimulus mean, variance, and power spectrum. Natural signals are known to have strong higher-than-second order correlations that cannot be described by a Gaussian distribution. To examine whether these higher-order statistics can also cause neurons to adapt their codes, we modeled the neural spike probability as an arbitrary nonlinear function with respect to two stimulus dimensions. The relevant stimulus dimensions were found as those that accounted for the largest mutual information between stimuli and spikes. We found that the contribution of the second dimension on the spike probability was stronger for natural, rather than Gaussian noise, stimuli and increased with the kurtosis of the stimulus distribution.

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