

# New mathematical analysis for easy brain activity visualization

July 19 2023

---



Credit: AI-generated image ([disclaimer](#))

A research team led by the University of Tsukuba has revolutionized the visualization of neuronal activity in the brain through a simplified mathematical analysis. Previous methods of visualizing these activities required advanced mathematical procedures, but the new technique developed by the scientists utilizes standard statistical analysis software

with only two steps.

In our daily routines, our neurons are active and processing complex matters. This research aimed to comprehend the complexities of the [brain](#) by developing a [mathematical analysis](#) that can easily visualize the neuron activities in various aspects of our daily experiences. By simplifying the complex mathematical procedures, the team improved the technique using commonly available statistical analysis software.

The method employs state-space analysis, a technique that disentangles the mixed neuronal activity corresponding to different components in the brain. It identifies the crucial components within the observed activity data for multiple neural activities. Since [brain activity](#) constantly changes in response to various behavioral situations, continuously monitoring the variations is critical in this process. Although various methods have been developed based on this technique, all demand advanced mathematical skills and programming techniques by the users.

In the study, published in the journal *Neuro*, the researchers focused on an analysis process with minimal or no programming. Consequently, the activity changes with only two statistical processes could be visualized using general statistical analysis software. The visualized activity is depicted as circles, lines, points, and other figures (trajectories), representing the dynamic states in which the information is processed by the brain from moment to moment (drawing a circle or a curve) or the state in which the brain continues to process the same subject (stationary and constant).

This enables the [visualization](#) of the changes in [neuronal activity](#) occurring in short time periods (less than one second), reflecting a series of cognitive behaviors such as remembering the location of an office or recollecting a memory after leaving home. In developing this technology, the researchers verified its validity by comparing it with conventional

methods using neural data obtained from monkeys by several other research teams.

With the newly developed analysis technique, anyone can easily analyze various types of neural activity data. Thus, this technology is expected to uncover novel mechanisms of information processing within the brain, opening doors to new discoveries.

**More information:** He Chen et al, Stable Neural Population Dynamics in the Regression Subspace for Continuous and Categorical Task Parameters in Monkeys, *eNeuro* (2023). [DOI: 10.1523/ENEURO.0016-23.2023](https://doi.org/10.1523/ENEURO.0016-23.2023)

Provided by University of Tsukuba

Citation: New mathematical analysis for easy brain activity visualization (2023, July 19) retrieved 27 April 2024 from <https://medicalxpress.com/news/2023-07-mathematical-analysis-easy-brain-visualization.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.