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Neural mechanisms of learning and memory

Over the past several decades, the “stability–plasticity dilemma” has been a central issue in the field of learning and memory: That is, an organism must be able to learn about information shared across similar episodes while simultaneously retaining individual memories. Many theoretical accounts have embraced the complementary learning systems (CLS) model which holds that these two types of learning depend on separate memory systems with different specializations. The hippocampus maintains specific memories by assigning distinct representations to similar experiences, and the neocortex is specialized for slowly developing representations of the schematic statistical structure of overlapping experiences. Despite substantial evidence supporting this CLS view, it is not fully understood how exactly structured knowledge is emerged through accumulated experiences. Specifically, the CLS model predicts that the neocortex requires a large number of overlapping experiences to represent generalities due to its inherent low learning rate. However, it does not provide sound explanations on how we often successfully learn general knowledge only based on several observations. Given the current computational challenges, I propose a novel theoretical account explaining how an organism acquires structured knowledge efficiently by taking into account interactions between the two memory systems.

Aim	Understanding neural mechanisms of learning and memory		
Tool	Computational modeling + Behavioral experiment + fMRI + machine learning		
	Computational modeling 	fMRI data 	Analyzing fMRI data using machine learning techniques

Curriculum Vitae

2018~Present : Principal Investigator, KBRI

2016~2018 : Postdoctoral Associate, Dept. of Psychology/
Univ. of Oregon, OR, USA

Academic Credential

2016 : Ph.D., Dept. of Psychology, Princeton Univ., NJ, USA

2010 : M.S., Dept. of Psychology, Yonsei Univ., Seoul, Korea

2008 : B.A., Dept. of Psychology, Yonsei Univ., Seoul, Korea

Awards/Honors/Memberships

2018~Present : Member, Korean Psychological Association

2011~Present : Member, Context and Episodic Memory Symposium

2011~Present : Member, Vision Science Society

2011~Present : Member, Society for Neuroscience

Research keywords

Episodic memory, Semantic memory, Hippocampus, fMRI, Computational modeling.

Research Interests/Topics

- Memory competition between overlapping episodic memories and neural differentiation.
- Comparing a current input with related memories facilitates semanticization of the overlapping experiences.

Research Publications (selected)

- **Kim G**, Lewis-Peacock JA, Norman KA, Turk-Browne NB. Pruning of memories by context-based prediction error. *Proc. Natl. Acad. Sci. USA*, 111(24):8997-9002, 2014.
- **Kim G**, Norman KA, Turk-Browne NB. Neural differentiation of incorrectly predicted memories. *J Neurosci*. 37(8): 2022-2031, 2017.
- **Kim G**, Norman KA, Turk-Browne NB. Neural overlap in item representations across episodes impairs context memory. *Cereb. Cortex*. 29(6): 2682-2693, 2019.
- **Kim G**, Yi DJ. Repetition antipriming: The effects of perceptual ambiguity on object recognition. *Korean J Cogsci*. 21(4), 2010.