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200242V

Understanding DICOM

How to read, write and organize medical
images

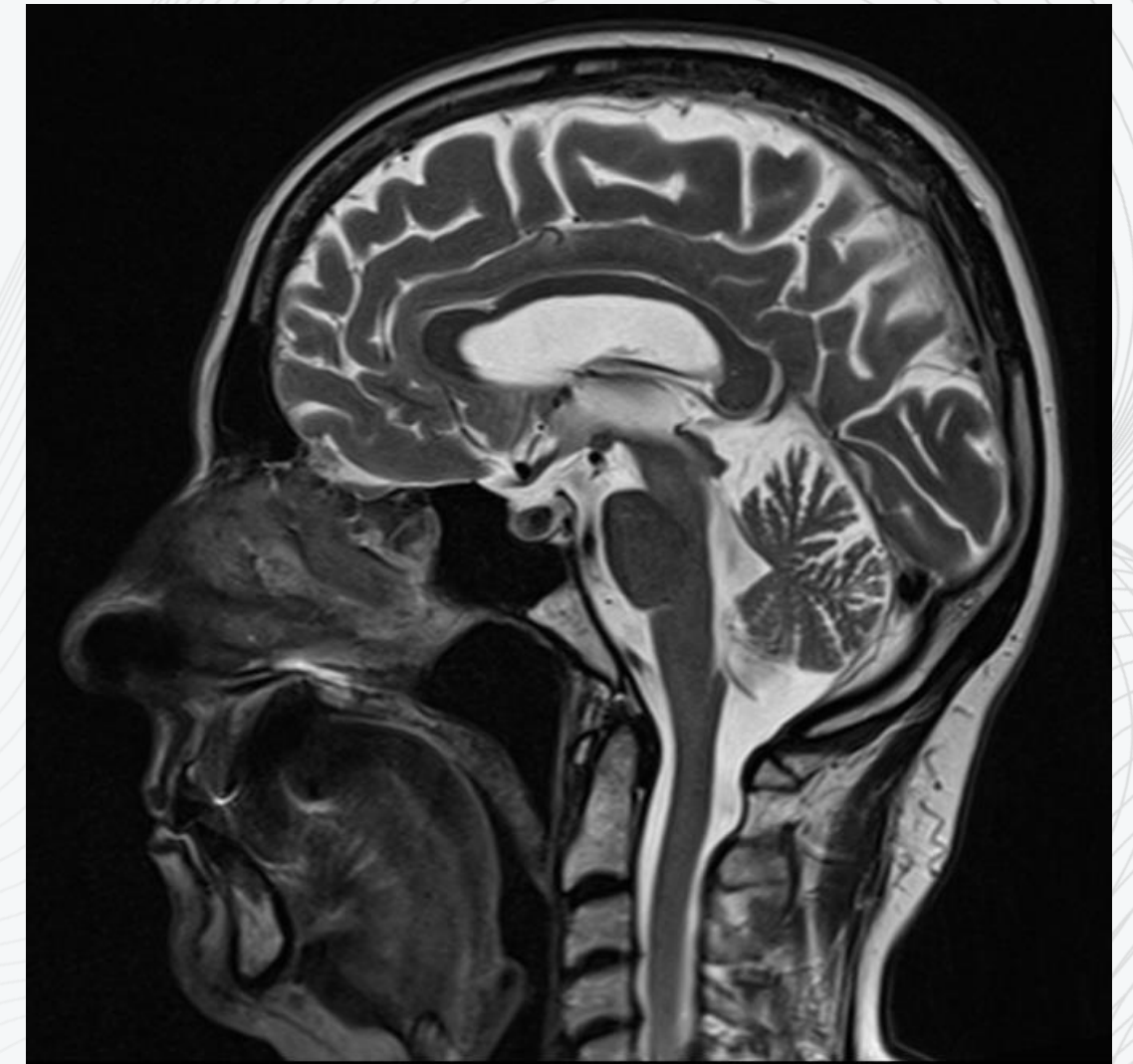
Medical Imaging Formats

- 1.DICOM** (Digital Imaging and Communications in Medicine) - The most widely used standard for storing, transmitting, and exchanging medical images and related information.
- 2.NRRD** (Nearly Raw Raster Data) - A flexible file format for storing n-dimensional raster data
- 3.NIFTI** (Neuroimaging Informatics Technology Initiative) - A file format commonly used in neuroimaging for storing MRI, fMRI, and other brain imaging data.
- 4.TIFF** (Tagged Image File Format) - A general-purpose format used in medical imaging, particularly for storing 2D images like pathology slides.

DICOM Images

A digital vault that holds,

- **Header** - Overflowing with patient demographics, modality details, acquisition date and time, and more.
- **Pixel Data** - The core image information is depicted in grayscale or color, depending on the format.
- **Private Tags** - Manufacturer-specific details complementing the standardized data.



DICOM Header

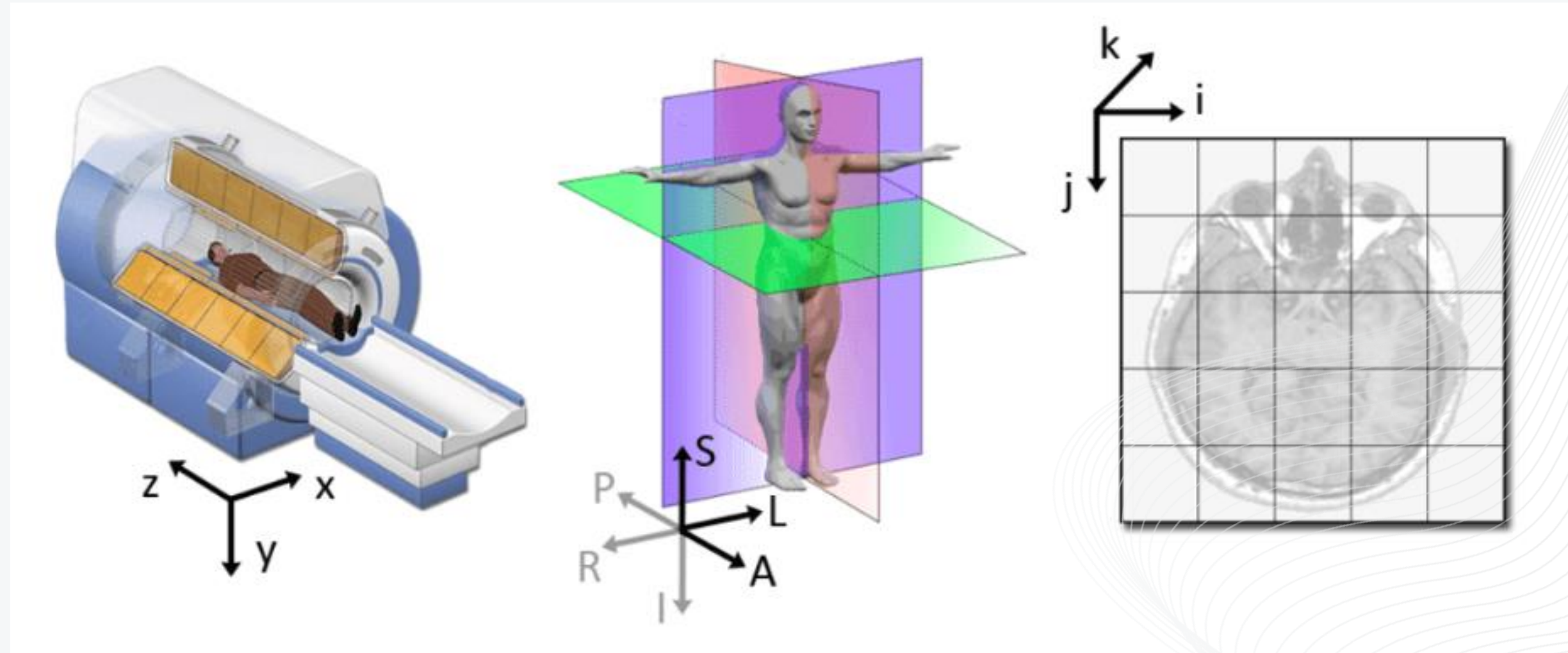
It consists of all the information needed to identify the file,

Tag	Name	Value
(0008, 1030)	Study Description	'CT ABDOMEN_W_IV_CONTRAST'
(0008, 103e)	Series Description	'ABD'
(0010, 0010)	Patient's Name	'SIMPSON_HOMER_J'
(0010, 0020)	Patient ID	'5553226'
(0020, 000d)	Study Instance UID	1.2.826.0.1.3680043.2.1125.1.38381854871216336385978062044218957
(0020, 000e)	Series Instance UID	1.2.826.0.1.3680043.2.1125.1.68878959984837726447916707551399667
(0020, 0013)	Instance Number	"20"
(7fe0, 0010)	Pixel Data	Array of 524288 elements

- **Patient** - the person receiving the exam
- **Study** - A study typically corresponds to a complete imaging session or a single diagnostic procedure.
- **Series** - A series groups together images or other data that are closely related. For example, a series might consist of multiple slices from a single CT or MRI scan, all acquired with the same imaging parameters.
- **Instance** - every slice of a 3D image is treated as a separate instance

```
└─ 5553226
  └─ 1.2.826.0.1.3680043.2.1125.1.38381854871216336385978062044218957
    └─ 1.2.826.0.1.3680043.2.1125.1.68878959984837726447916707551399667
      └─ 000000.dcm
      └─ 000001.dcm
      └─ 000002.dcm
      └─ 000003.dcm
      └─ 000004.dcm
```


Anatomical Coordinate System



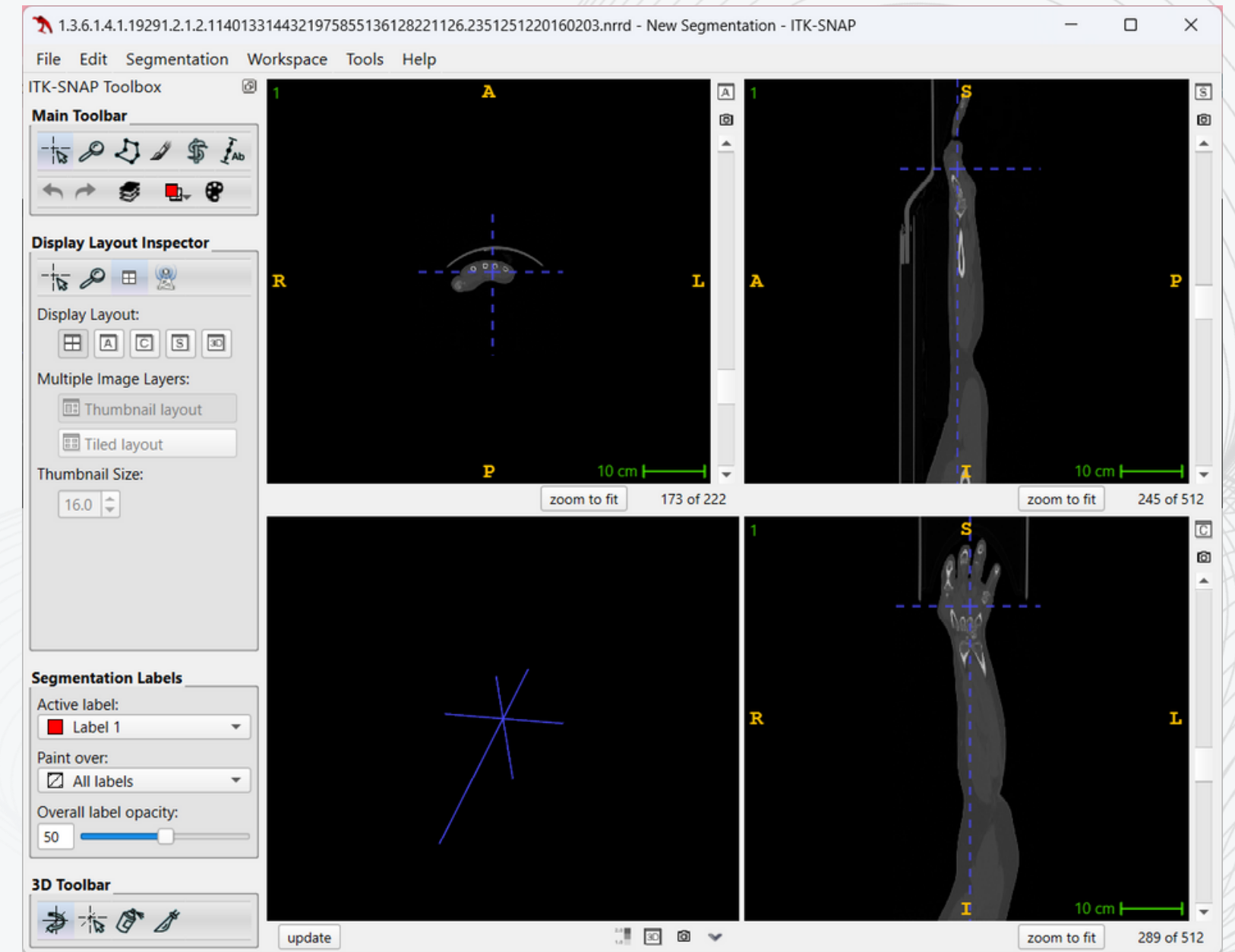
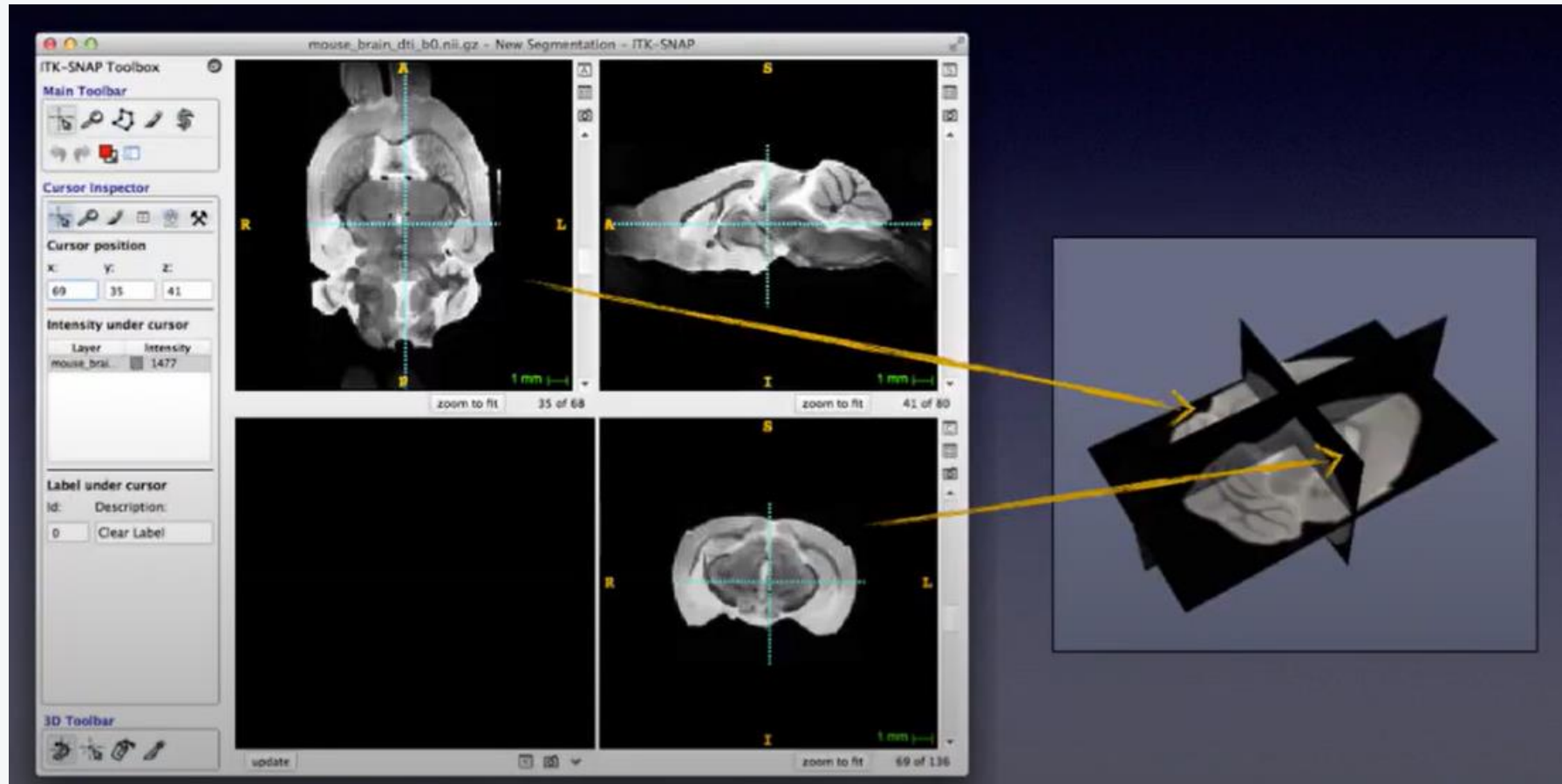
World
Coordinates

Anatomical
Coordinates

Image
Coordinates

Standard Anatomical
Planes,
1.The Axial Plane
2.The Sagittal Plane
3.The Coronal Plane

ITK-SNAP



Resources

1. DICOM Standard, <https://www.dicomstandard.org/>.
2. Overview — v5.4.0, 31 October 2023, <https://examples.itk.org/>.
3. Barré, Sébastien, and Steve Jordan. “The ITK Software Guide.” Insight Toolkit, <https://itk.org/ItkSoftwareGuide.pdf>.

Thank You!