The memory representation of indoor scenes

The experiment you just completed investigates how people learn and remember new information. The specific focus of this experiment was observing the cognitive process of remembering complex real-world scenes especially using indoor scene images. To successfully remember the scenes, you had to selectively attend to diagnostic features, ignore the irrelevant features, think about your previous experiences, and create a new memory representation of the given scene.

We were particularly interested in measuring how precisely people can form the memory representation of the complex scenes. To measure the memory precision, here we introduced the continuously changing scene dimension named 'scene wheel' by synthesizing scene images through a deep neural network. In the experiment, one scene from the scene wheel was selected as a target scene to be remembered. By asking participants to find a closely matched scene to the target from the scene wheel, we measured the distance of the target and response scenes on the scene wheel. In this way, we were planning to measure memory errors on a continuous scale.

We further hypothesized that the memory precision varies depending on the similarity level of the scenes in the scene wheel. In each trial, the scenes wheel can contain either very similar scenes or dramatically different scenes depending on the similarity level. When the scenes were very similar to one another within the wheel, the attended and remembered feature of the target scene could be frequently included in the other scenes so that it would be hard to specify the exact target among the wheel. On the other hand, if the scenes were less similar within the wheel, the remembered features of the target scene in your memory could be diagnostic and so the memory precision could be high.

Completion of this project will inform theories of memory by characterizing how people remember complex scenes in such a learning context. This project will also inform future studies we will conduct that investigate different brain regions critical for successful learning and memory ability. If you are interested in this topic, check out the materials below:

Cacioppo, J. T., & Freberg, L. (2018). *Discovering psychology: The science of mind (Chapter 9. The knowing mind: memory).* Cengage learning.

Konkle, T., Brady, T. F., Alvarez, G. A., & Oliva, A. (2010). Scene memory is more detailed than you think: The role of categories in visual long-term memory. *Psychological science*, *21*(11), 1551-1556.

If you have any questions, please contact Dr. Michael Mack at 416-978-4243 or by email at mack@psych.utoronto.ca.

Thanks for participating in our experiment!

Questions

: Please try to answer the questions below to review what you've learned from participating in the experiment.

1. What is the purpose of the experiment?
2. What kind of cognitive processes can be involved in remembering scenes?
3. For what purpose the deep neural network was used in the experiment?
4. What is the independent variable in the experiment?
5. What is the dependent variable in the experiment?
6. What kind of future studies can be planned after this study?

(You can check the answers on the next page)

Answers

1. To investigate how we remember complex scene images (or to measure how precisely people can remember the complex scenes).
2. Perception, attention, retrieving prior knowledge, etc.
3. To make a continuous space for complex scene images by synthesizing scenes.
4. Similarity level of the scenes in the scene wheel.
5. Memory precision (error distances between target and response scenes on the scene wheel).
6. Neural mechanism of remembering scenes, etc.