What makes a memory? It may be related to how hard your brain had to work

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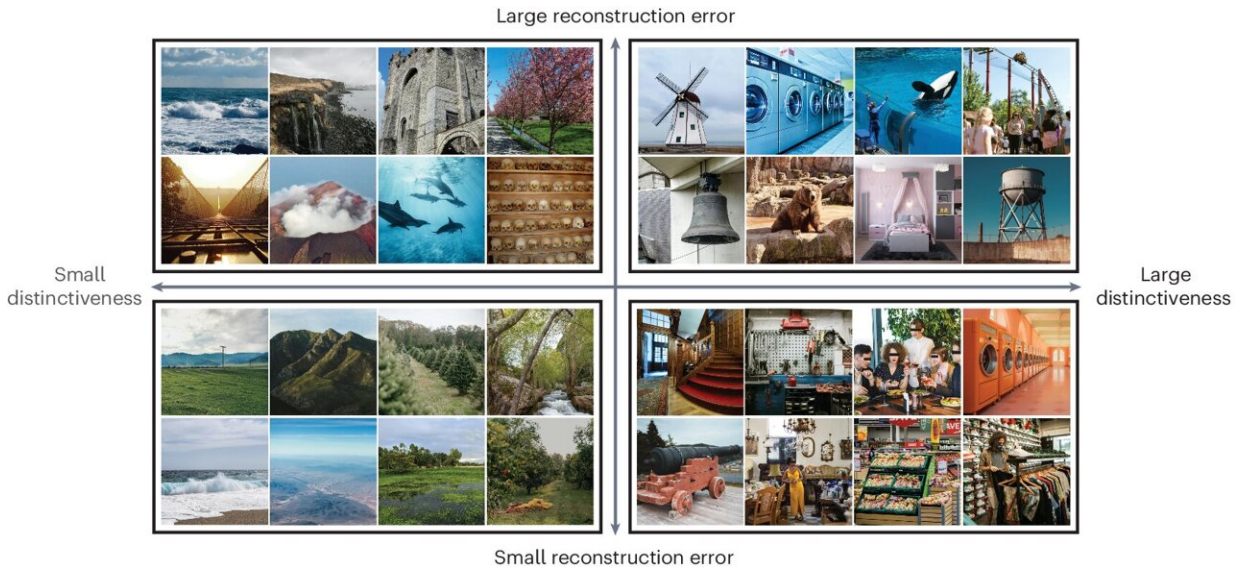

Example images from each of the four groups with different distinctiveness–reconstruction error profiles. Credit: *Nature Human Behavior* (2024). DOI: 10.1038/s41562-024-01870-3

The human brain filters through a flood of experiences to create specific memories. Why do some of the experiences in this deluge of sensory information become "memorable," while most are discarded by the brain?

A computational model and behavioral study developed by Yale

scientists suggests a new clue to this age-old question, they report in the journal *Nature Human Behaviour*.

"The mind prioritizes remembering things that it is not able to explain very well," said Ilker Yildirim, an assistant professor of psychology in Yale's Faculty of Arts and Sciences and senior author of the paper. "If a scene is predictable, and not surprising, it might be ignored."

For example, a person may be briefly confused by the presence of a fire hydrant in a remote natural environment, making the image difficult to interpret, and therefore more memorable.

"Our study explored the question of which visual information is memorable by pairing a computational model of scene complexity with a behavioral study," said Yildirim.

For the study, which was led by Yildirim and John Lafferty, the John C. Malone Professor of Statistics and Data Science at Yale, the researchers developed a computational model that addressed two steps in memory formation—the compression of visual signals and their reconstruction.

Based on this model, they designed a series of experiments in which people were asked if they remembered specific images from a sequence of natural images shown in rapid succession. The Yale team found that the harder it was for the computational model to reconstruct an image, the more likely the image would be remembered by the participants.

"We used an AI model to try to shed light on perception of scenes by people—this understanding could help in the development of more efficient memory systems for AI in the future," said Lafferty, who is also the director of the Center for Neurocomputation and Machine Intelligence at the Wu Tsai Institute at Yale.

More information: Qi Lin et al, Images with harder-to-reconstruct visual representations leave stronger memory traces, *Nature Human Behaviour* (2024). DOI: 10.1038/s41562-024-01870-3