

CUBE - Center for Ultrasound Brain imaging at Erasmus MC



What: CUBE is the first dedicated functional ultrasound center in the world and holds an extensive and diverse expert team with the singular purpose of unveiling the mysteries of the human brain while optimizing neurosurgical interventions. We are working around 3 main themes, namely

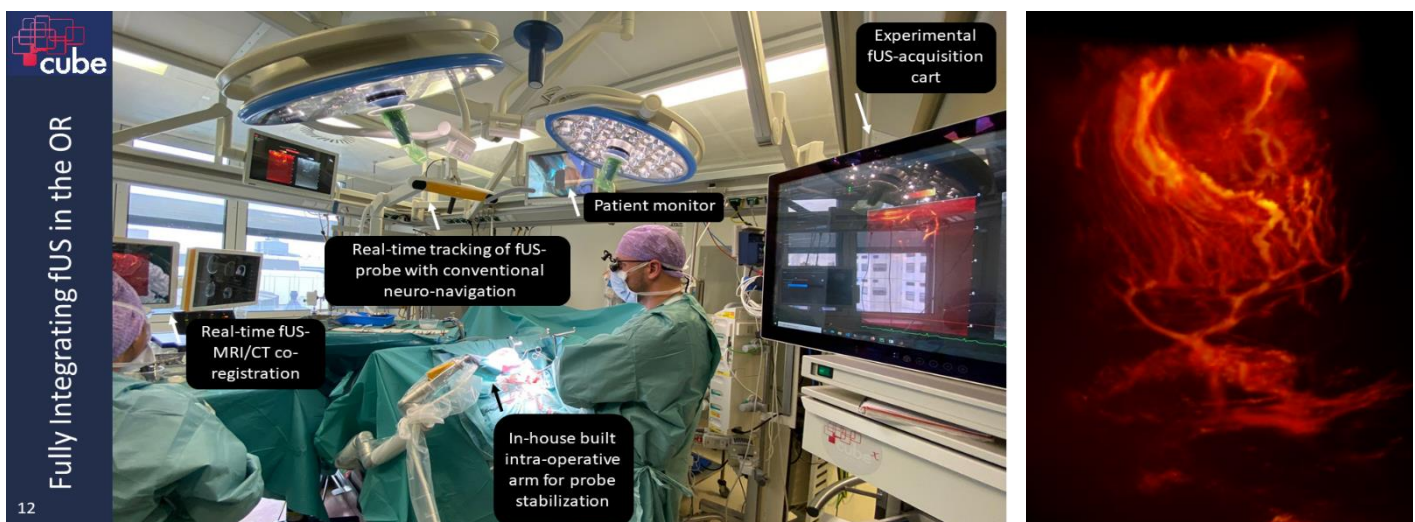
- Whole-brain Functional Imaging, where we employ Functional Ultrasound (fUS) to measure brain activity;
- Image-guided neurosurgery, where we focus on improving oncological neurosurgery by imaging and fUS
- Next-generation ultrasound technology, which focusses on computational ultrasound to get better images.

Why: In CUBE, we are developing new ultrasound-probe technologies, deploying a unique High-Performance Computing cluster for imaging and data-analytics purposes, and – finally – building dedicated neuroscience labs for fundamental research as well as portable ultrasound scanners for clinical research.

Who: Multiple disciplines are collaborating on a daily basis within CUBE, for example experts in Physics, Technology, Neurosurgery and Neuroscience. ErasmusMC houses CUBE, and is involved via several departments, namely; Neuroscience, Biomedical Engineering, Neurosurgery, and Biomedical Imaging. But also Experts from Technical University Delft (Laboratory of Acoustical Wavefield Imaging) and Netherlands Institute for Neuroscience (Gazzola Group) are actively participating in CUBE.

How: CUBE has a broad set-up, having fundamental researchers working on solutions together with clinical practice, which are implementing these new technologies and insights in the OR. CUBE has weekly access to OR rooms, where trained OR-staff is acquainted with the technology and techniques from CUBE. A first impression of the infrastructure:

- *5 functional Ultrasound (fUS) setups.* The scanners consist of an open ultrasound acquisition device coupled with a high speed link to a powerful computer. All of the setups communicate with the CUBE computing cluster for data management and storage.
- *Cube computing cluster.* The computing cluster is now used for data management, storage and heavy duty analysis of the data. The analysis software runs also on the cluster and can be accessed from anywhere in the world via a safe VPN connection.
- *Clinical fUS workstation.* This system includes an open ultrasound research scanner, powerful compute node, custom made software, clinical ultrasound probes, interfaces to monitoring systems (e.g. optical tracking, vital signs recording) in the OR and more.



Links for more information:

Erasmus MC Department of NeuroScience: <https://neuro.nl/>

CUBE: <https://ultrasoundbrainimaging.com/>

For inspiration: <https://openneurosurgery.com/>