

Spike correlation measures that eliminate stimulus effects in response to white noise

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When measured in response to non-repeating white noise, standard covariance measures of two neuronal spike trains contain components due simply to a shared stimulus. We argue that, without stimulus repeats, model-free measures cannot in general remove these stimulus-induced components. We present spike correlation measures that eliminate them when the neural response can be approximated by a linear-nonlinear system. One of these measures fully characterizes the correlations in the special case that all remaining correlations are due to small reciprocal connections between the neurons. In addition, we demonstrate that the proposed measures give accurate results with a more realistic, integrate-and-fire model of neural response.