

# NeuroVis: Mixed Reality System for Neurosurgery Case Planning

## Scientific Co-Founders:

### **Susan C. Pannullo, M.D.**

Robert G. Schwager, M.D. '67 Education Scholar,  
Neurological Surgery, Weill Cornell Medical College  
Associate Professor of Clinical Neurological Surgery,  
Weill Cornell Medical College

### **Swathi Chidambaram, M.D.**

Former Radiosurgery Innovations Fellow, Weill  
Cornell Medical College  
MBA Candidate, Stanford University

*Developed in collaboration with Politecnico di Milano, Catholic University (Rome), and Agostino Gemelli University Hospital*



## **Business Development Contact:**

Donna J. Rounds  
Associate Director, Business Development and Licensing

(646) 962-7044  
djr296@cornell.edu

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## Background & Unmet Need

- Radiosurgery, or stereotactic surgery, is a noninvasive technique in which focused radiation beams are delivered into the body for treatment of tumors or other abnormalities
- Stereotactic surgery does not require any incisions, and instead uses high resolution, 2D brain scans to target the radiation
- Targeting radiation to minimize damage to surrounding tissues requires a multidisciplinary team
- During radiosurgery case planning, team members must mentally convert complex neural anatomy from 2D brain scans to 3D abstraction
- The ability of team members to do this conversion varies, and current commercially available radiosurgery software allows simulated 3D projections only
- **Unmet Need:** Precise and anatomical 3D visualization of neural anatomy for surgical case planning and guidance

## Technology Overview

- **The Technology:** A system for visualization of neural anatomy which uses augmented reality to render 3D images of scans
- Volumes of neural structures are obtained by CT/MRI and are processed to build a holographic model resembling the intracranial structures
- A computer program precisely renders the anatomy and allows the user to reconstruct regions of interest, which is projected via a Microsoft HoloLens headset
- **PoC Data:** Interactive models of neuro-oncologic scenarios have been created, which have demonstrated 3D identification of the following structures:
  - Intercranial metastases
  - Resection cavity with metastasis
  - Intraventricular lesion

## Inventors:

Swathi Chidambaram  
Susan C Pannullo  
Alessandro Olivi  
Maria Chiara Palumbo  
Alberto Redaelli  
Vito Stifano

## Patents:

US Application Filed

## Publications:

[Chidambaram et al. JMIR Neurotech. 2022.](#)

## Biz Dev Contact:

Donna J. Rounds  
(646) 962-7044  
[dj296@cornell.edu](mailto:djr296@cornell.edu)

## Cornell Reference:

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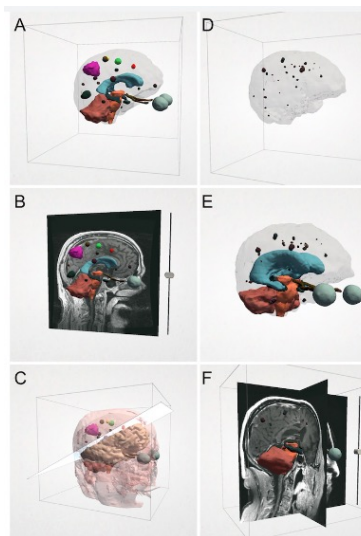
## Technology Applications

- Enhances radiosurgery case planning discussions and allows for practicing in simulations
- Detection of tumors, lesions, and cysts on key organs
- Reconstruction of organs for root-cause analysis of medical conditions
- Use in medical education to study highly variable conditions

## Technology Advantages

- Offers 3D views and cross-sectioning capabilities, whereas current imaging technologies only offer views in 2D
- Allows for real-time interaction with the patient's model, such as moving the model around, hiding structures, fading structures, and layering with 2D imaging
- Compatible with off-the-shelf VR hardware

## Supporting Data / Figures



**Figure 1:** NeuroVis holograms for a patient undergoing stereotactic radiosurgery planning for treatment of a resection cavity with metastasis (A-C) and for a patient with multiple intracranial metastases (D-F).

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