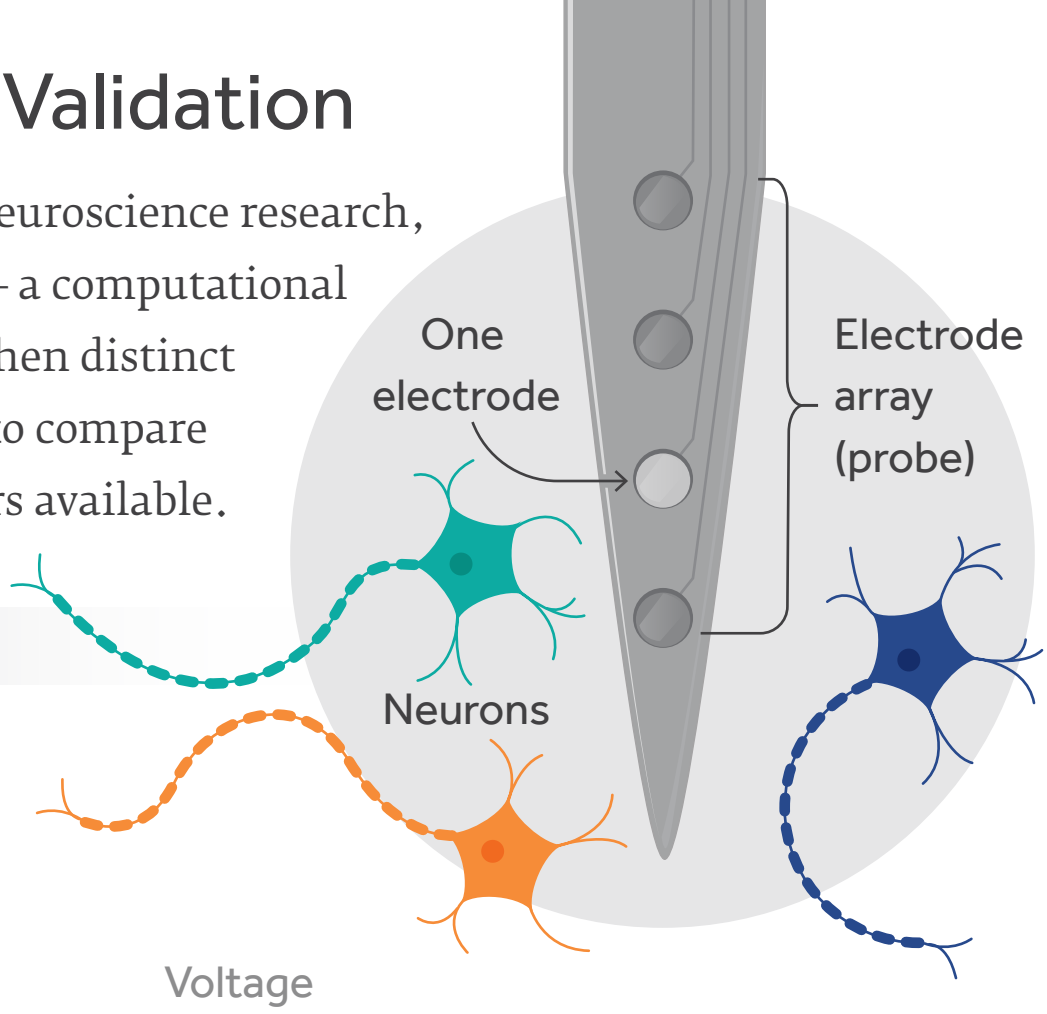
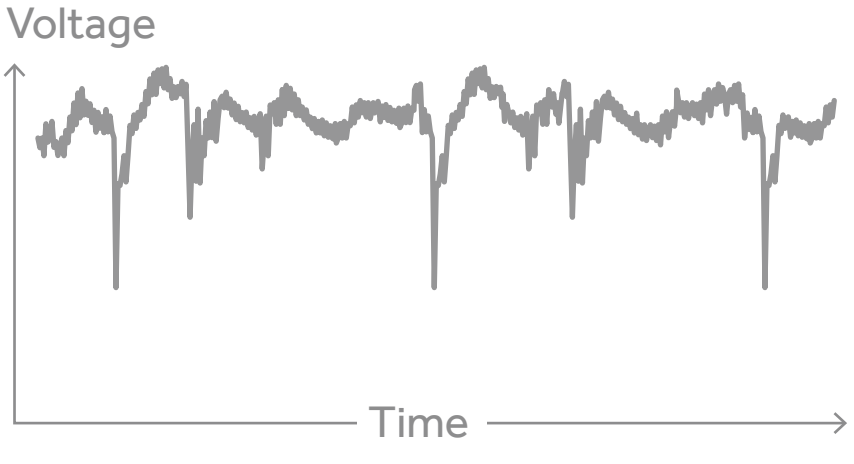
Spike Sorting and Its Validation

Recording from electrodes is key to neuroscience research, but the raw data require *spike sorting* — a computational technique for determining exactly when distinct neurons fire. Our lab develops ways to compare the accuracy of the many spike sorters available.

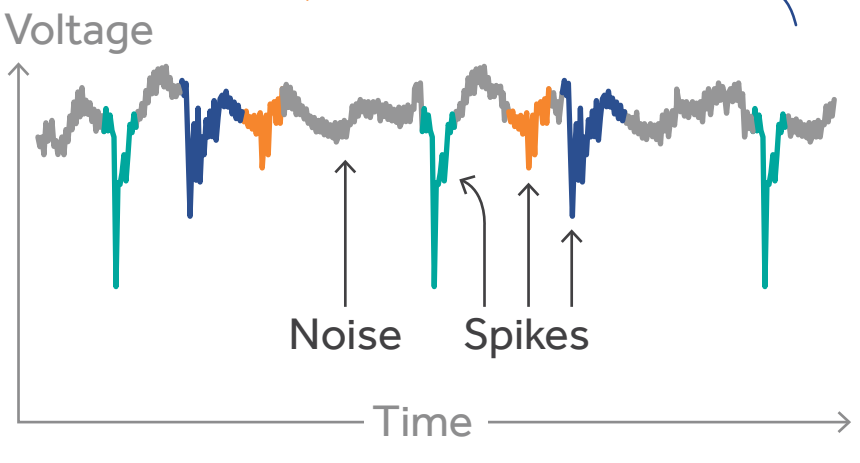


Sorting Spikes

1 A needlelike probe with many electrodes picks up electrical pulses when nearby neurons fire, or "spike."



2 The signal from one electrode might look like this. The signal is a mixture of spikes from nearby neurons plus background noise.



3 The job of spike sorters is to automatically associate as many spikes as possible with their source neurons.

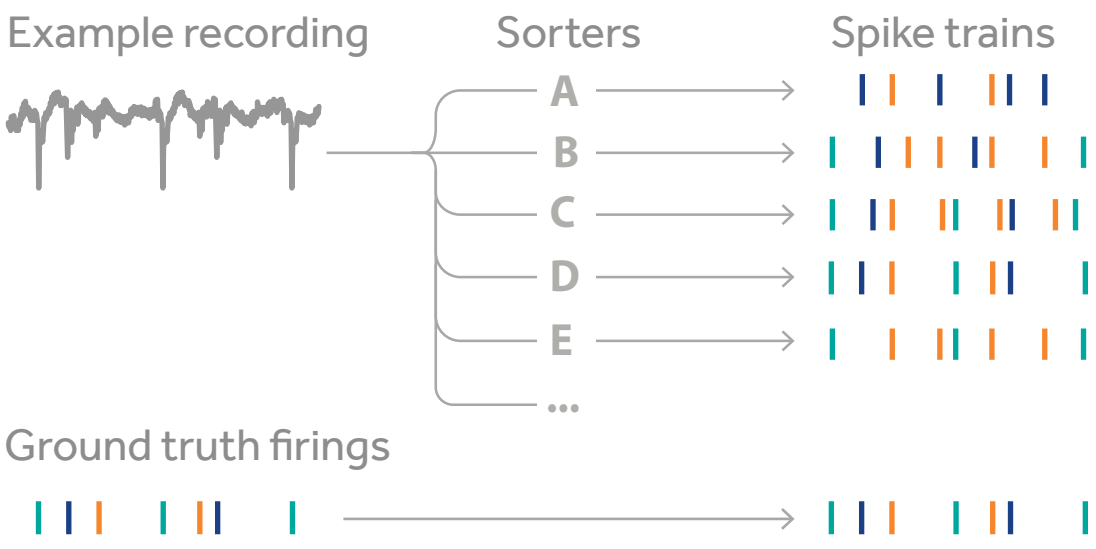
Benchmarking Spike Sorters

There is little consensus on how various spike sorting software compare. To remedy this, we built SpikeForest, a large-scale web-facing tool that benchmarks sorter accuracy using *ground truth* data where some spikes are already known. This is how it works:

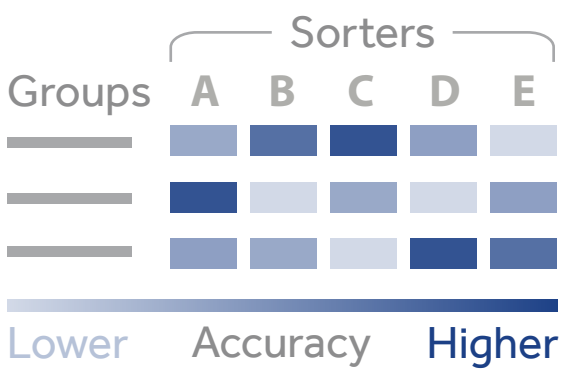
1 650 recordings with ground truth were collected and run through 10 sorters.

2 Sorter outputs were compared to their respective ground truths to count the number of faulty spikes.

3 The recordings were grouped with others sharing features such as brain region and probe type.



Examples of ground truth include data from a second nearby electrode that records just one neuron with 100% reliability.



4 Our interactive website shows the accuracy results in color in table form. The user can click on each result for details.

DOI: 10.7554/eLife.55167 | https://spikeforest.flatironinstitute.org
Center for Computational Mathematics at the Flatiron Institute