

Deep Learning to Improve Brain Registration by Screening the Brain Morphology Automatically

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In order to visualize the brain and analyze neuronal connection the brain from the different experiments, must be registered within one unified coordinate system with satisfactory results. We have developed an algorithm used two steps to warp the sampled brain into the standard model brain. All data were archived with the global warping as a first approximation by Avizo®, and followed by local warping with the aid of the image processing by Computational Morphometry Toolkit (CMTK). Thus, each brain had a normalized position in a standard 3D coordinate system.

Before registration, screening the brain morphology and 3D transforming the individual brain into a common 3D coordinate system is an important step. However, the process of screening the brain morphology is done by human vision until now. Thus, we demo a transfer learning with ResNet-50 for screening the brain morphology automatically with 86.3% accuracy. Classification of brain morphology based on deep learning helps us high throughput screening the brain morphology and transforming the brain into a reasonable 3D coordinate system automatically. Finally, more than 50,000 brains had a normalized position in a common 3D coordinate system.

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