

How Can 3D Segmentations Help Students Understand Fetal Central Nervous System Anatomy?

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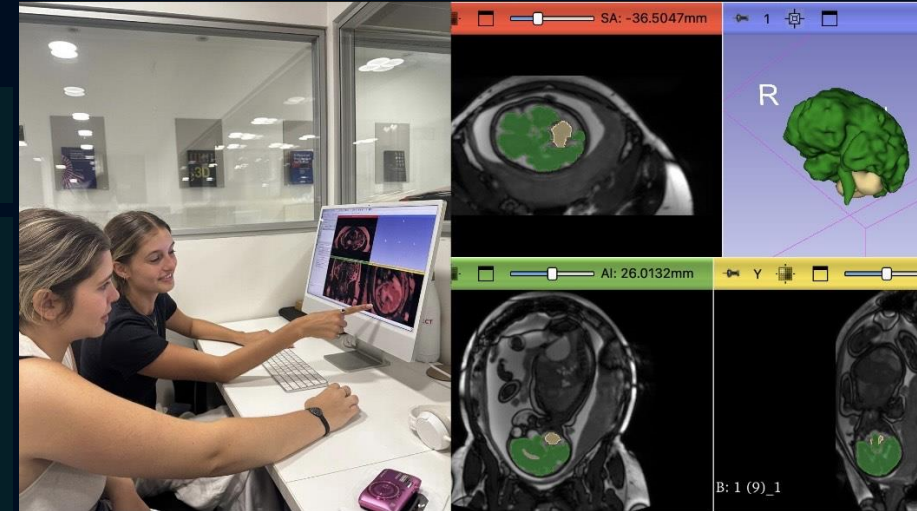
2. Curso de Neurociências PUC-Rio

Objectives: To assess the effectiveness of 3D segmentation in enhancing neuroscience and medical students' understanding of fetal central nervous system (CNS) anatomy.

Methods: Graduate students in neuroscience and medicine analyzed both healthy and pathological fetal brains using 3D segmentations. The images for segmentation were obtained from magnetic resonance imaging (MRI) between 26 and 35 weeks of gestation. The MRI protocol involved a 1.5-Tesla scanner (Magnetom Aera, Siemens, Erlangen, Germany). A 3D T2-weighted true fast imaging sequence with steady-state precession (true FISP) was applied in the sagittal plane (repetition time = 3.02 ms; echo time = 1.43 ms; isotropic voxel = $1.0 \times 1.0 \times 1.0$ mm³; matrix = 256×256 mm; 136 slices), with a total acquisition time of 26 seconds. The segmentation software used included 3DSlicer (v.5.0, Birmingham, UK) and Mimics (Materialise, Leuven, Belgium).

Results: Students demonstrated a strong ability to recognize and understand previously studied malformations. This process significantly enhanced their knowledge of CNS anatomy, enabling them to identify affected brain regions with greater accuracy. The students successfully identified conditions such as agenesis of the corpus callosum, ventriculomegaly, Chiari II malformation, and Dandy-Walker malformation.

Conclusions: Image segmentation appears to be a valuable tool for learning fetal anatomy and identifying pathologies. In addition to enabling 3D reconstructions from fetal MRI scans, it facilitates in-depth case discussions. Future research should include a larger sample of participants and cases to evaluate the broader applicability and educational impact of this approach.



3D segmentation and physical model of the fetal brain

