6th BigBrain Workshop - From microstructure to functional connectomics



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High-Resolution Cytoarchitectonic Maps of four new Areas in the Anterior Dorsolateral Prefrontal Cortex in the BigBrain enabled by Deep Convolutional Neural Networks

Wednesday 26 October 2022 17:00 (1 hour)

The dorsolateral prefrontal cortex (DLPFC) represents a crucial organizational unit of the human prefrontal frontal cortex. It plays a key role in monitoring and controlling behavioral strategies and numerous cognitive processes associated with value encoding, working memory, attention, and decision-making. The DLPFC is a major research subject as alterations in this brain region are assumed to be involved in schizophrenia, obsessive-compulsive disorder, depression, and bipolar disorder. However, previous anatomical maps show considerable discrepancies due to high interindividual variability in this brain region's sulcal pattern and microstructure. Therefore, we aim to create three-dimensional (3D) cytoarchitectonic maps of the anterior DLPFC in the BigBrain (Amunts et al. 2013). The areas SFS1, SFS1, MFG1, and MFG2 were identified in the anterior DLPFC on at least every 30th section of the BigBrain dataset based on cytoarchitectonic criteria (Bruno et al., 2022). Using the deep-learning-based brain mapping tool (Schiffer et al., 2020), ultrahigh-resolution maps of the four areas on all sequential histological coronal sections of interest in the BigBrain were created. Automatic mappings were transformed to the 3D reconstructed BigBrain space using transformations used in Amunts et al. 2013, provided by Claude Lepage (McGill). The high-resolution 3D cytoarchitectonic maps serve as a histological reference providing a detailed anatomical basis for interpreting and comparing neuroimaging studies and future research. The maps will be publicly available and accessible via the EBRAINS Knowledge Graph and the Human Brain Project's interactive atlas viewer (https://interactive-viewer.apps.hbp.eu/).

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