

Scientists develop new brain analytical tool

March 31 2009



This is Dr. Amir Globerson at the Hebrew University of Jerusalem. Credit: Tamir Hazan

An interdisciplinary team of scientists at the Hebrew University of Jerusalem has developed a new analytical tool to answer the question of how our brain cells record outside stimuli and react to them.

Although much progress has been made in understanding the brain in recent decades, scientists still know relatively little about how these processes function. The two key problems in making progress in this field are that there will never be enough real data in terms of measuring what the brain actually does, and even if there were, there haven't been enough methods for analyzing such data and using them to answer the question of how neural coding actually takes place.

The analytical method developed by the Hebrew University researchers

should be able to provide an indication, for example, of how many [neurons](#) encode a given stimulus such as reactions to a face or a movement and how they collaborate to do it.

Current technology allows researchers only a very partial view of [brain activity](#). For example, one cannot record the activity of more than a few hundred nerve cells from the [cortex](#) of a behaving animal. Methods like MRI imaging can map larger [brain areas](#), but cannot be used to measure single neurons. A key question then remains of what one can learn from such a partial view.

The Hebrew University researchers, headed by Dr. Amir Globerson of the Rachel and Selim Benin School of Computer Science and Engineering, have formulated the novel principle of Minimum Mutual Information (MinMI) to tackle the issue. An article detailing their findings has been published online in the [Proceedings of the National Academy of Sciences](#) (*PNAS*) in the US.

In the article, the researchers provide analyses of both real and simulated data. Their method permits quantification of information in the brain about behavior, given sets of very partial measurements. The key insight to obtaining such results is to consider, via computer simulations, a set of "hypothetical brains" that could have generated the combination of the observed measurements, and then drawing conclusions that are valid for all the brains in this set. Although this seems like a daunting computational task, the researchers have shown that it can be achieved in some cases.

The real data was recorded from monkeys in the laboratory of Prof. Eilon Vaadia, who is the Jack H. Skirball Professor of Brain Research at the Hebrew University- Hadassah Medical School and the Interdisciplinary Center for Neural Computation at the Hebrew University.

The research was carried out as part of Dr. Globerson's Ph.D. thesis at the Interdisciplinary Center for Neural Computation, and in collaboration with Dr. Eran Stark (who at the time was a graduate student at the Hebrew University- Hadassah Medical School) and with Dr. Globerson's Ph.D. advisors, Prof. Naftali Tishby and Prof. Vaadia. Prof. Tishby is a professor at the the School of Computer Science and Engineering and also a member of the Interdisciplinary Center for Neural Computation at the Hebrew University.

As experimental tools develop, the researchers are looking forward to obtaining access to actual brain measurements on a larger scale. Methods such as the ones they have developed will be applied to help analyze such data and gain even more far-reaching conclusions as to how brain cells process information.

Source: The Hebrew University of Jerusalem

Citation: Scientists develop new brain analytical tool (2009, March 31) retrieved 5 May 2024 from <https://medicalxpress.com/news/2009-03-scientists-brain-analytical-tool.html>

<p>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.</p>
--