Neuroscience Term Project

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This manuscript was compiled on February 1, 2022

Please provide an abstract of no more than 250 words in a single paragraph. Abstracts should explain to the general reader the major contributions of the article. References in the abstract must be cited in full within the abstract itself and cited in the text.

Keyword 1 | Keyword 2 | Keyword 3 | ...

In this paper we have used the electrophysiological dataset recorded in motor cortex of two macaque monkey(N) during an instructed delayed reach-to-grasp task to create numerous plots. Meanwhile the data is recorded with a 10×10 electrode array. The area under control includes: central sulcus, M1, Premotor Cortex Dorsal (PMD) and Premotor Cortex Ventral (PMV). 96 electrodes out of 100 have the data we need. We'll be clarifying the type of the process, whether the neurons are sensitive to a particle event or not, studying the firing rate based on different events, and etc. (**?**)

Behavioural Task

The task is done by Monkey (N) and recorded during the trials. TS_ON set signals when the task begins. After 400 ms, the yellow LED turns on, a signal that the start of the trial (WS_ON). CUE_ON set is the representation of how the monkey should grasp the object; Whether it is a side grip (SG) and the two left LEDs turn on, or it's a precision grip (PG) and the two right LEDs turn on. After 300 ms CUE_OFF happens and the LEDs turn off. During the following 1000 ms, if something out of order happens, the trial leads to an error; and if not, at GO_ON set, signal to the monkey to move its hand and grip the object divides into two kinds: Low force (LF) and high force (HF). After some delay, depending on the monkey's own behaviour, SR_ON signals the start of the monkey's hand's motion. If no error happens, it should hold on the object for 500 ms, and then it receives the reward (RW_ON). At last, WS_OFF signals the end of the trial. These events are saved as bit numbers in dataset.

Results

Go over your analysis/experiments step by step and describe what is shown in each figure then make a case to go to the next analysis.

Discussion

Should be at least three paragraphs: first paragraph says what was the main results you showed, second paragraph says what was the relationship of what you showed to what was previously shown in other papers and what might be the shortcomings of your approach, third paragraph gives a short summary of significance of what you found and future directions.

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Materials and Methods

We used the data associated with the neurons' spike trains and the events during the trials. In order to have the raster plot, each trial has been separated from other trials, and its starting time shifted to zero. This way the behaviour of neurons can be seen during each trial. PSTH figure is the density of spikes over time, and is plotted with the same data sorting procedure (Fig. 2). Because the events were not altogether ordered and collected over time, showing the events as vertical line in Fig. 1 would cause unnecessary confusion. So, instead, a histogram of events for all the trials is provided, implementing which events have happened at which time during the trial (Fig. 3).

Manuscript Length. Less than ten pages using a two-column format.

References. References should be cited in numerical order as they appear in text; this will be done automatically via bibtex, e.g. (1) and (2, 3).

Significance Statement

You are encouraged to submit a 120-word maximum statement about the significance of your paper written at a level understandable to an undergraduate educated scientist outside their field of speciality. The primary goal of the Significance Statement is to explain the relevance of the work in broad context to a broad readership. The Significance Statement appears in the paper itself and is required for all research papers in some journals.

Please provide details of author contributions here.

[1]A.O.(Author One) and A.T. (Author Two) contributed equally to this work (remove if not applicable).

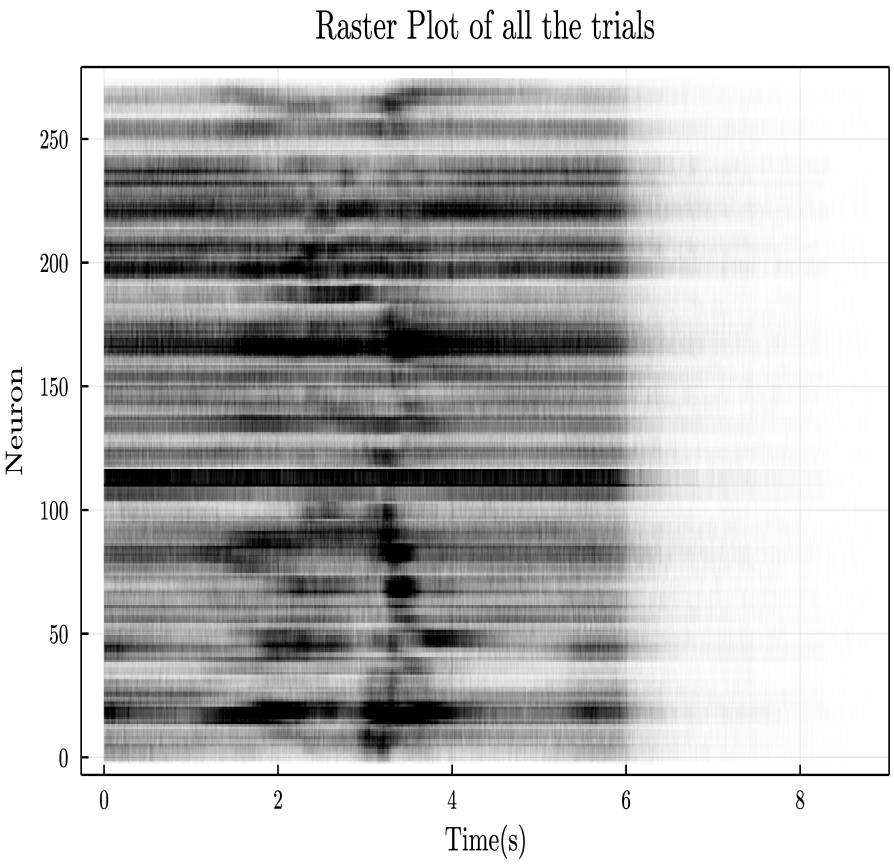

Fig. 1. Raster Plot. The rasters show multiple trials during which a neuron responds to the stimulus.

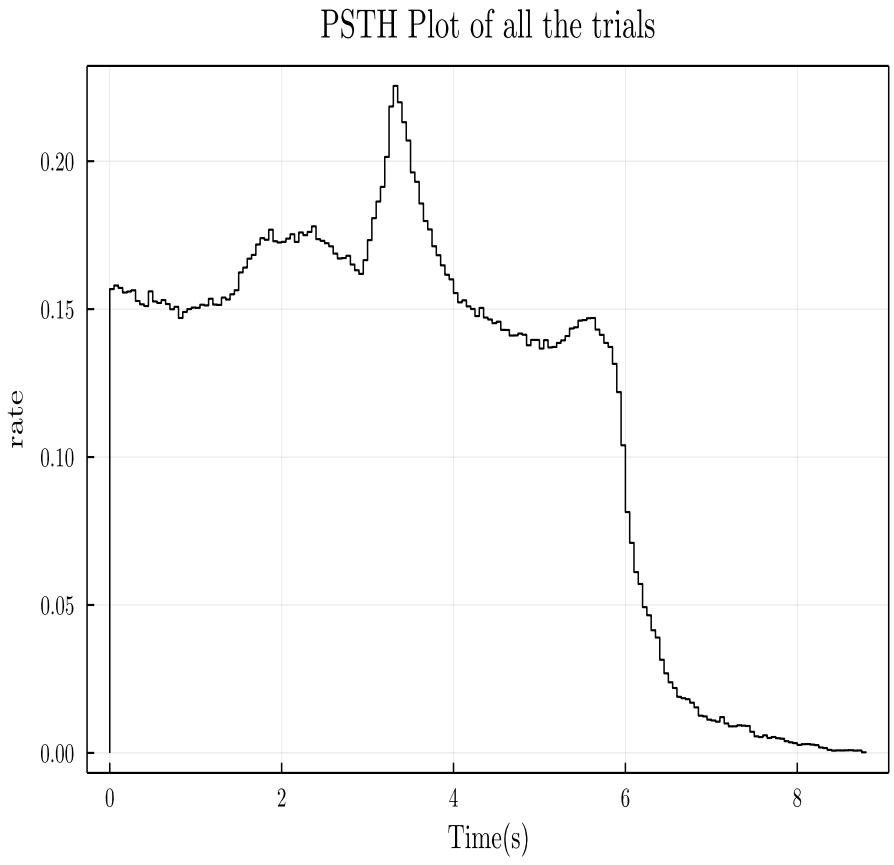

Fig. 2. PSTH. Firing rates, shown under the raster plot , were constructed from the multiple trials by counting spikes within discrete time bins and averaging over trials.

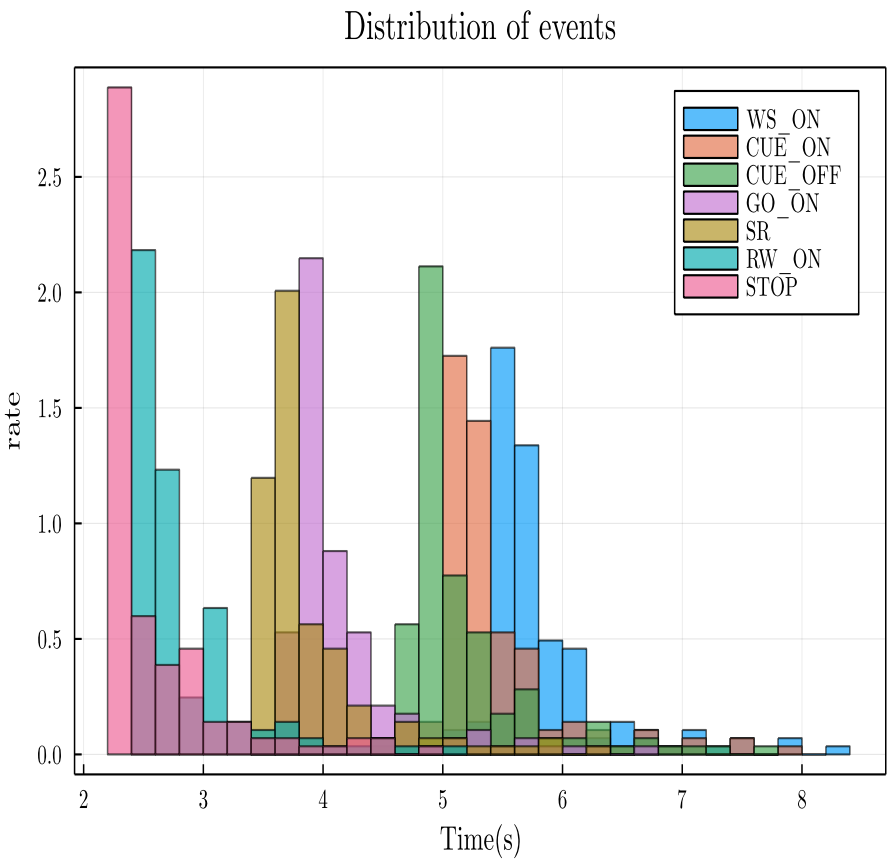

Fig. 3. The density of events in all the trials over time.

We fit the data to the general exponential equation Ae^{Bt} with $B = -2.24 \pm 0.14$

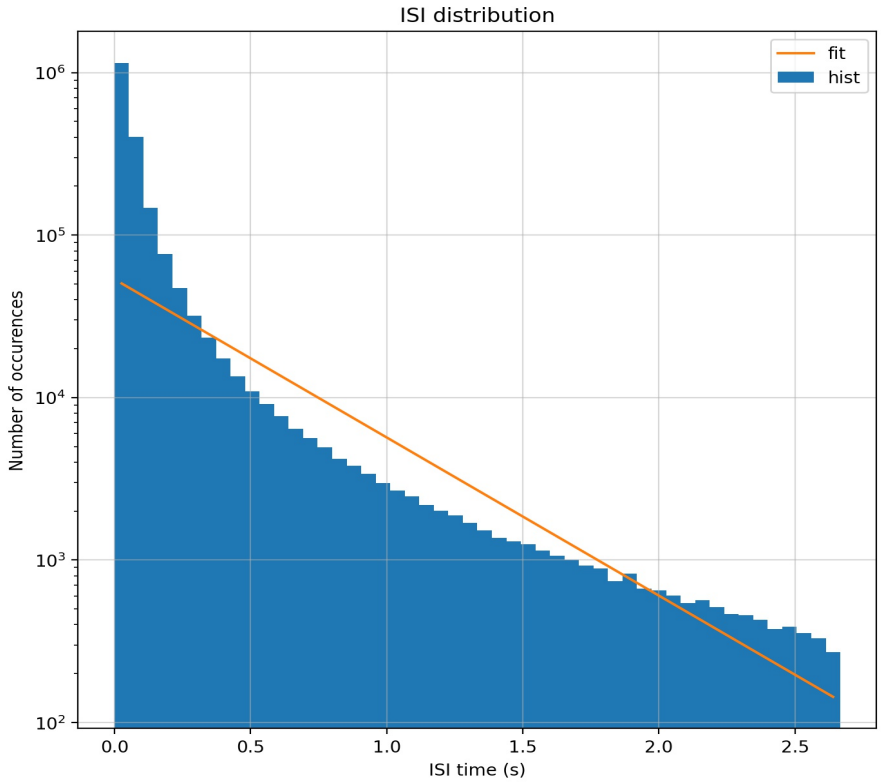

Fig. 4. The density of events in all the trials over time.

$$
\begin{aligned}
(x+y)^3 &= (x+y)(x+y)^2 \\
&= (x+y)(x^2+2xy+y^2) \\
&= x^3+3x^2y+3xy^3+x^3.
\end{aligned}
\tag{1}
$$

Single column equations. You may use 1- or 2-column equations in your article, according to your preference.

To allow an equation to span both columns, use the `\begin{figure*}...\end{figure*}` environment mentioned above for figures.

Note that the use of the `widetext` environment for equations is not recommended, and should not be used.

References

1. Mikhail Belkin and Partha Niyogi. Using manifold stucture for partially labeled classification. In *Advances in neural information processing systems*, pages 929–936, 2002.
2. Pierre Bérard, Gérard Besson, and Sylvain Gallot. Embedding riemannian manifolds by their heat kernel. *Geometric & Functional Analysis GAFA*, 4(4):373–398, 1994.
3. Ronald R Coifman, Stephane Lafon, Ann B Lee, Mauro Maggioni, Boaz Nadler, Frederick Warner, and Steven W Zucker. Geometric diffusions as a tool for harmonic analysis and structure definition of data: Diffusion maps. *Proceedings of the National Academy of Sciences of the United States of America*, 102(21):7426–7431, 2005.