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How Clear Is Our View Of Brain Activity?

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Imaging techniques have become an integral part of the neurosciences. Methods that enable us to look through the human skull and right into the active brain have become an important tool for research and medical diagnosis alike. However, the underlying data have to be processed in elaborate ways before a colourful image informs us about brain activity. Scientists from Freiburg and colleagues were now able to demonstrate how the use of different filters may influence the resulting images and lead to contradicting conclusions.

In the current issue of Human Brain Mapping, Tonio Ball of the Bernstein Center Freiburg and colleagues from the universities of Oldenburg, Basel and Magdeburg demonstrate how variable the results of imaging techniques like functional Magnetic Resonance Imaging (fMRI) can be depending on the way how the original data are filtered. The use of filtering algorithms is indispensable in order to separate meaningful information from inherent noise that is part of every data set. These filters have different "mesh sizes" or widths, and are indispensable in the first place to reveal activity patterns that span different scale sizes. In most cases, only a filter of one specific width, which differs from study to study, is employed.

Tonio Ball and colleagues systematically investigated the influence of the mesh size of these filters on the resulting imagery of brain activity. They conducted an experiment during which test persons had to rate music by pressing a button while lying in an fMRI scanner. During this task, brain regions responsible for hearing, vision, and arm movements were active. The scientists treated the gained data with filters of different widths and found surprising results: The filters had a marked influence on the outcome of the brain scan analyses, showing increased brain activity in one region in one case, and in a different region - in the other. Even smallest changes in filter width led to areas of the brain appearing to be either active or inactive. This effect can ultimately lead to widely disparate interpretations of such a scan. Tonio Ball and his colleagues therefore stress the importance of taking into account the effect of filtering in future interpretations of fMRI studies. This way, scientists won't run the risk of inadvertently skewing our view of the brain.

Sources: Albert-Ludwigs-Universität Freiburg, AlphaGalileo Foundation.

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