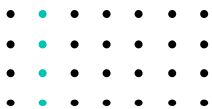


An introduction to the 2nd project

Poorya Omid





Working Memory Enhances Cortical Representations via Spatially Specific Coordination of Spike Times

Zahra Bahmani,¹ Mohammad Reza Daliri,^{1,2,*} Yaser Merrikhi,¹ Kelsey Clark,³ and Behrad Noudoost^{3,4,*}

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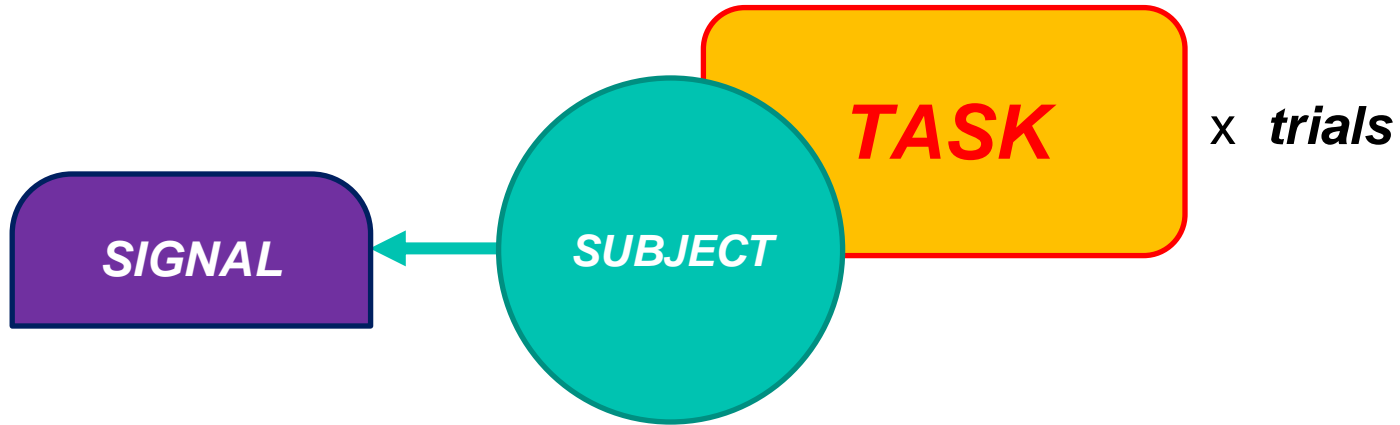
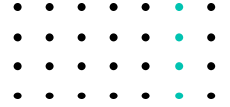
*Correspondence: daliri@iust.ac.ir (M.R.D.), behrad.noudoost@utah.edu (B.N.)

<https://doi.org/10.1016/j.neuron.2018.01.012>

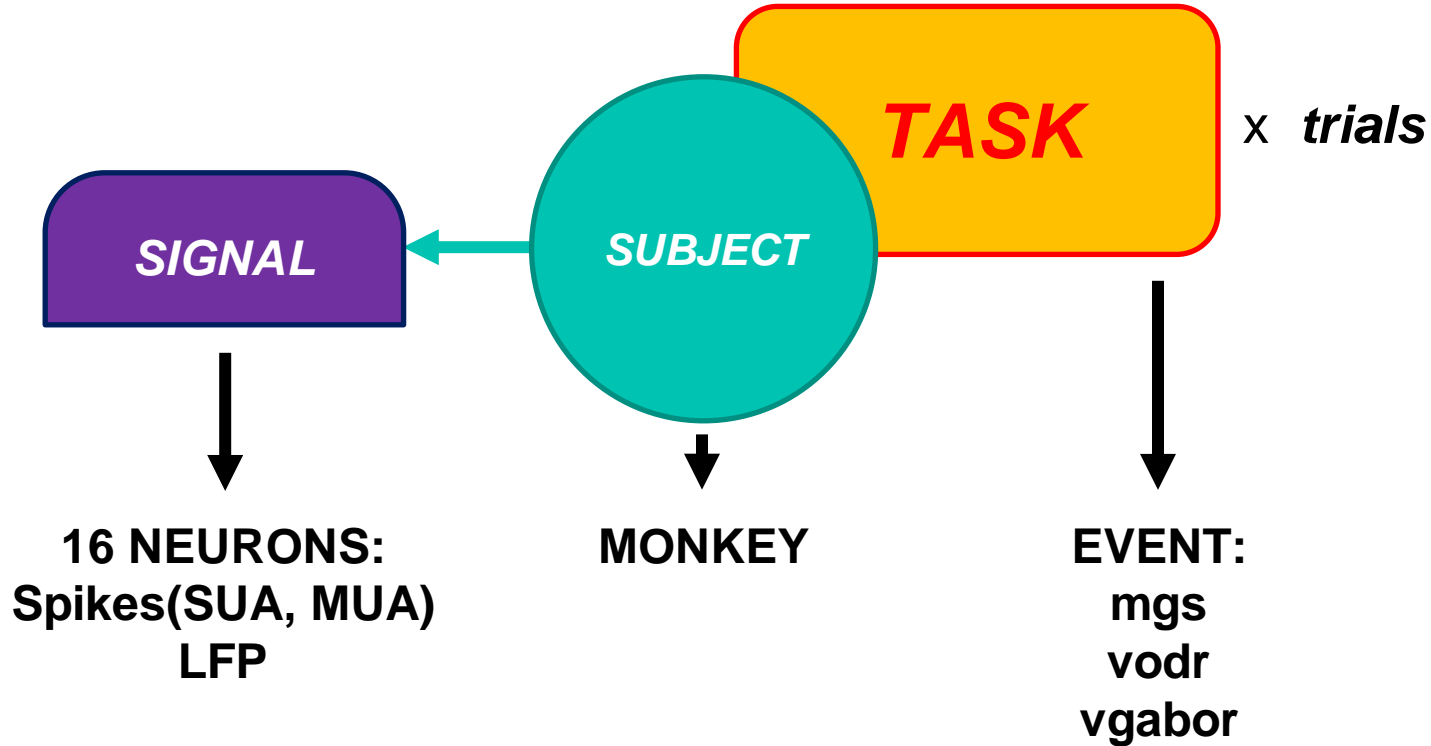
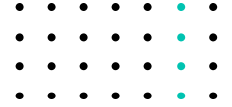
LINK TO [GOOGLE DRIVE](#)



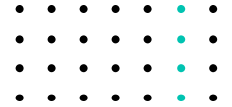
INTRODUCTION



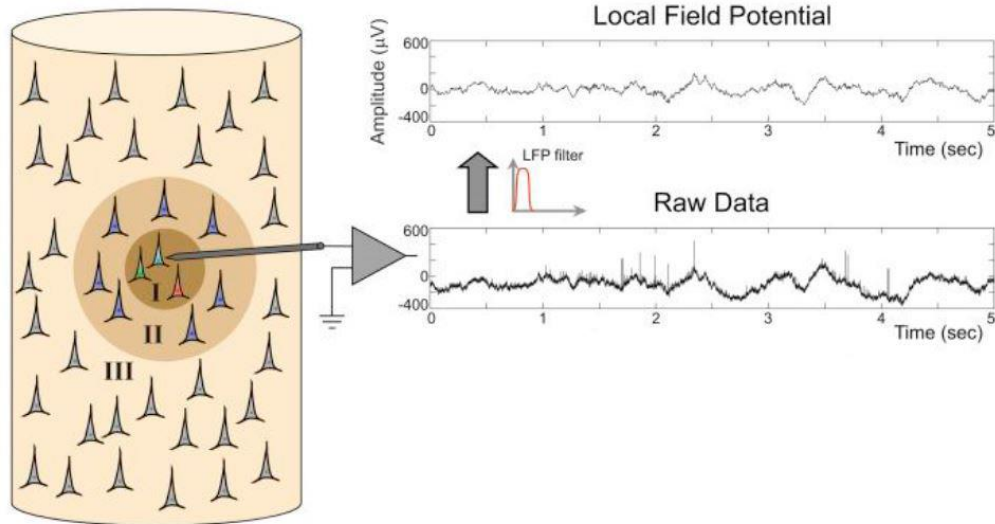
INTRODUCTION



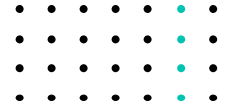
INTRODUCTION



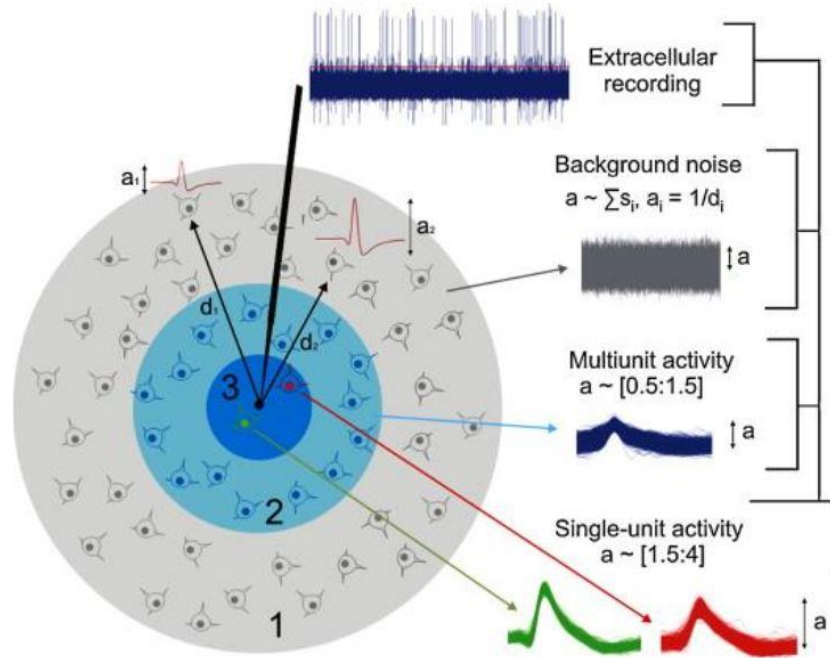
Quick reminder:



INTRODUCTION



Quick reminder:



INTRODUCTION



For each task:

1

• • • • •

EVENT

Details about every trial and
its relevant stimulus

2

• • • • •

Spikes

Single and multi unit activities
as binary numbers

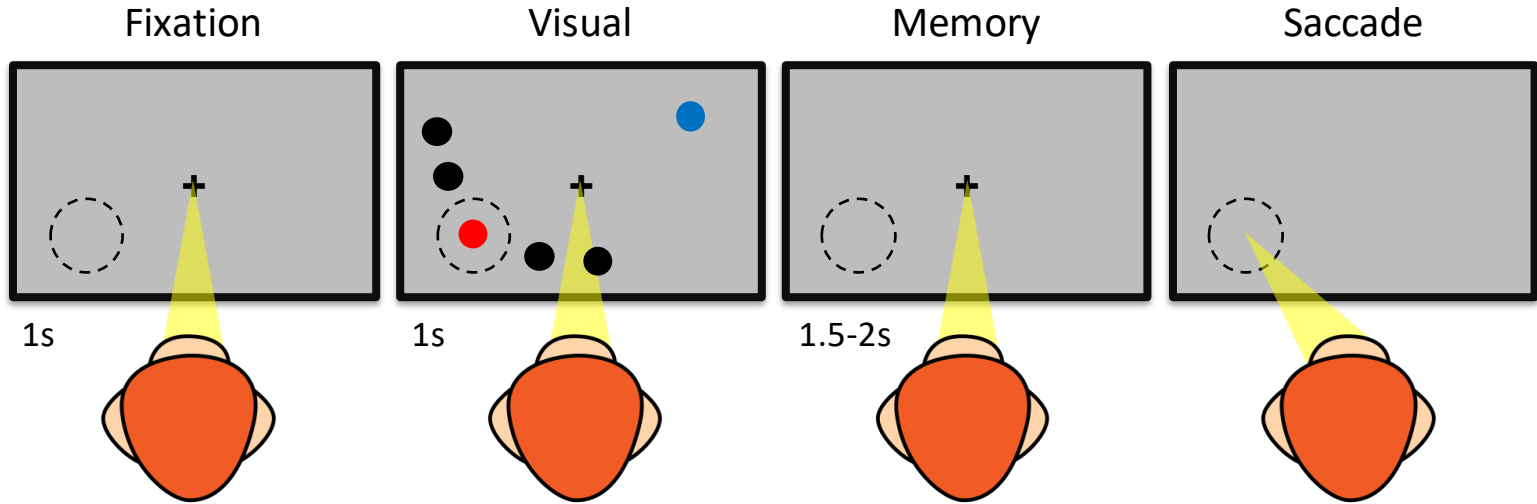
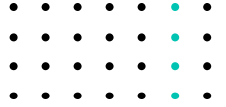
3

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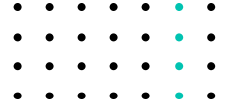
LFP

LFP of recorded signal

TASKS - mgs



TASKS - vodr



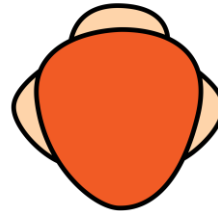
8 random probes
in each trial

100 – 200 ms for
each probe

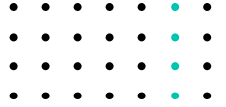
7

7

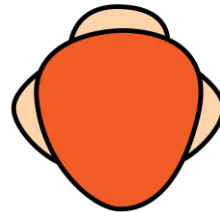
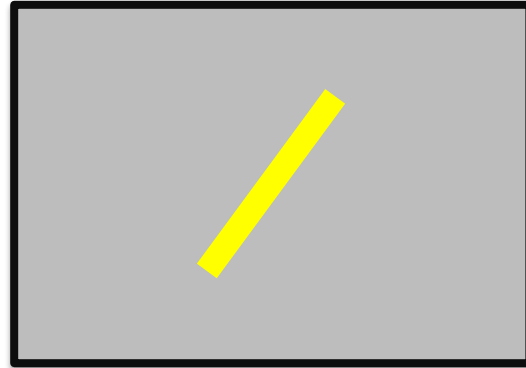
31	41	51	61	71	81	91
32	42	52	62	72	82	92
33	43	53	63	73	83	93
34	44	54	64	74	84	94
35	45	55	65	75	85	95
36	46	56	66	76	86	96
37	47	57	67	77	87	97



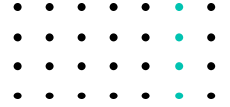
TASKS - vgabor



different angles



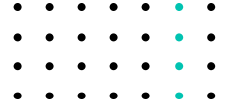
QUESTIONS – 1st



1- Explain the task and the data based on figure 1 of the attached paper.



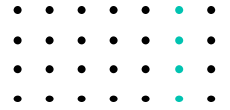
QUESTIONS – 2nd



- 2- Plot the **PSTH** and **Raster** plot of all trials of each IN and OUT condition.
- (Try to compare in & Out conditions like the example or using different colors)

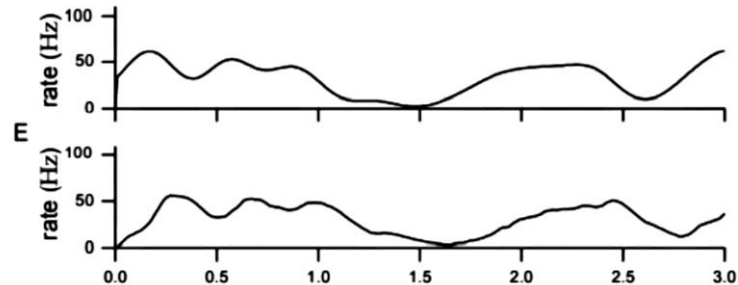
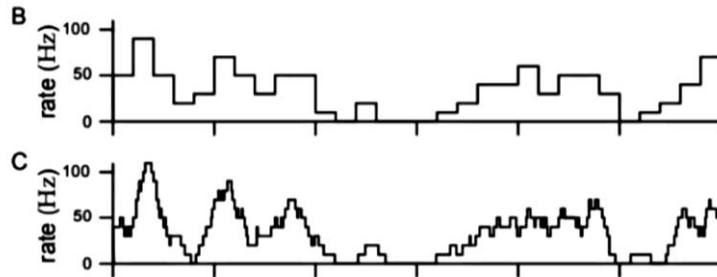


QUESTIONS – 3rd – part a

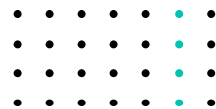


3- Consider firing rate formulas and answer the questions:

- a) Calculate the **time-dependent firing rate** of six location by applying 4 different kernels across all trials of each IN and OUT condition. (Try to compare in & Out conditions like question 2)



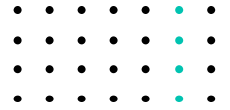
QUESTIONS – 3rd – part b



- b) Measure the firing rate of one selected neuron for conditions IN (the condition with the highest response usually 51 in this date set) & OUT (condition 54 in this date set) during fixation (0-1000 ms), visual period (1000-2000 ms), memory period (2500-3500 ms) and over all firing rate (during the whole trial).



QUESTIONS – 4th – part a

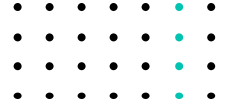


4- Consider 3 periods of mgs task and answer the questions:

- a) Find & plot the inter spike interval distribution of one selected neuron during fixation (0-1000 ms), visual period (1000-2000 ms) and over all firing rate (during the whole trial). What is your statement about the type of point process of this neuron?



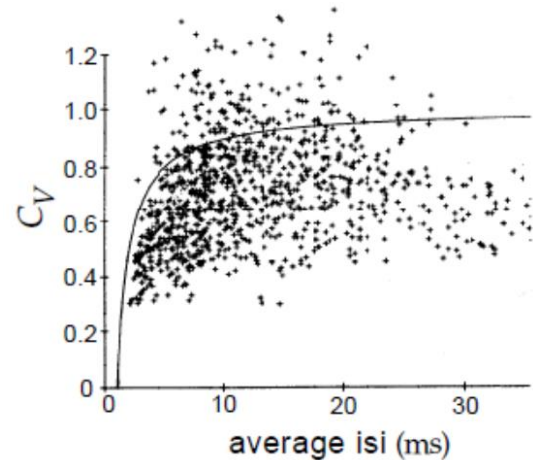
QUESTIONS – 4th – part b



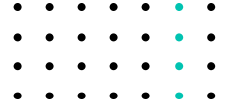
b) Measure Fanofactor & CV (coefficient of variation) of one selected neuron during fixation (0-1000 ms), visual period (1000-2000 ms) and over all firing rate (during the whole trial). What is your statement about the type of point process of this neuron?

Fanofactor: trial-fanofactor

, CV:



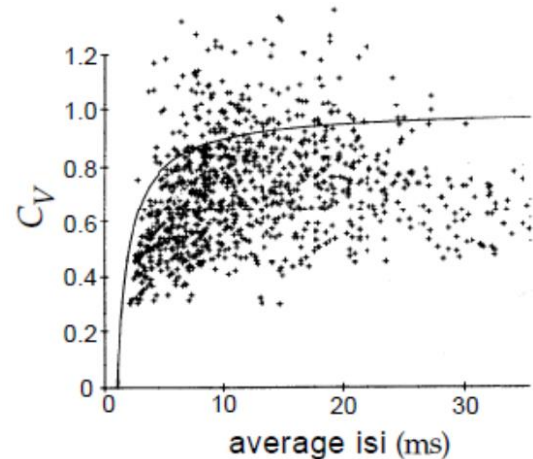
QUESTIONS – 4th – part c



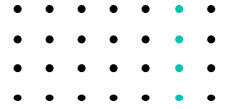
- c) Measure Fanofactor & CV (coefficient of variation) across all neurons during fixation (0-1000 ms), visual period (1000-2000 ms) and over all firing rate (during the whole trial). What is your statement about the type of point process of neurons in area MT of monkey brain?

Fanofactor: trial-fanofactor

, CV:



QUESTIONS – 5th

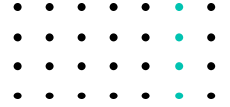


5- Generate spikes according the firing rates of section a using:

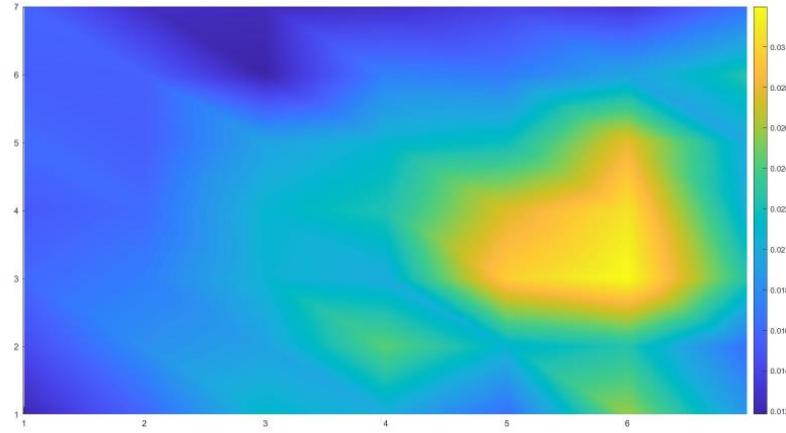
- a) homogenous point process
- b) Inhomogeneous point process



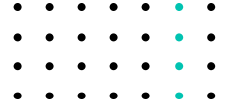
QUESTIONS – 6th



6- Create & plot receptive field using **average firing rate** based on **vodr** structure (RF mapping task).

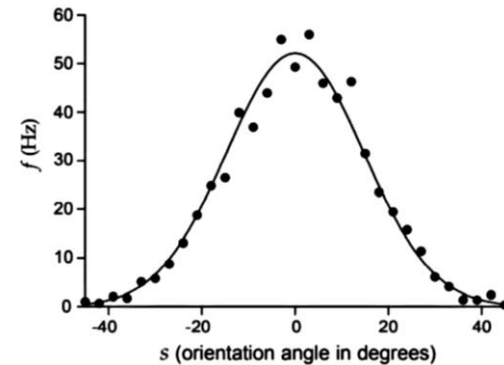


QUESTIONS – 7th

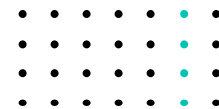


7- Create & plot tuning curve using **average firing rate**:

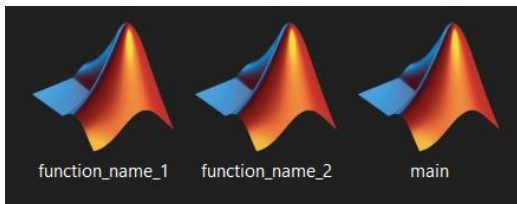
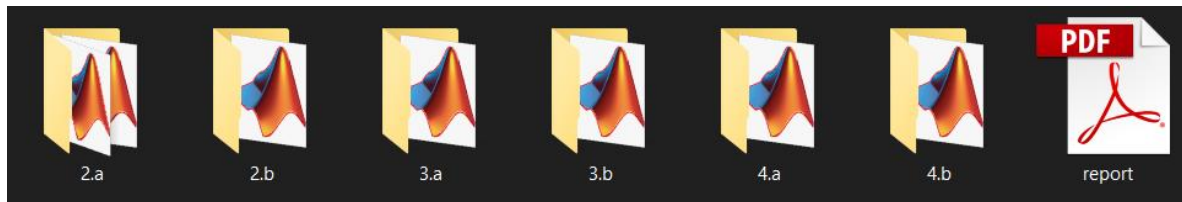
- a) based on different locations using mgs data
- b) based on different orientations using vgabor data



what you are supposed to send



Name.zip



Report: output figures, codes, explanation

Code: write comments





 pooryaomidi@gmail.com

 @Punoia

