

Calculating mutual information for spike trains and other data with distances but no coordinates.

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Many important data types, such as the spike trains recorded from neurons in typical electrophysiological experiments, have a natural notion of distance or similarity between data points, even though there is no obvious coordinate system. Here, a simple Kozachenko-Leonenko estimator [1, 2] is derived for calculating the mutual information between data sets of this type. This is relevant to neuroscience because electrophysiological data, whether spike trains from single neurons or collections of spike trains from a population of neuron, can be naturally considered to take values in a metric space [3, 4]. It is, in turn, useful to be able to calculate information theory quantities for these data as part of an investigation into effective coding theories of neurodynamics or as a tool for quantifying the relationship between the activity of different neurons or different neuronal populations.

References

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