

# Data science x neuroscience: Taking a big-data, machine learning approach to elucidate the neuronal basis and biophysical mechanism of higher cognition and cognitive maps

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## Abstract

Repetition enhancement (RE) and repetition suppression (RS) are two kinds of neurons' response pattern for repeated stimuli. Based on previous studies, our summer research looks into the response of the neurons at the posterior parietal cortex. Among all patterns, we found that repetition suppression occupied the highest ratio. For future studies, we'll do further analysis on the representational drift and the repetitional effect.

## Method

Each trial contains a 2-s blank screen, a 1.5-s screen with a picture followed by a rewarding of 1.2 mL water and a 6-s blank screen (Figure A). During picture viewings, extracellular single neuron activities were acquired from posterior parietal cortex of two adult macaque monkeys (monkey Jupiter and monkey Mercury) (Figure B & C).

After spike sorting and marker extraction, we calculated the firing rates of each neurons and built a linear regression model based on the relationship between the firing rates and either the repetitions of the same picture or different pictures belong to the same categories.

## Result

As a result, we found 118 RS units, 61 RE units, and 85 neutral units (Figure J). Neuron 31a from Session 7 and Neuron 31b from Session 10 are two examples for RE and RS separately.

Clear trends of enhancement (slope = 2.869) and suppression (slope = -1.818) respectively appear in Figure E and Figure H. Specially, Neuron 31a from Session 7 always shows a repetition enhancement trend, while Neuron 31b from Session 10 always shows a repetition suppression trend.

## Conclusion

In our research, we found that different neurons in the posterior parietal cortex fit different response types. Especially, RS is the most popular response pattern that appeared in our experiment. Next step, we plan to do further analysis on the representational drift of the experiment outcomes.

## Reference

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