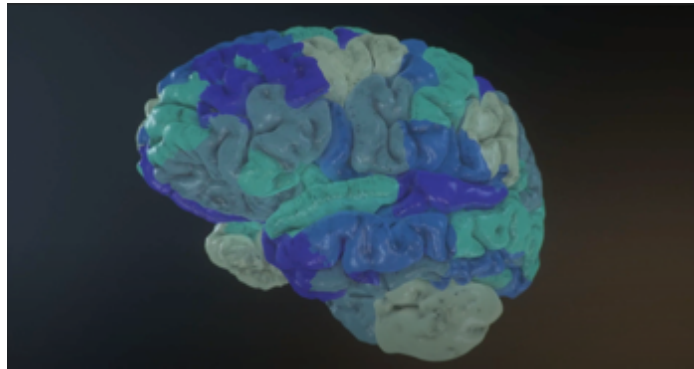


PRESS RELEASE, 18 February 2021

New EBRAINS-enabled tool to help guide surgery in drug-resistant epilepsy patients

Ultra-high definition predictive brain tool seeks to give surgeons a sharp eye to spot epilepsy in a patient's brain



Scientists of the Human Brain Project have developed a computational tool to locate the areas in a patient's brain where epilepsy seizures emerge. Now, the team is using EBRAINS to further boost the accuracy with high resolution brain atlas data. With a clinical trial ongoing, the approach aims to give surgeons an increasingly powerful and precise tool to support targeted surgery decisions for each patient.

Epilepsy is one of the most common neurological disorders, affecting over 50 Million people worldwide.¹ Patients suffer from seizures caused by sudden neuronal activity engaging at times large networks of the brain. In a third of all cases the disease is resistant to drugs. The most common treatment option for these patients is surgical removal of the “epileptogenic zone”, the areas of the brain, where the seizures emerge.

“Surgery success depends on locating these areas as precisely as possible. But in clinical practice this often proves very difficult, and the average surgery success rate remains at only around 60%”, says Viktor Jirsa. Any improvement would have major impact for many patients”.

The scientist has developed a computational tool, called “The Virtual Brain” (TVB), to model and predict activity in an individual patient brain. In collaboration with the neurologist Fabrice Bartolomei, they adapted the model to epilepsy, simulating the

¹ <https://www.who.int/news-room/fact-sheets/detail/epilepsy>

spread of individual seizure activity. The model thus can become an additional advisory tool for neurosurgeons to help target surgeries more precisely.

A clinical trial is currently underway to evaluate the personalised brain models of TVB as a new tool for epilepsy surgery planning, with promising first results. It is important to underscore that the Virtual Brain tool is still at clinical investigating stage and is therefore not yet available to patients.



VIDEO - Virtual Brain Modeling for Epilepsy: The Next Generation

This video showcases the capabilities of the EBRAINS Research Infrastructure. Researchers are developing the next generation of Virtual Brain Modelling based on EBRAINS. The scaled up model is expected to be operational by 2023.

[Watch the video here](#)

The team now works on the next generation of The Virtual Brain, which boosts the accuracy of the model further using the EBRAINS research infrastructure. The objective is to significantly scale up the potential for personalised brain representation with the help of large brain data sets from the EBRAINS Brain Atlas. This includes the most detailed 3D representation of the brain's anatomy, the BigBrain, at a resolution of 20 micrometers.



“Only EBRAINS allows to go to this massive scale and resolution”, Jirsa says. “Here brain data resources are made compatible and integrated with high-performance computing and informatics tools. EBRAINS enables the application of deep learning and other methods to find the configuration that most closely matches the patient’s own recordings of brain dynamics. This is an important step towards pinpointing the epileptogenic zone with greater precision.”

Katrin Amunts, Scientific Research Director of the HBP says: “The HBP’s multidisciplinary approach, gaining neuroscientific insight from the analysis of big data and neuroimaging studies, supported by brain modelling and advanced computing is a highly impactful way to advance brain research and bring innovation to patients and society.”

Pawel Swieboda, CEO of EBRAINS and Director General of the HBP, comments: “Prof Jirsa’s Virtual Brain computing tool is one of the many breakthrough achievements resulting from the cutting-edge scientific expertise of the Human Brain Project scientists and from the state-of-the art research infrastructure EBRAINS. We’re looking forward to sharing more brain health advances enabled by EBRAINS in the future. Meanwhile we invite researchers in different fields, such as neuroscience, neuroengineering, or neurotechnology – to list a few - to explore how the EBRAINS platform can enhance their own research.”

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ABOUT THE HBP



The Human Brain Project (HBP) is the largest brain science project in Europe and stands among the biggest research projects ever funded by the European Union. At the interface of neuroscience and information technology, the HBP investigates the brain and its diseases with the help of highly advanced methods from computing, neuroinformatics and artificial intelligence, and drives innovation in fields like brain-inspired computing and neurorobotics.

ABOUT EBRAINS



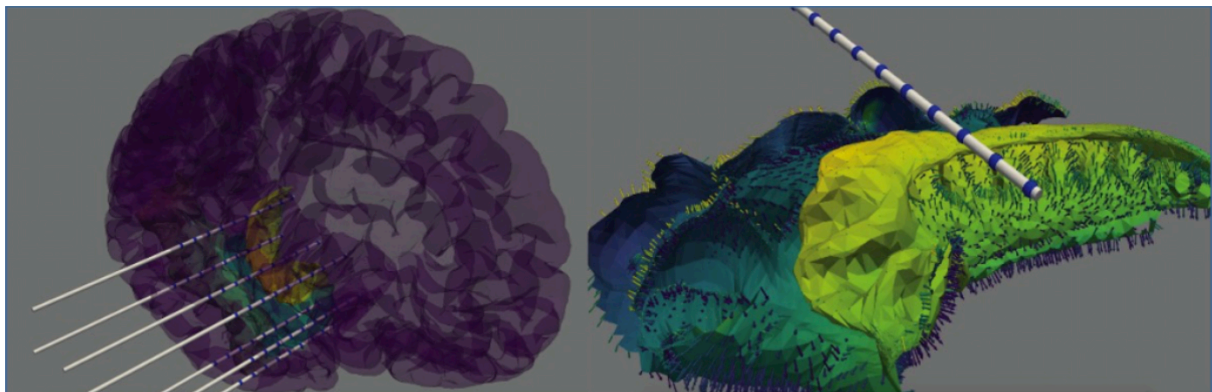
EBRAINS is a **new digital research infrastructure**, created by the EU-funded Human Brain Project, to foster brain-related research and to help translate the latest scientific discoveries into innovation in medicine and industry, for the benefit of patients and society.

It draws on cutting-edge neuroscience and offers an extensive range of brain **data** sets, a multilevel brain **atlas**, **modelling and simulation** tools, easy

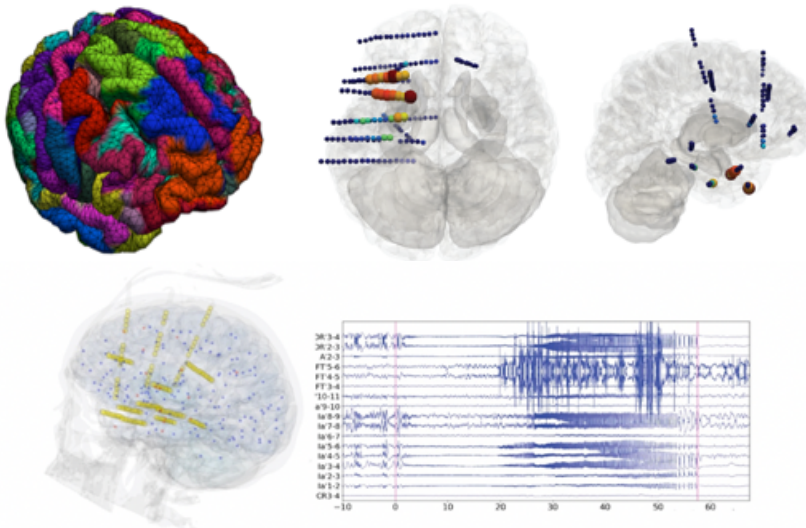
access to **high-performance computing** resources and to **robotics** and **neuromorphic** platforms.

All academic researchers have **open access** to EBRAINS' state-of-the art services. **Industry researchers** are also very welcome to use the platform under specific agreements. For more information about EBRAINS, please contact us at info@ebrains.eu or visit www.ebrains.eu.

FURTHER IMAGES



An ultrahigh-resolution Epilepsy model to help research and brain surgery



ABOUT THE RESEARCHER

Viktor Jirsa, Aix-Marseille University (AMU P78)

HBP Project lead: [The human multiscale brain connectome](#)



Viktor Jirsa is senior researcher at the Centre National de la Recherche Scientifique (CNRS) in France and Director of the Inserm Institut de Neurosciences des Systèmes (UMR1106 Inserm) at Aix-Marseille University. He has pioneered the field of connectome-based brain modeling and contributed for over 25 years to computational neuroscience at the interface with brain imaging data. Dr. Jirsa has published more than 160 articles and 6 patents with a total of over 14 000 citations and has been awarded international and national research awards including the Francois Erbsmann Prize for biomedical imaging in 2001, the Early Career Distinguished Scholar Award in 2004, and the Grand Prix de Recherche by Provence (PACA, Inserm) in 2018. Dr Jirsa is Scientific Director of the French large-scale multi-site clinical trial EPINOV (www.epinov.com) testing Virtual Brain technologies in Epilepsy surgery with 400 prospective patients. In the Human Brain Project (www.humanbrainproject.eu), he leads the workpackage *Human multiscale brain connectome*, pioneering the European efforts in the use of brain network models for health and personalised medicine.