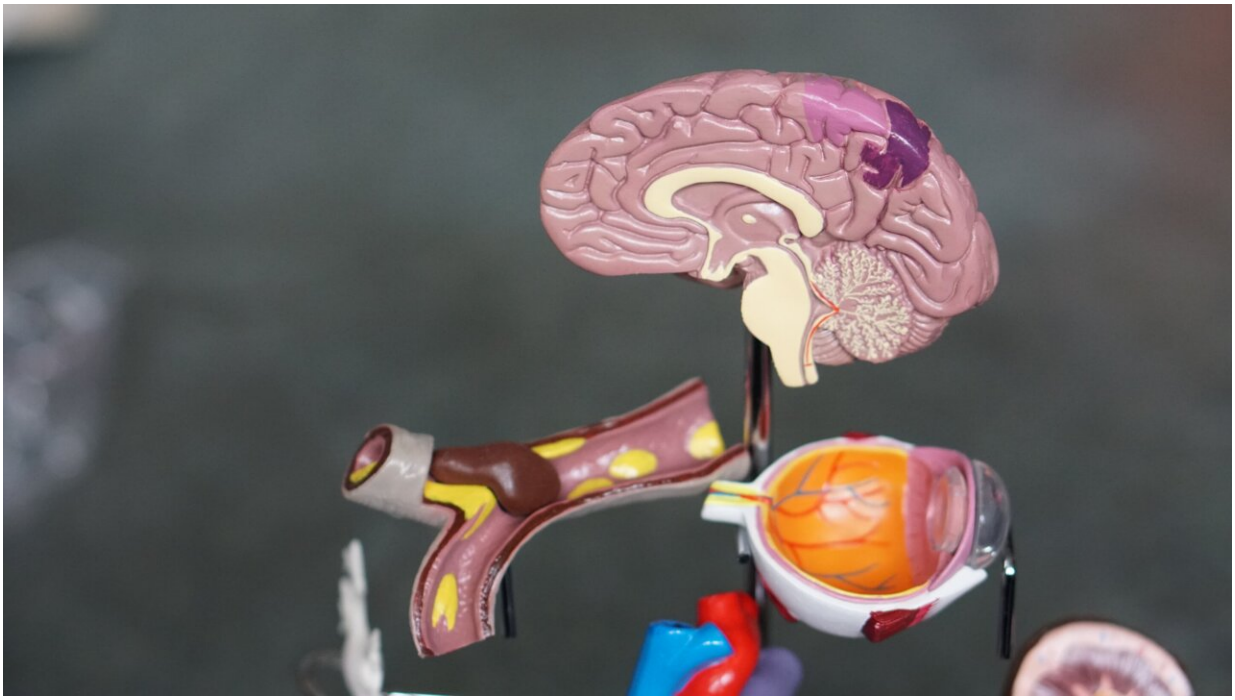
MedicalXpress

New public neuroimaging dataset provides deep sampling of individual human brains

December 16 2021



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Researchers from the University of Minnesota Medical School have published an extensive dataset that uses cutting-edge, high-field (7T) fMRI technology to probe how humans perceive, interpret and memorize naturalistic photographs. The Natural Scenes Dataset (NSD) joins a growing body of big-data neuroimaging resources that are providing researchers with opportunities to develop deeper insights in

cognitive and computational neuroscience.

"Deciphering how the human visual system works is a heavily studied topic, but progress is limited by our sampling of how the brain responds to and interprets different visual stimuli," said co-senior author Kendrick Kay, Ph.D., an assistant professor of radiology and a researcher at the Center for Magnetic Resonance Research (CMRR) at the U of M Medical School. "This publicly shared resource will catalyze the development of advanced computational methods and models and machine-learning techniques that will shed light into brain function."

As published in *Nature Neuroscience*, Kay and co-senior author Thomas Naselaris, Ph.D., an associate professor of neuroscience and CMRR researcher, led the investigation. In their initial report, they demonstrated that:

- Researchers can use the massive scale of the brain data to directly train complex deep-learning models that predict brain activity.
- The NSD is similar in scale to datasets that have helped drive the development of modern artificial intelligence (AI) algorithms, and should therefore provide a bridge between neuroscience and AI.
- The NSD is similar to recent datasets that extensively sample brain activity in animal models, and thus can provide a bridge between animal and human work that can facilitate translational research.

NSD follows upon the previous Human Connectome Project (HCP) spearheaded by the CMRR. One important difference between NSD and HCP is the emphasis in NSD on gathering many hours of data on the same set of individuals. Kay and his team anticipate that the computational and cognitive neuroscience communities will use the NSD

to gain a deeper understanding of brain function.

"This dataset is part of a growing effort in cognitive neuroscience to deeply sample a small number of individuals," Naselaris said. "Gathering extensive data on each individual opens the possibility of developing precise and individualized characterizations of brain structure and function. This will lay the groundwork for precision medicine efforts."

More information: Kendrick Kay, A massive 7T fMRI dataset to bridge cognitive neuroscience and artificial intelligence, *Nature Neuroscience* (2021). DOI: 10.1038/s41593-021-00962-x. www.nature.com/articles/s41593-021-00962-x

Provided by University of Minnesota Medical School