

# Cognitive and Brain Informatics KURASHIGE LAB

## 倉重研究室



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## Revealing cognitive and neural architectures in knowledge acquisition and generation

keywords: brain, MRI, EEG, knowledge, artificial intelligence

### Background and Motivation

In human knowledge acquisition, we actively select an information to be acquired from the external environment and even generate novel information through internal thoughts. However, principles governing them remains unclear. I try to elucidate it using behavioral experiment, brain measurement, computational modeling, and machine learning-based data analysis. In addition, I address the social-level knowledge acquisition. Moreover, on the basis of results obtained from such studies, I develop human-like and human-complementing artificial intelligence systems. One of my goal is to understand and augment how 'we' complement our incomplete worldviews as well as the world.

### Originality

The human knowledge acquisition is an active process where we select information to be newly acquired based on knowledge preexisting in the brain. Indeed, many psychological and neuroscientific studies have suggested dependence of selectivity in knowledge acquisition on preexisting knowledge and have revealed brain regions relating to such selectivity. On the other hand, it is unknown what emerges consequent to integration of preexisting knowledge and selected novel information. If there is a principle more than the tendency to be acquired information relating to prior knowledge easily, there should be more elaborative laws governing what types of novel knowledge from the view of functionality emerge. How does selective knowledge acquisition change our knowledge? An originality of my research is to address this issue using multidisciplinary approach including psychological experiments, brain measurements, and mathematical methods.

### Impact and Perspective

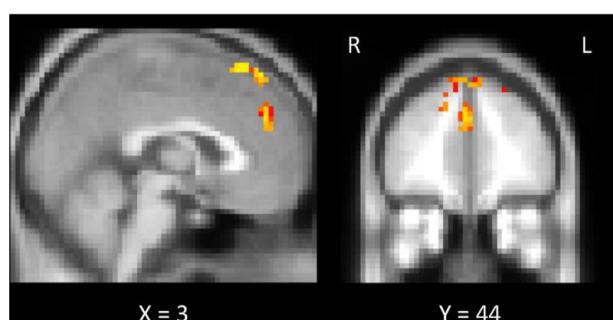
As I mentioned above, knowledge acquisition is the basis of our perceptions, feelings, thoughts, and actions. Therefore, my study provides fundamentals to understand humans and human society. Moreover, since my study informs us what human knowledge acquisition cannot do, efficient completion of such 'lacks' and augmentation of human knowledge are expected to to be feasible. One of the incredible human abilities is to possess knowledge as a unity, not a motley gathering. This enables our knowledge to be the basis of cognition. Selectivity in knowledge acquisition is regarded as an incredible ability to select the information which contributes to constructing such unitary knowledge. When we clarify the mechanism underlying the selectivity in human knowledge acquisition, it should be utilized to develop an AI model which autonomously acquires knowledge and acts.

#### For more information:

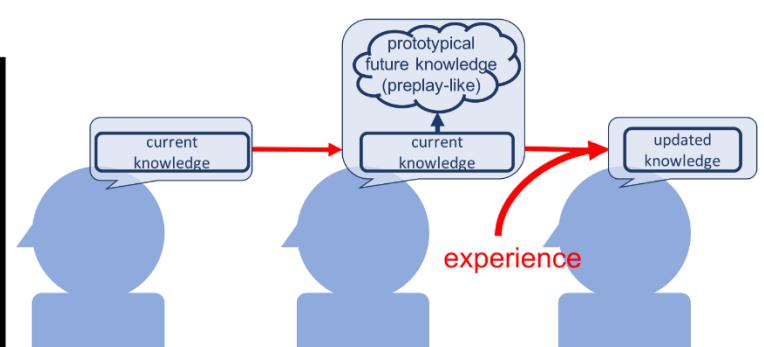
[http://wwwpr.tokai.ac.jp/tuist/english/tt/2018\\_kurashige.html](http://wwwpr.tokai.ac.jp/tuist/english/tt/2018_kurashige.html)

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Brain areas relating to prior knowledge-based contribution of prototypical neural representation to selectivity in knowledge acquisition.



Current knowledge arranges the prototypical neural representation as a designated position for future knowledge. The experience that fits this prototypical neural representation is easily assimilated.