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Task 4: Spike inference from Ca^{2+}-traces

Due date: Monday, May 11th, 11.59 AM

This task will be a small competition. For download, you have a file called TrainingData.mat, which contains Ca^{2+}-traces of 10 cortical neurons and their simultaneously recorded spikes (data is courtesy of A. Tolias and M. Froudarakis, Baylor College of Medicine; for use with this lecture only). For each neuron, the file also specifies the sampling rate. Your task is to implement a Matlab function with the following interface:

```
inferredRate = estimateRateFromCa(trace)
```

Here, trace is the calcium `trace` of a neuron. Any parameters specific to your algorithm should be hard coded/inferred in the function. `InferredRate` is a vector of the same dimensionality as the input `trace`. We will evaluate your algorithm by applying this function to all 45 neurons in the test set, computing the linear correlation with the true spike rate and averaging over the dataset.

To obtain a baseline for your algorithm, the most naïve way of inferring spikes from calcium measurements would be to use `diff(trace)`.

Please make two figures:

(a) Showing the average performance of your algorithm and the spread across the different cells

(b) Comparing traces as well as true and inferred spikes.

You will get points for your implementation if it is better than the baseline or particularly creative. The best team wins a prize.

Rule: No out-of-the-box algorithm (e.g. `fast_oopsi`) may be used. Built-in Matlab functions are fine. Of course, you can implement an algorithm described in the literature.

PS. For one neuron, the trace and the spike train do not match. Likely a different neuron has been recorded. The correlation here should be very close to zero.