Contribution ID: **36** Type: **Poster**

Going 3D with AI: Full 3D Reconstructions of Cytoarchitectonic Maps in BigBrain

Monday 27 October 2025 17:30 (1h 30m)

The BigBrain dataset represents the first ultrahigh-resolution 3D model of the human brain at 20 µm isotropic resolution, reconstructed from 7,404 histological sections of a human post-mortem brain. This unique dataset provides the basis for cytoarchitectonic mapping at a level of anatomical detail that bridges microscopic cellular organization with macroscale brain imaging. Traditionally, cytoarchitectonic areas have been delineated on individual histological sections, resulting in 2D maps that are difficult to integrate into 3D brain reference spaces.

To address this, we applied the AtLaSUi tool to reconstruct delineated BigBrain areas in full 3D. This workflow transforms manual 2D annotations into volumetric, topologically consistent maps that preserve the fine-grained borders of cortical regions. The resulting 3D maps enable spatially continuous visualization of cortical areas and facilitate direct comparison with structural and functional neuroimaging data.

The reconstructed areas are part of the Julich-Brain Atlas, a continuously expanding cytoarchitectonic atlas of the human brain. All maps are openly available through the EBRAINS research infrastructure and can be explored, accessed, and programmatically queried via the siibra tool suite. By making these maps accessible in a standardized 3D reference space, we contribute to the integration of microstructural data with multimodal neuroimaging and to the advancement of open, reproducible neuroscience.

Primary author: LOTHMANN, Kimberley (Forschungszentrum Juelich INM-1)

Co-authors: SCHIFFER, Christian (Forschungszentrum Jülich); AMUNTS, Katrin; DICKSCHEID, Timo (Forschungszentrum Jülich)

Presenter: LOTHMANN, Kimberley (Forschungszentrum Juelich INM-1)

Session Classification: Poster Session