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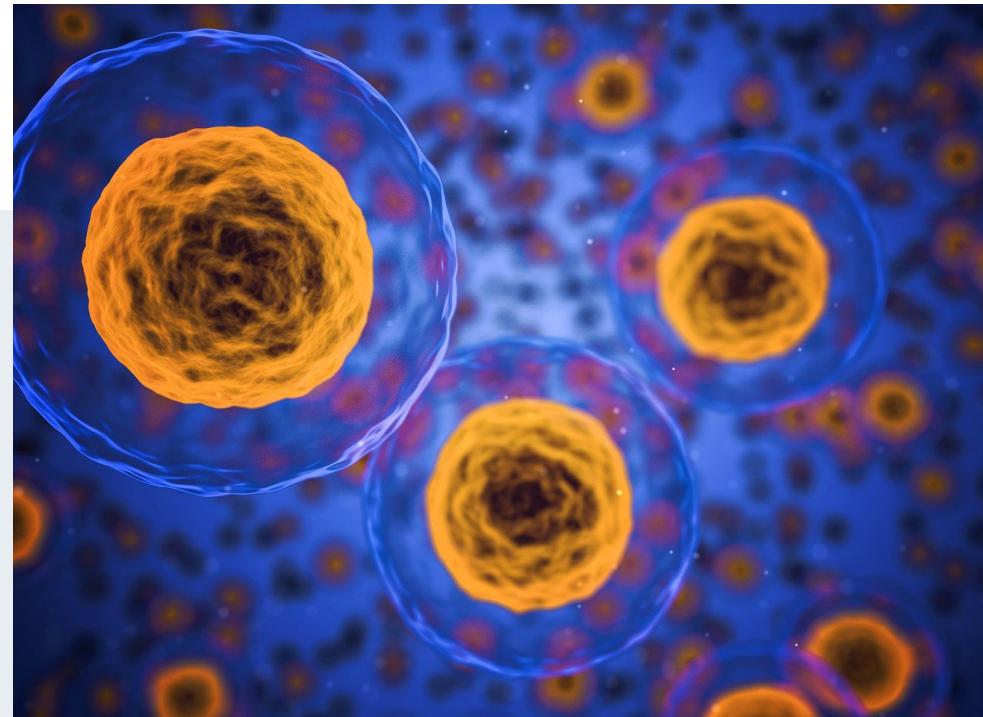


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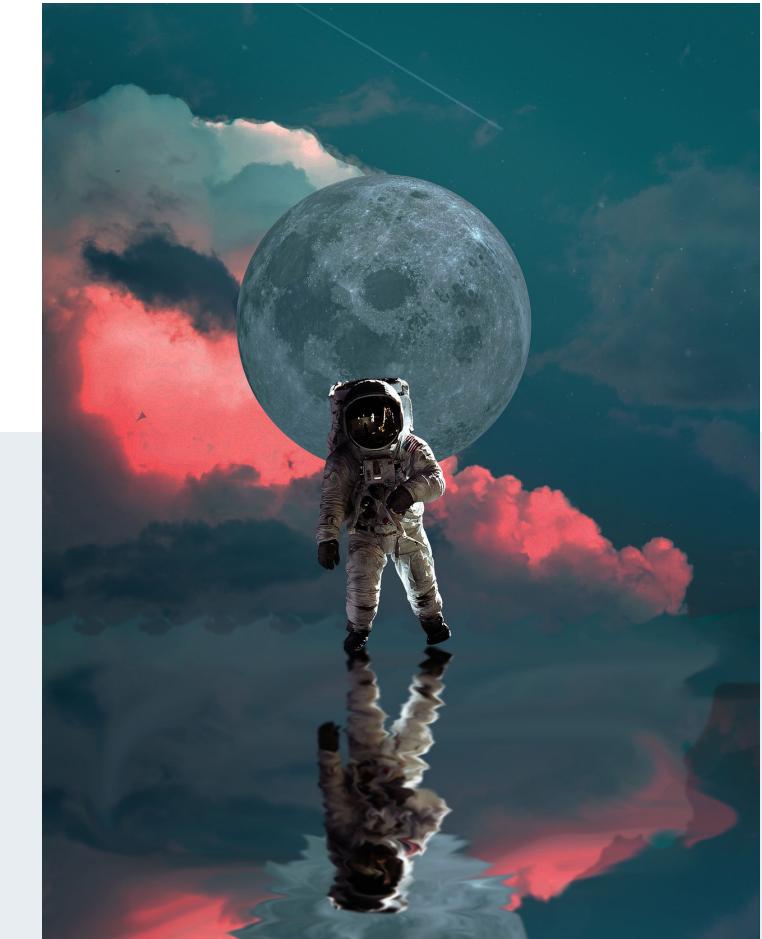
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Confidence and Optional Sampling during Perceptual Decision-Making

Yuxuan Zhang,

Introduction

A direct decision-making is often accompanied with a degree of certainty, or confidence which is an estimate of probability that a decision can be correctly made. The main task, here, is to explore the unknown relationship between optional sampling behavior which indicates confidence and the decision making mechanism.

Experimental Procedures

The psychophysical experiment mainly utilizes the random-dot paradigm. Subjects need to report the direction of perceived general dots moving direction in each trial.

Stimulus	Mission
No-down	In each trial, two arrows, left and right, appear on the screen. The subject is asked to try his/her best to make correct left/right choices, and do it as fast as possible.
Opt-down	All the same as no-down condition except one more arrow appearing on the screen. If the subject presses down, a new random-dot paradigm with 0.26 coherence replaces the current random-dot paradigm and no down arrow appears again.

Report tool: keyboard

Results

General Performance

Both subjects' psychometric curves strongly show a positive correlation between dot coherences and accuracy. The subject 2's opt-down psychometric curve is more obviously steeper than no-down psychometric curve than the subject 1's.

Confident Estimation

Opt-down ratio, pressing the down key ratio, represents the confidence about the subject's ability. It is clear that this ratio is inversely correlated with coherence.

Reaction Time(RT)

The true opt-down RT, a period before pressing the down key, is longer than the no-down and false opt-down RT, a period before deciding direction. The true opt-down RT is more likely to be a constant and this distribution is more symmetric.

Additional Discoveries

When the subject decides a direction in the no-down or false opt-down condition, he is a similar thinking pattern: spending more time determining left random-dot paradigm, true opt-down RT seemingly offset the difference between left and right. Independent 2-group Mann-Whitney U test proves this. In addition, after pressing down, RT is not obviously correlated with the past coherence.

Modeling

To explain the decision making in optional sampling behavior, building a model, established on DDM, is essential.

Summary

There is a constant period, RT accumulation. If evidence accumulation doesn't change decision variable reasonably during this period, the subject will make a decision.

Reference

1. Reenob Kiani and Michael N. Shadlen(2009). "Representation of Confidence Associated with a Decision by Neurons in the Parietal Cortex," *Journal of Neuroscience*, Vol. 29, No. 10, pp. 3080-3091.
2. Reenob Kiani and Michael N. Shadlen(2012) and Michael N. Shadlen(2014). "Choice Certainty Is Informed by Both Evidence and Decision Time," <http://dx.doi.org/10.1016/j.jocn.2014.12.001>.

Acknowledgement

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