

Crabsort

Spike-sorting for small circuit networks

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Spike-sorting primer

Spike-sorting is the process of mapping action potentials to the originating cell.

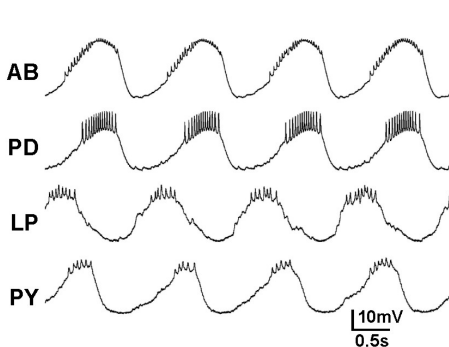


Figure: Intracellular recordings of pyloric cells.

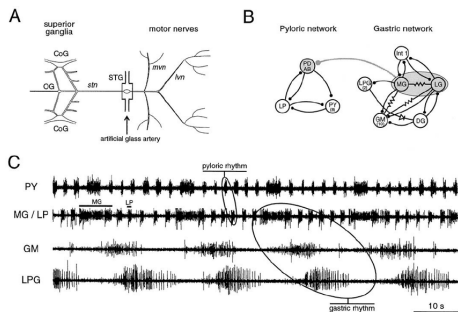


Figure: **A** circuit diagram of nerves; **B** connectivity diagram, circles are cells, synapses are lines and dots; **C** extracellular recording of motor nerves.

How to sort spikes

- 1 Identify spikes from membrane potential waveform (easy)
- 2 Sort spikes using some magic algorithm (hard)

For large networks, spike sorting means:

- 1 Methods: PCA, SVD, stochastic k-means matching of correlograms
- 2 Data: 100s of channels but without a ground truth

For small networks, spike sorting means:

- 1 Methods: dimensionality reduction, machine learning
- 2 Data: few channels with known activity

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Dimensionality Reduction

Dimensionality reduction is the process of taking high-dimensional data and representing it in a lower dimensional space.

Crabsort allows the user to:

- 1 Dimensionally reduce the data to a 2-dimensional manifold
- 2 Interactively label the data

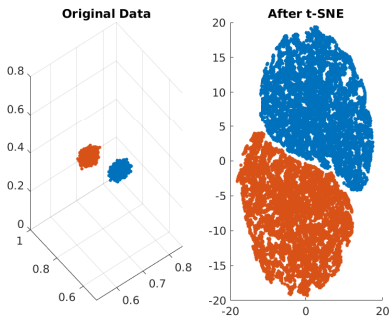


Figure: Using the t-SNE algorithm to reduce a 3-dimensional dataset to a 2-dimensional dataset.

t-SNE

