

The Cerefy brain atlas database, with the Schaltenbrand-Wahren, Talairach-Tournoux 1988, Talairach-Tournoux 1993, and Ono-Kubik-Abernathey atlases, is a result of meticulous efforts over 10 years. These efforts resulted in an electronic brain atlas database of complementary atlases which are substantially enhanced and extended over the original print material, and have much higher anatomical parcellation than that of a typical scan. These atlases are also fully segmented and labeled, available in image and contour representations, deformable, spatially co-registered, and their 3D extensions are created. In addition, several novel solutions for atlas-assisted processing of neuroimages are introduced and suitable tools for stereotactic and functional neurosurgery, neuroradiology, human brain mapping, and neuroeducation are developed.

The **Cerefy brain atlas database** is the widely accepted standard in stereotactic and functional **neurosurgery**, and its popularity in other areas is growing. One of the major advantages of atlas-assisted surgery is a potential saving in terms of cost, time, and invasiveness. The Cerefy solutions are useful in preoperative planning, intraoperative support, and postoperative evaluation. Their use:

- 1) increases the accuracy of targeting by employing multiple atlases, multiple orientations, atlases in contour representation superimposed on the scan, and global and local registrations with any clearly visible landmarks;
- 2) lower surgical cost by reducing the duration of surgery by decreasing the number of tracts required and the number of microelectrodes used;
- 3) increase the neurosurgeon's confidence by using multiple atlases and multiple orientations, providing scan labeling, and intraoperative measurement of distances to critical structures. Our recent development, the probabilistic functional atlas based on electrophysiology, neuroimaging, and neurological postoperative assessment, will further increase the strength of the Cerefy brain atlas database.

In **neuroradiology**, the Cerefy atlases, solutions, and tools:

- 1) reduce time in image interpretation by providing interactive multiple labeling, triplanar display, higher parcellation of structures than the scan itself, multi-modal fusion, and display of underlying anatomy for functional images;
- 2) facilitate to communicate information about the interpreted scans from the neuroradiologist to other clinicians and medical students;
- 3) increase the neuroradiologist's confidence, particularly to consultant and resident radiologists who interpret brain scans infrequently;
- 4) reduces time in learning neuroanatomy and scan interpretation.

In **human brain mapping**, the Talairach-Tournoux brain atlas is the gold standard and serves as the reference. The Cerefy solutions provide a rapid superimposing of the scan to the atlas and support atlas-assisted analysis.

The Cerefy atlases are particularly useful in neuroeducation with their complementary content, high anatomical parcellation, 3D extensions, and user-friendly tools. The Cerefy atlases, fully labeled and deformable, overlaid on radiological images greatly facilitate

neuroanatomy learning and scan interpretation, and are superior to the traditional use of pre-labeled cadaveric images or drawings that are usually static in content. The Cerefy solutions are useful to label data of any imaging modality and provide spatial anatomical relationships. The neuroeducational potential will further be widened by a highly detailed and fully labeled cerebral vascular atlas which is under development.