

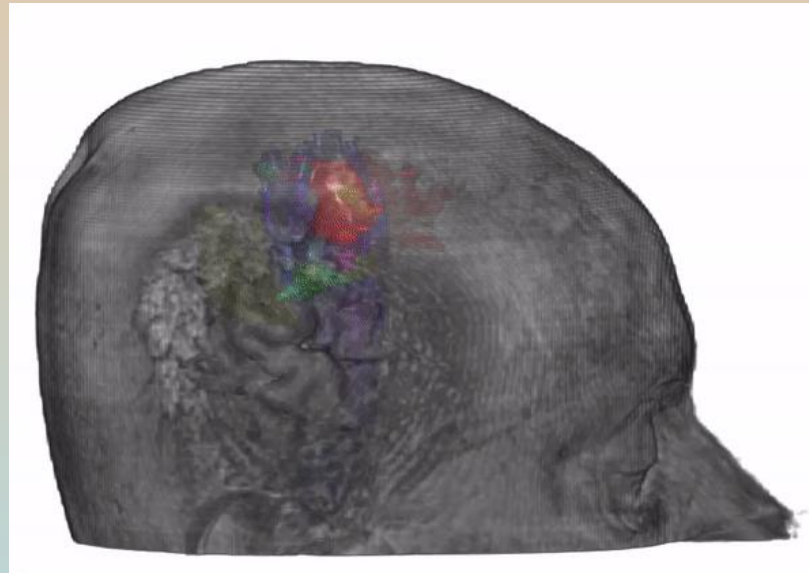


Tehran University of  
Medical Sciences



NeuroImaging  
and  
Analysis Group (NIAG)

# Clinical Brain Mapping

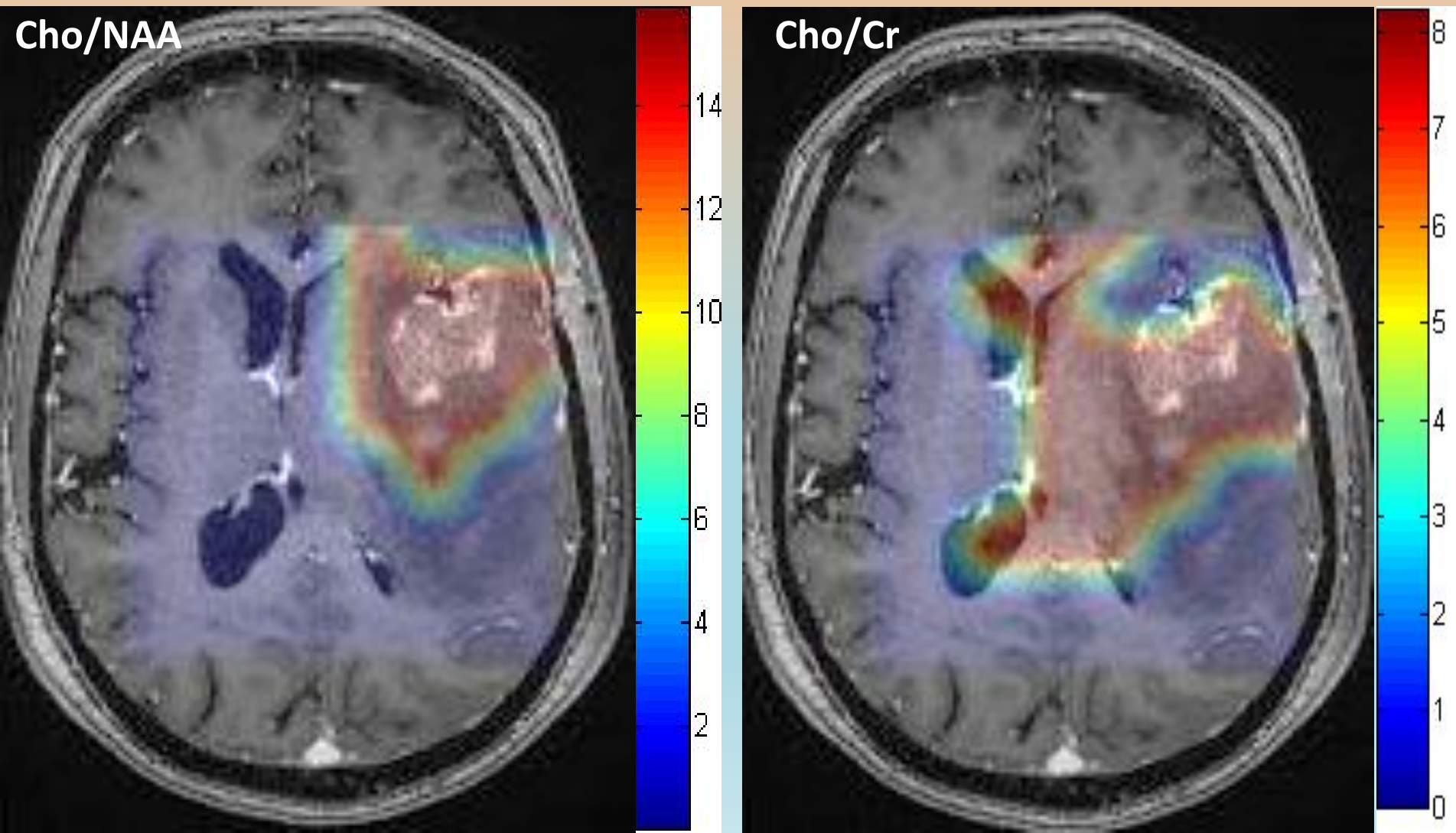


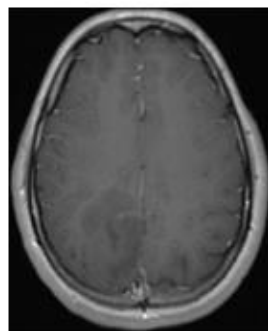
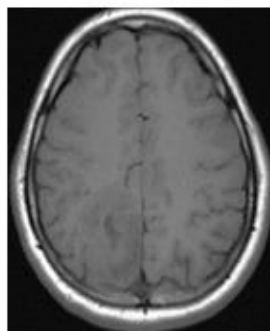
Samira Raminfard  
PhD in Neuroscience

# Tumor Mapping

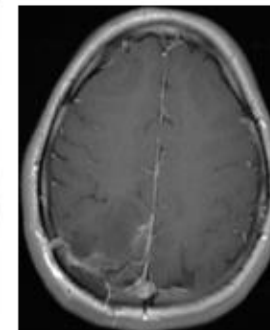
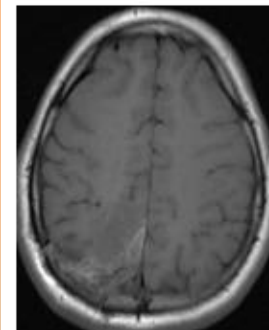
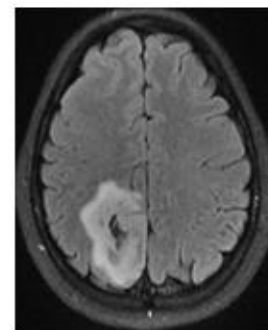
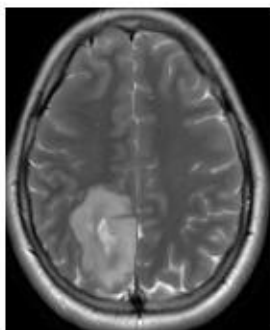
- **MR Spectroscopy** (metabolic tumor mapping)
- **Perfusion** (metabolic tumor mapping)
- **fMRI** (functional tumor mapping)
- **DTI** (structural network)

# Metabolic Tumor mapping

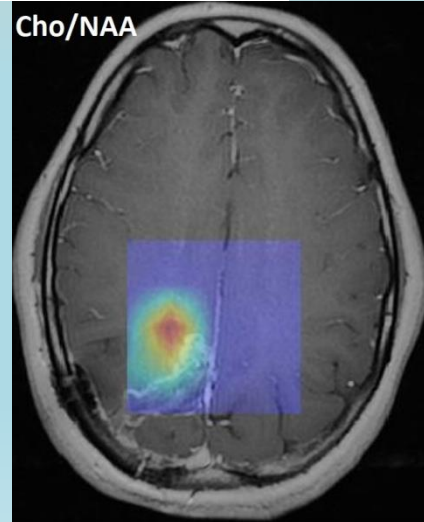
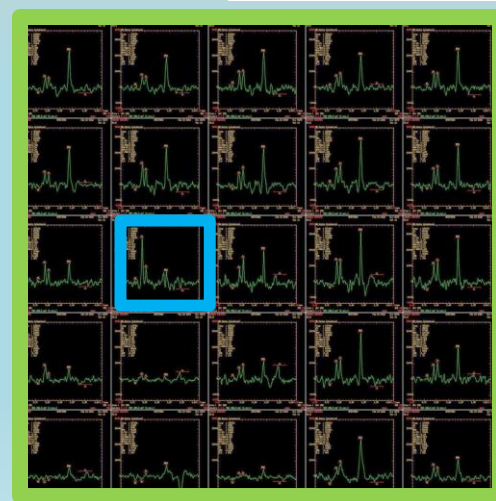
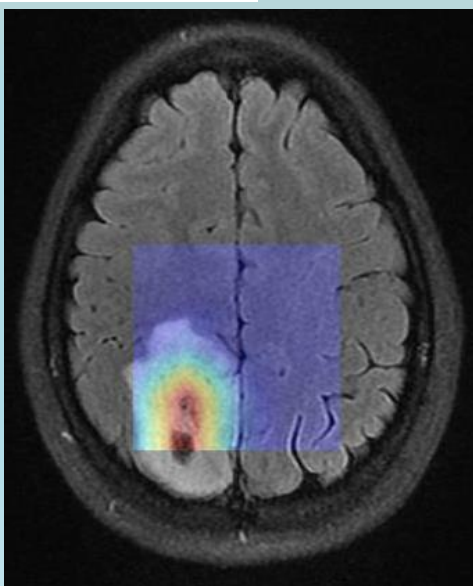
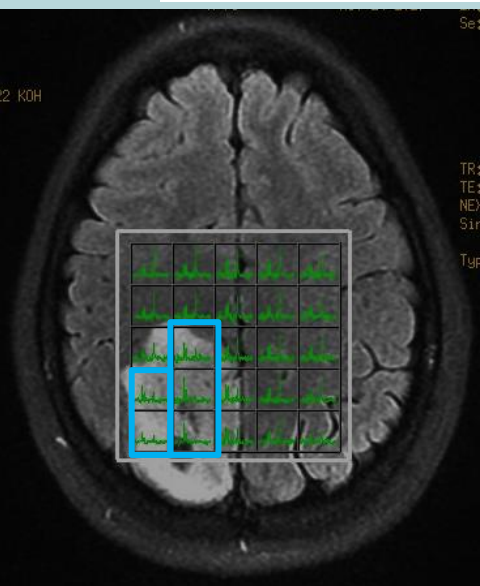
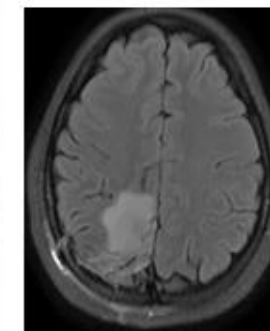
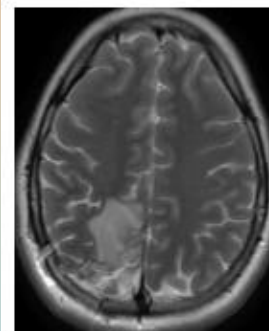




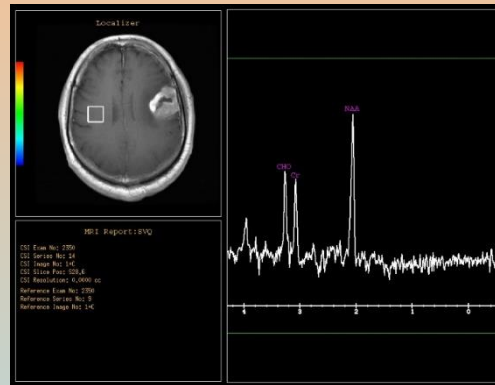
**Pre-op**



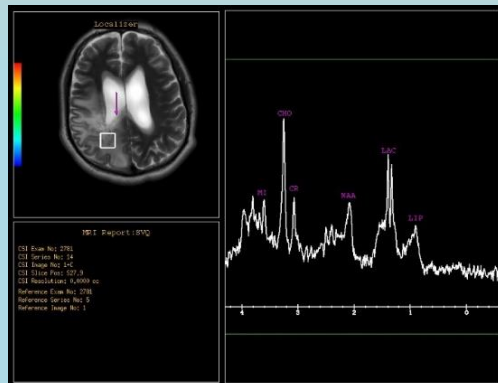
**Post-op**



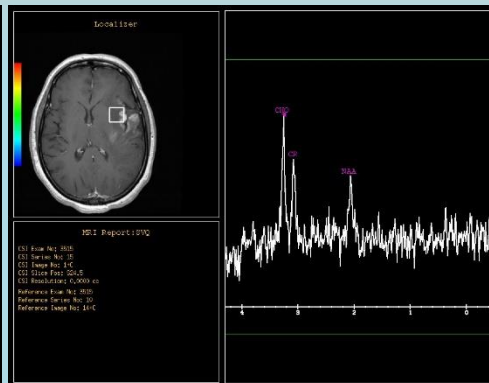
# Type of Lesion



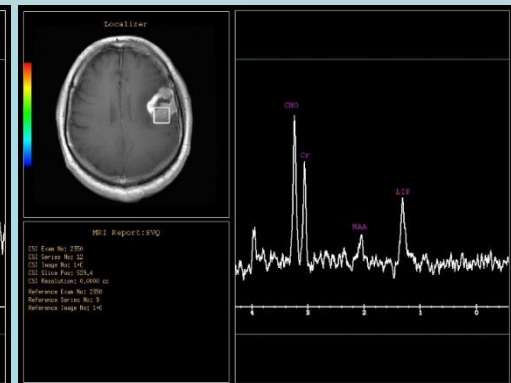
Normal Spectrum



Inflammation



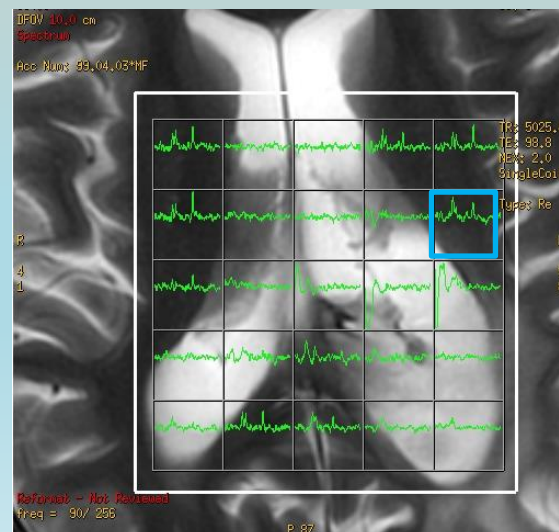
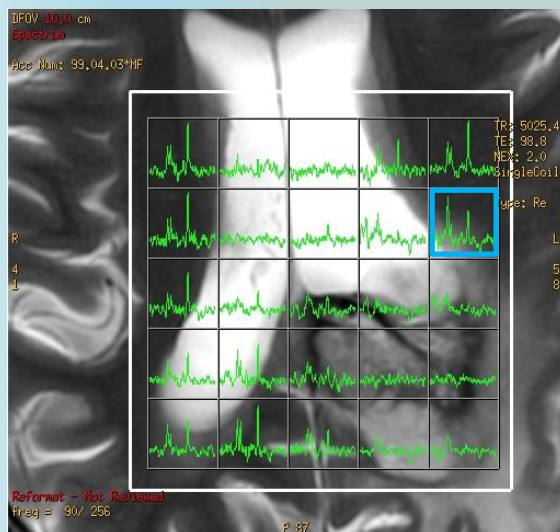
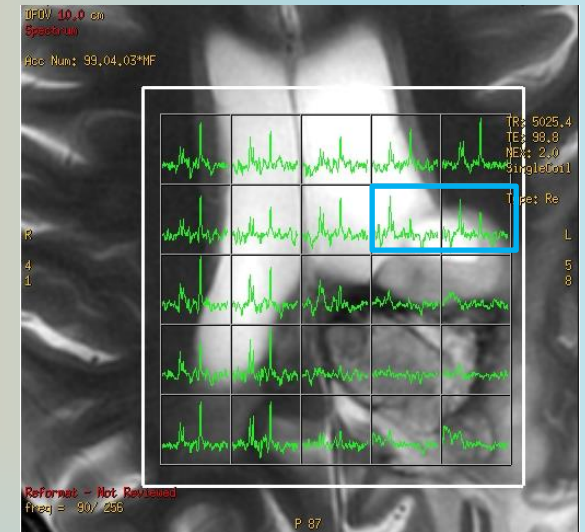
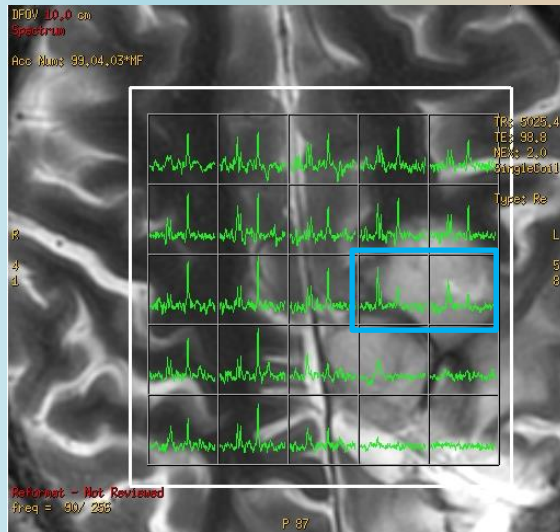
Ischemic lesion



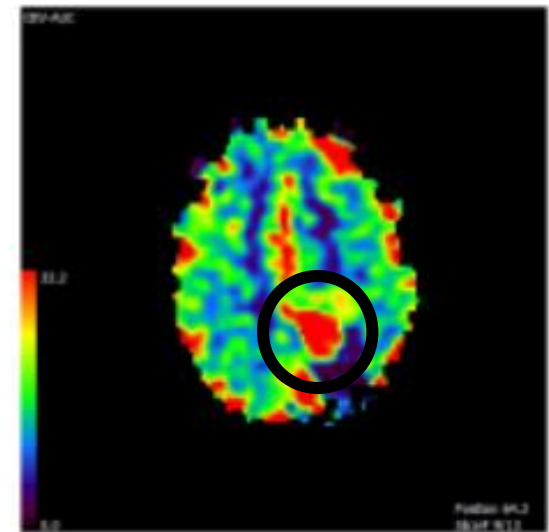
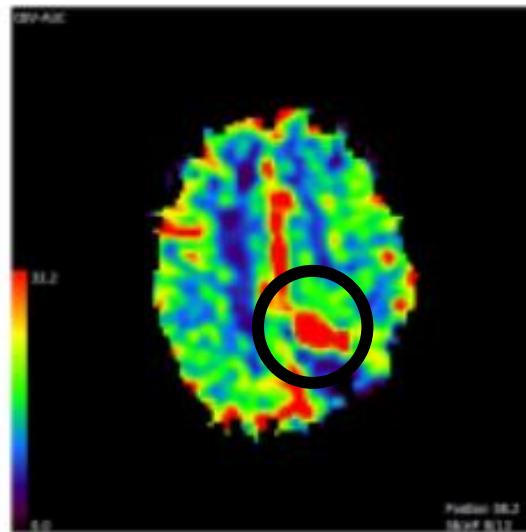
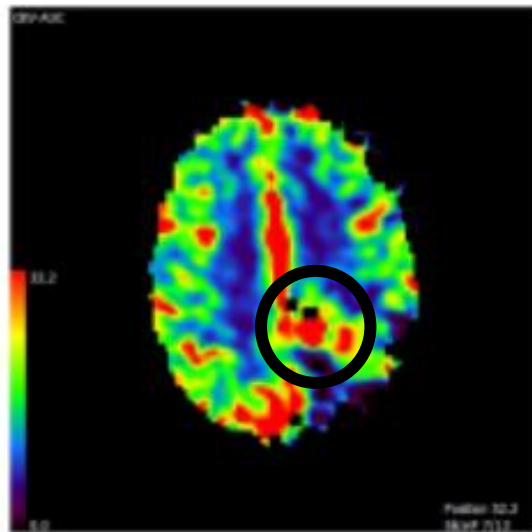
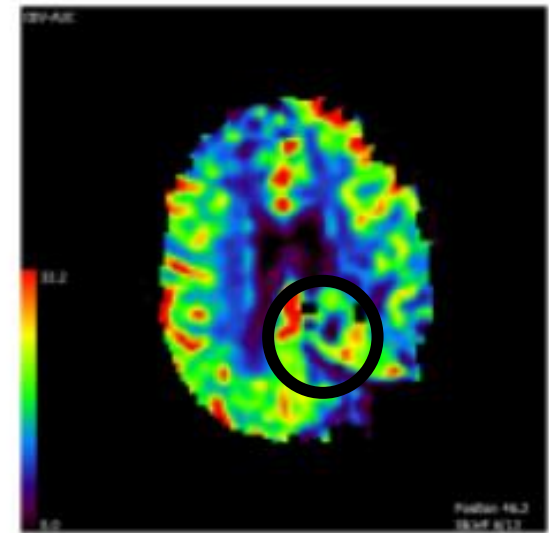
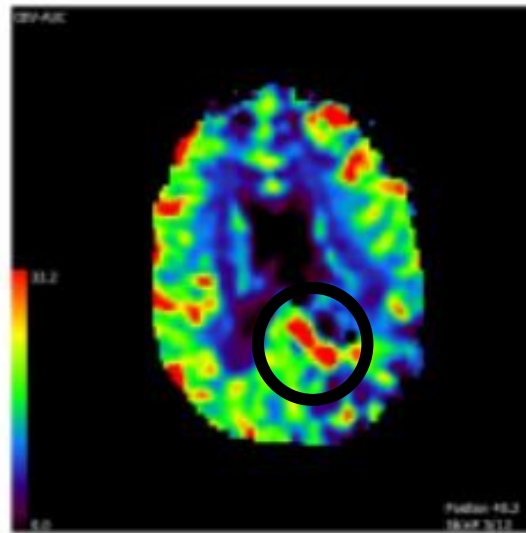
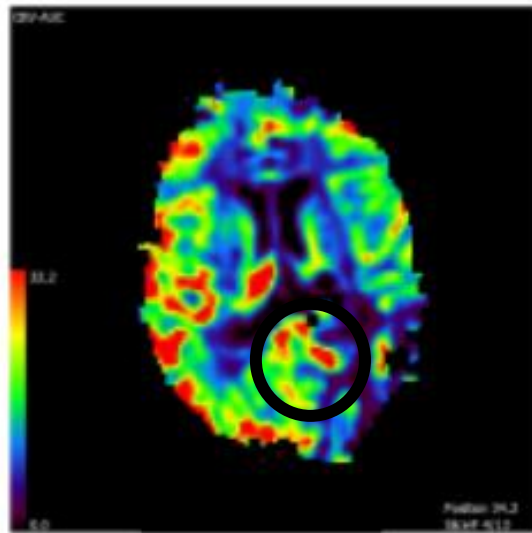
Tumor



# 3D MR Spectroscopy



# Perfusion imaging

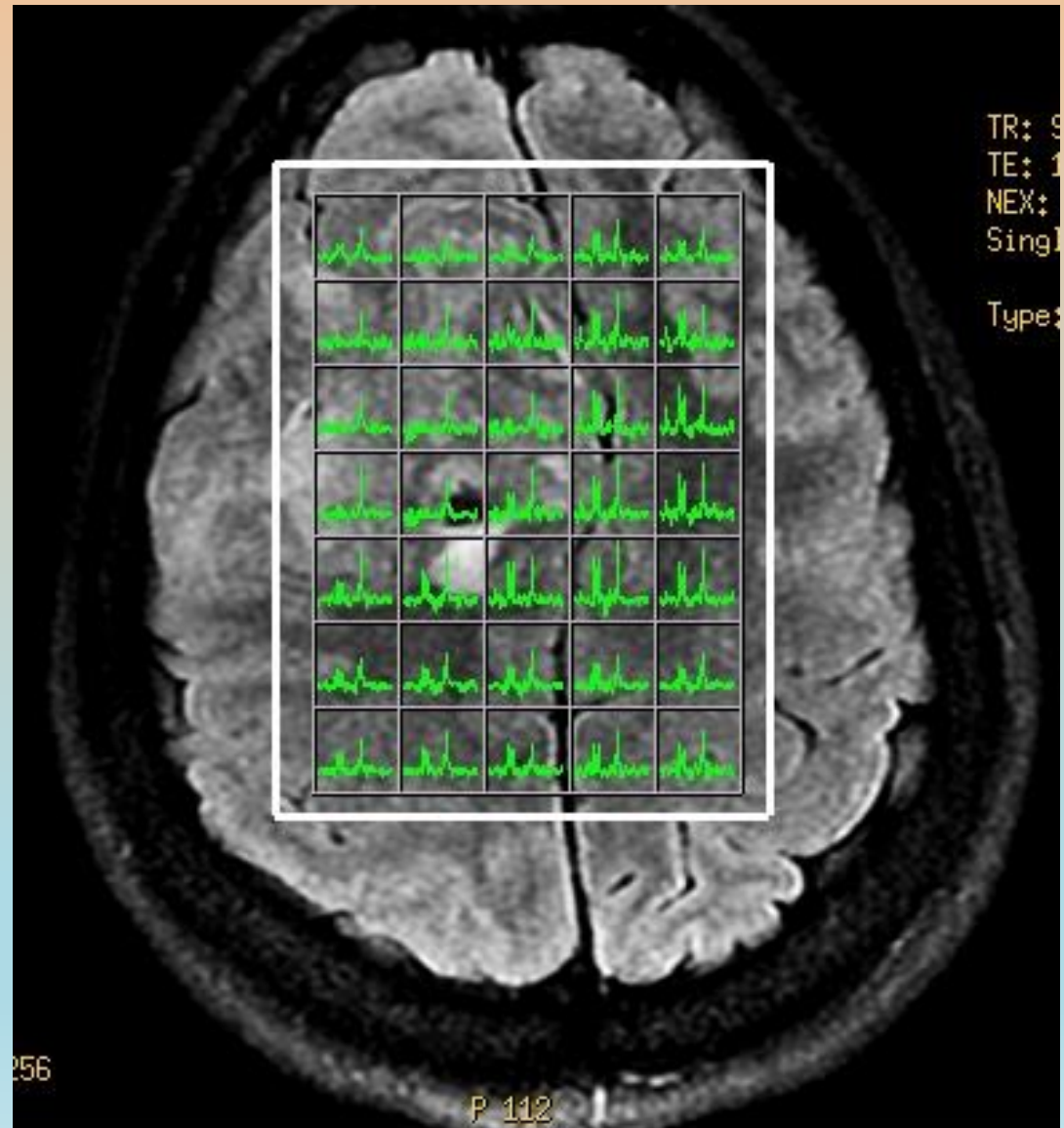
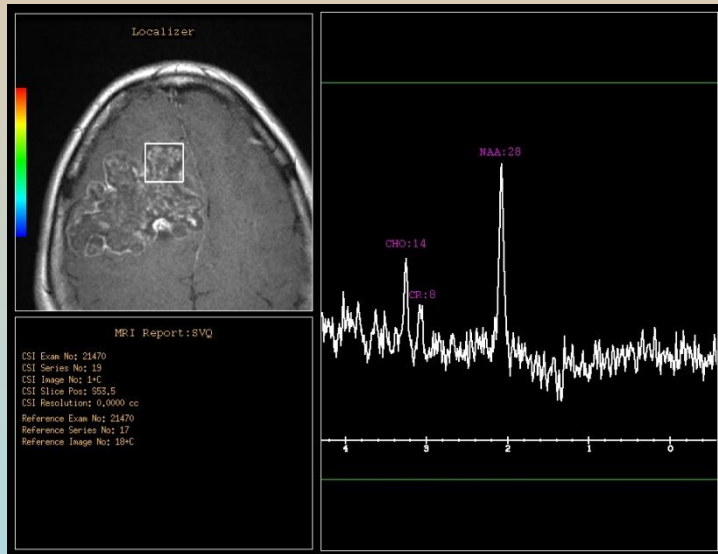


# Metabolic tumor mapping pitfalls:

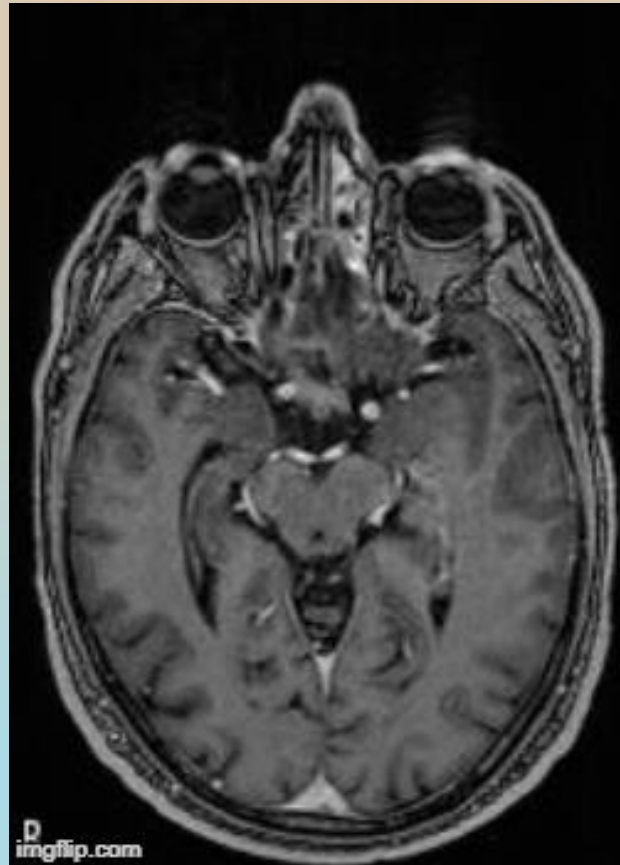
- For MRS:
  - Hemorrhage
  - Motion
  - Location of the lesion
  - Nature of the lesion
- For Perfusion:
  - Nature of the lesion
  - Imaging protocol
  - Speed of injection
  - Actual dose of injection
  - Blood pressure



# Extra Axial Lesions

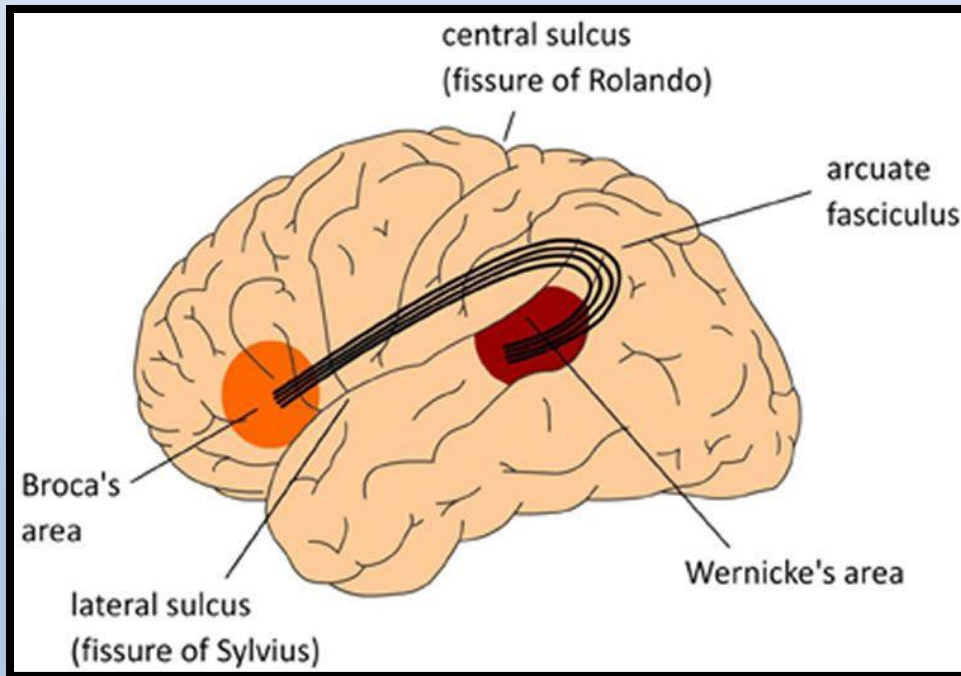


# Functional Tumor mapping

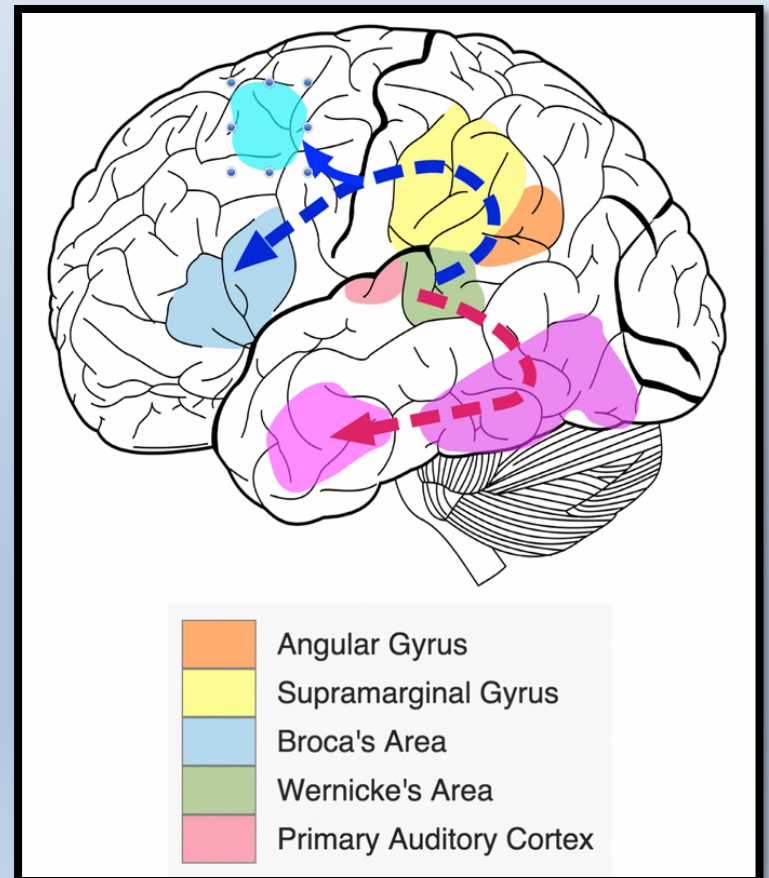


# Language Models

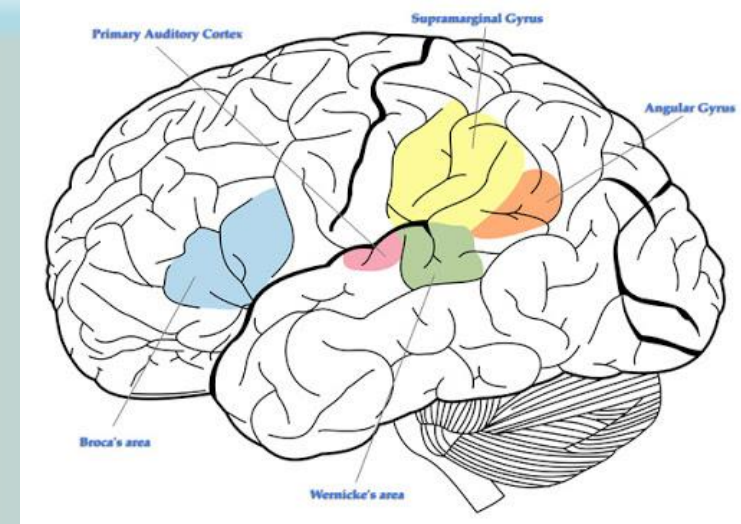
## Classic model



## Dual stream model



# Language Related Areas



- middle and inferior frontal cortex is more **verb specific**
- posterior part of the superior temporal gyrus is more **noun specific** point
- fronto-temporo-parietal convexity. This zone supports different aspects of action processing, including action verb semantics.

Viktória Havas et al., Electrical stimulation mapping of nouns and verbs in Broca's area, 2015



# Different tasks for language mapping

## Frontal lesions

Reverse word Reading

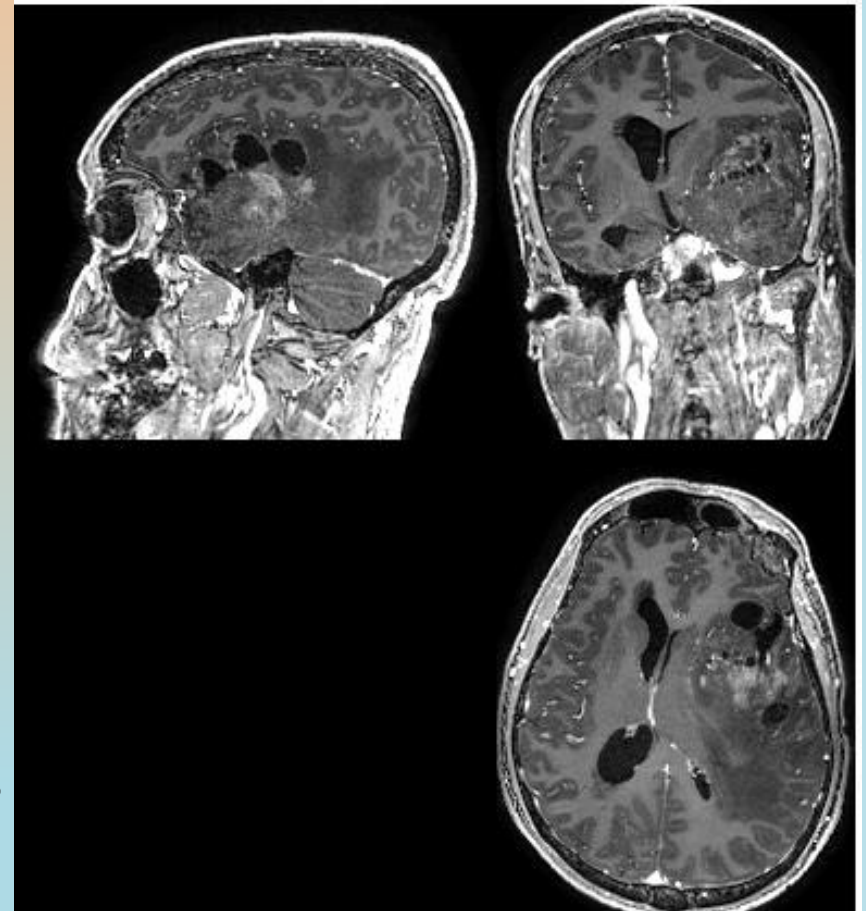
Object naming

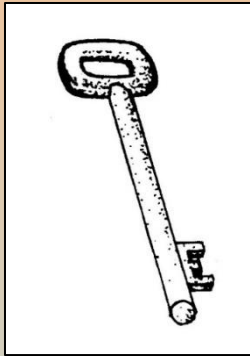
Action naming

Word generation

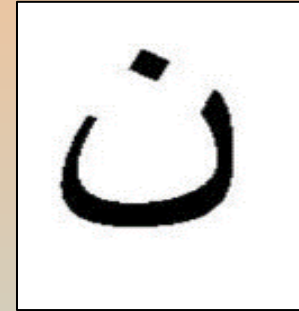
## Temporo parietal lesions

Rhyming

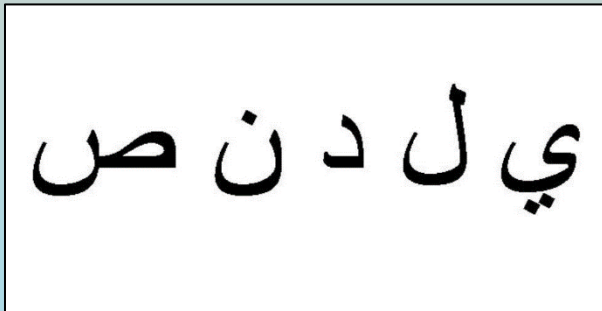




Object naming



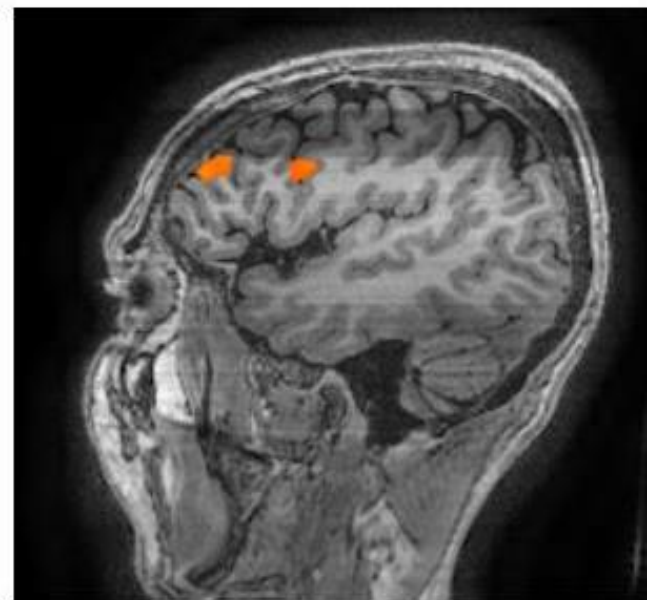
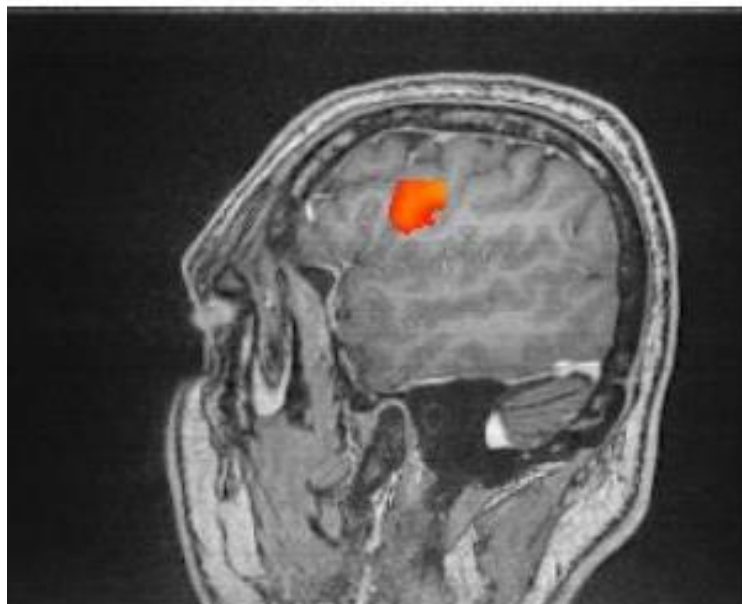
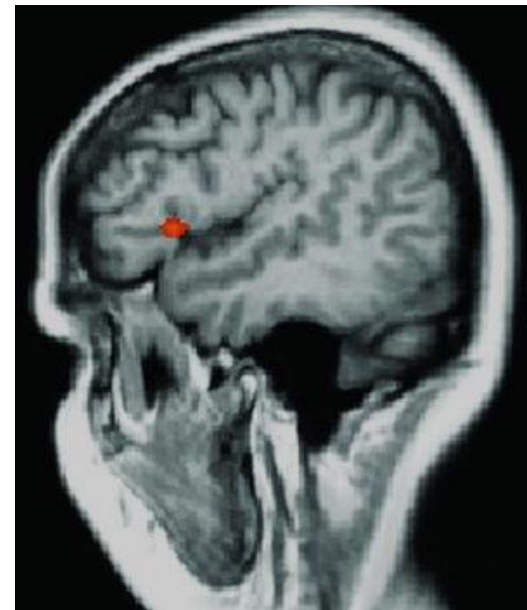
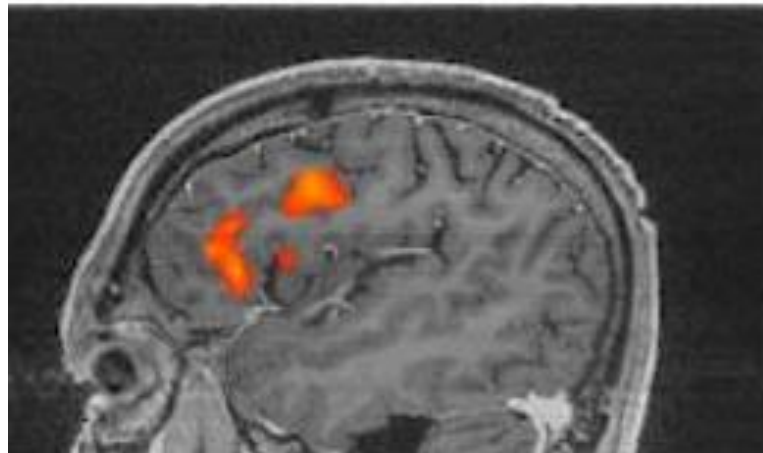
Word generation

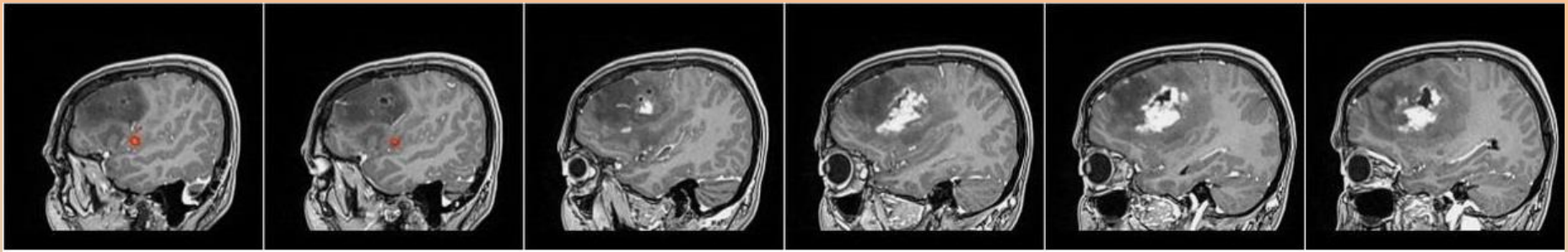


Reverse word reading

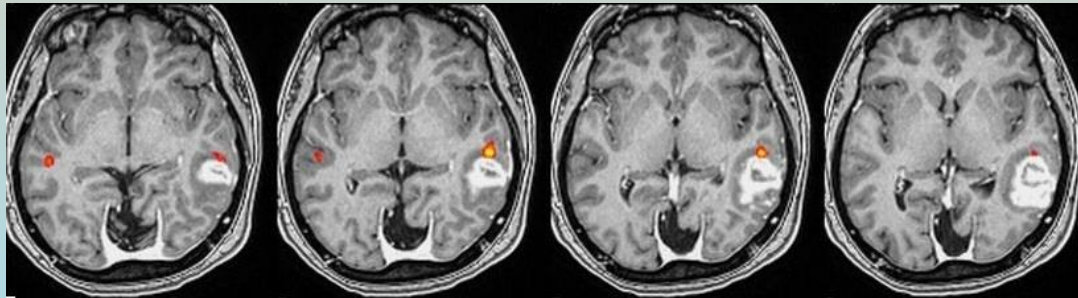
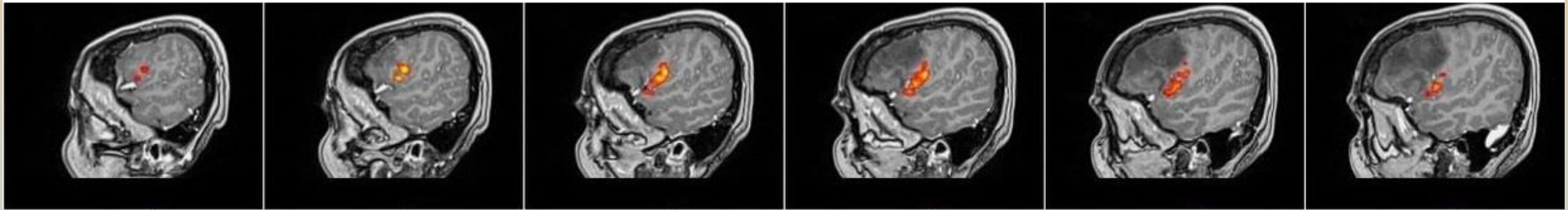


Action naming

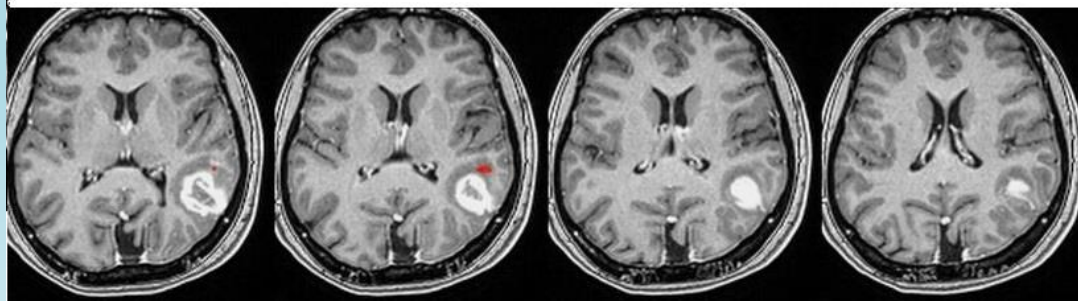




**Language (Broca)**



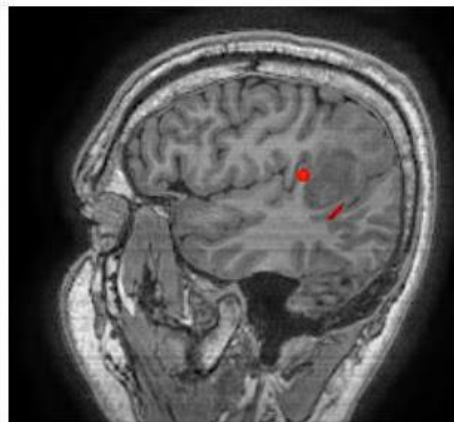
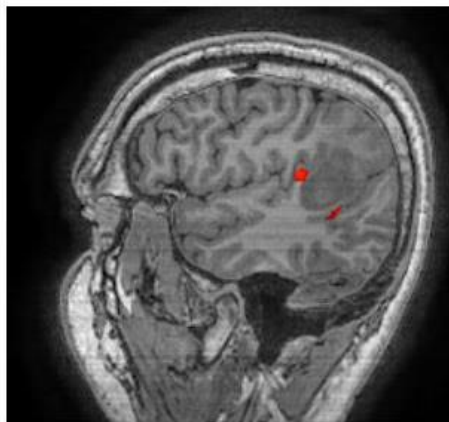
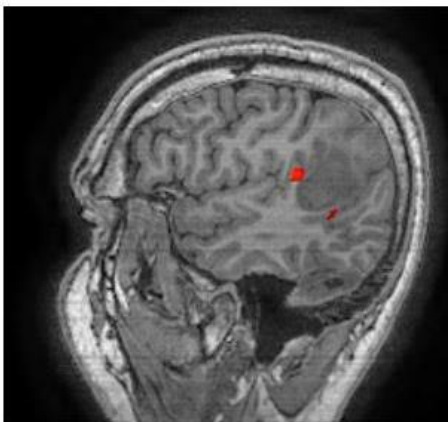
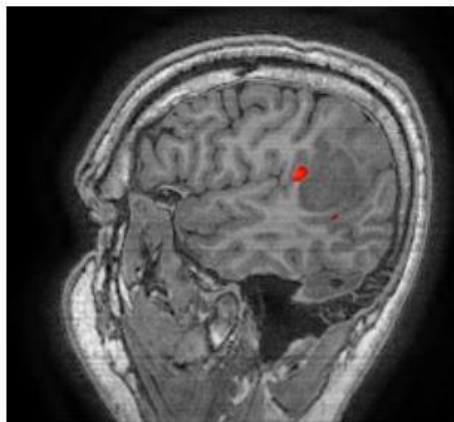
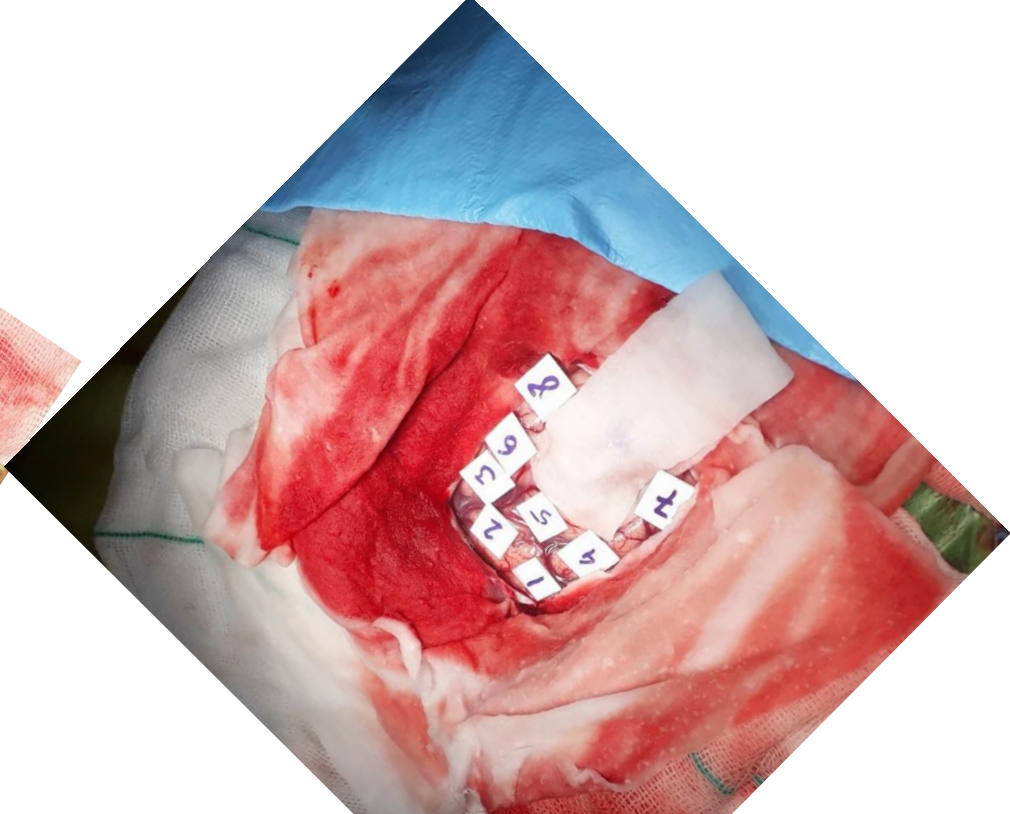
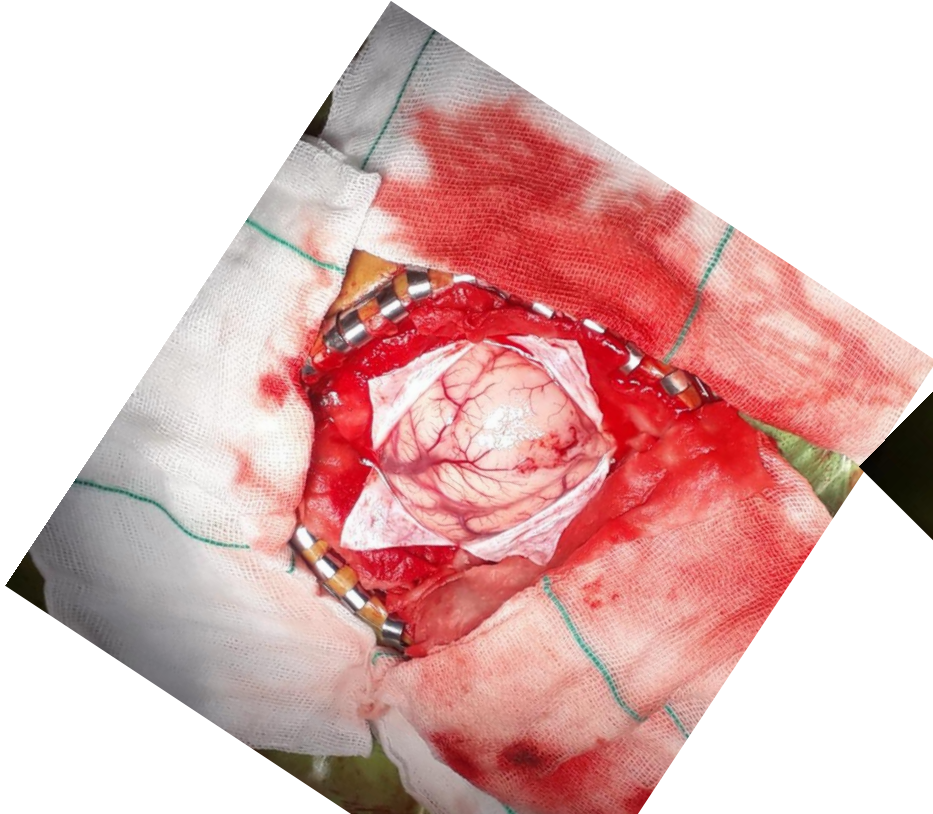
**Language (Wernike)**





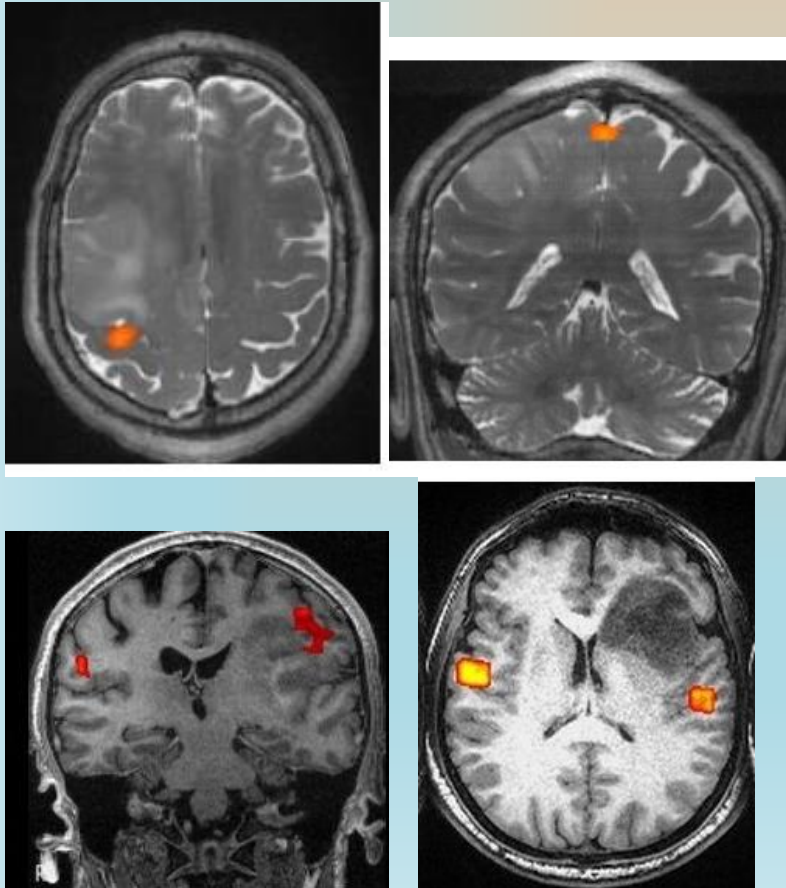
# Ongoing projects

- Predicting postoperative language outcome using fMRI/DTI, following evaluation of functional language mapping compared to Cortical Stimulation mapping
- Reorganization of language centers in patients with brain tumors
- Bilinguality; localization and size of language activation area

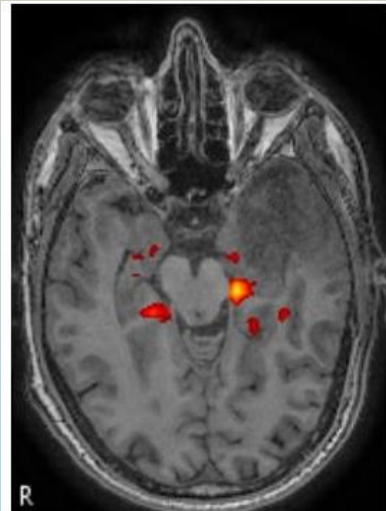


# Other Functional mapping tasks

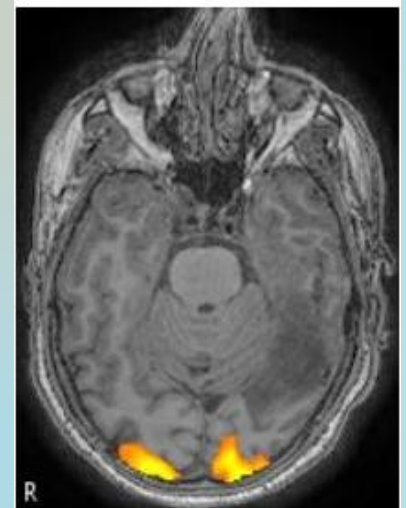
Motor function



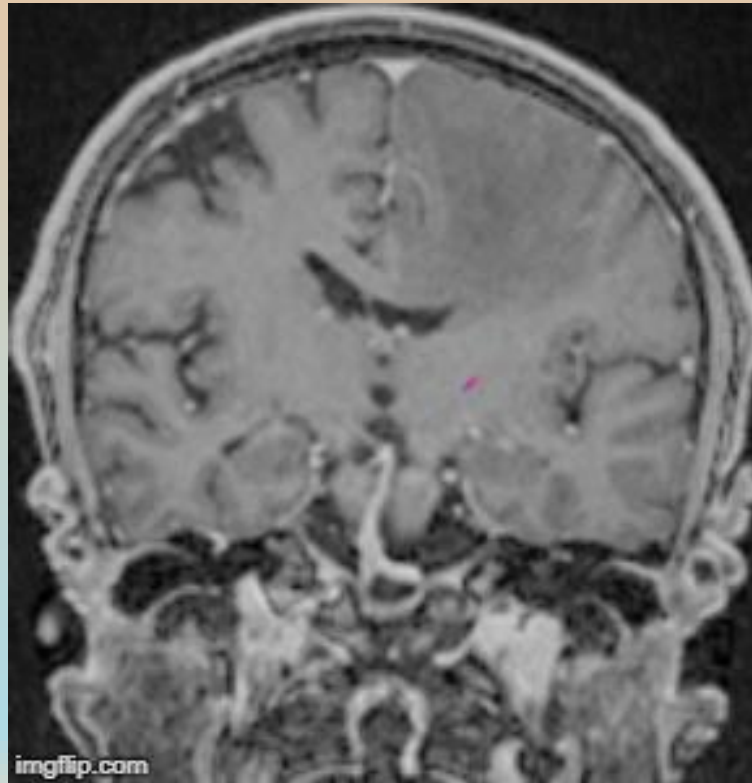
Memory



Visual



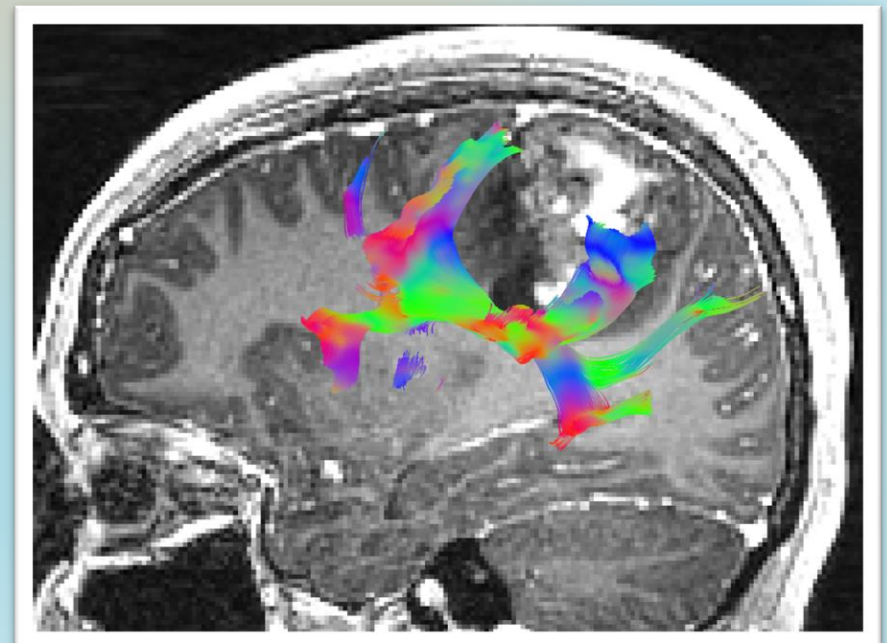
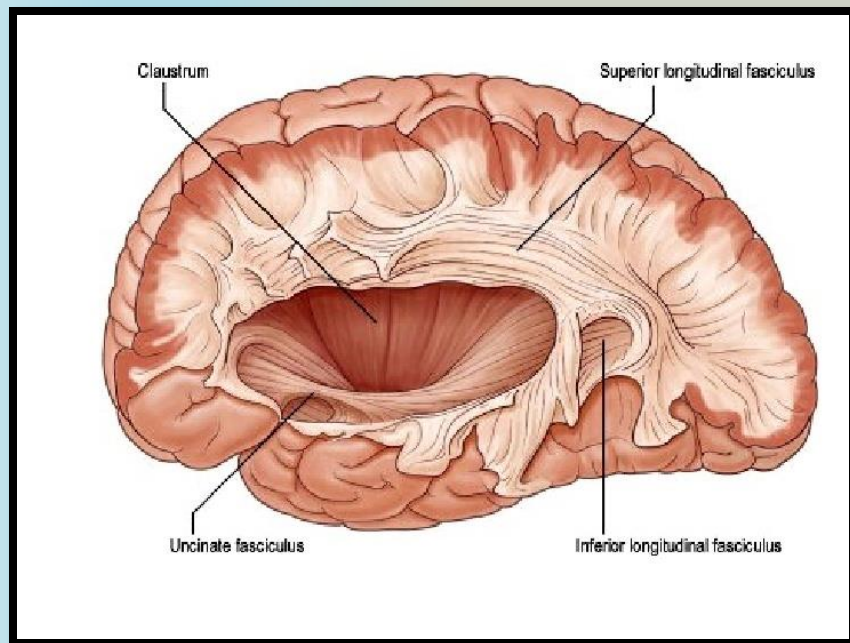
# Structural Network



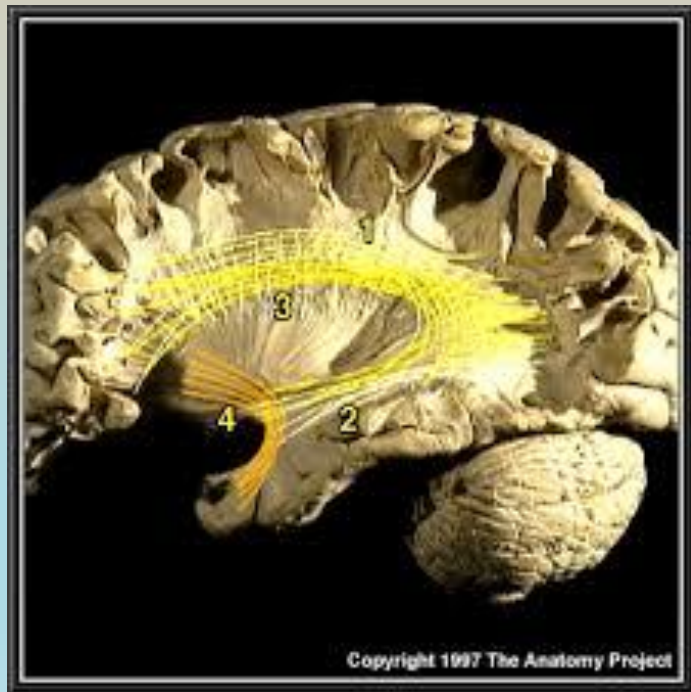


# Language related fiber pathways

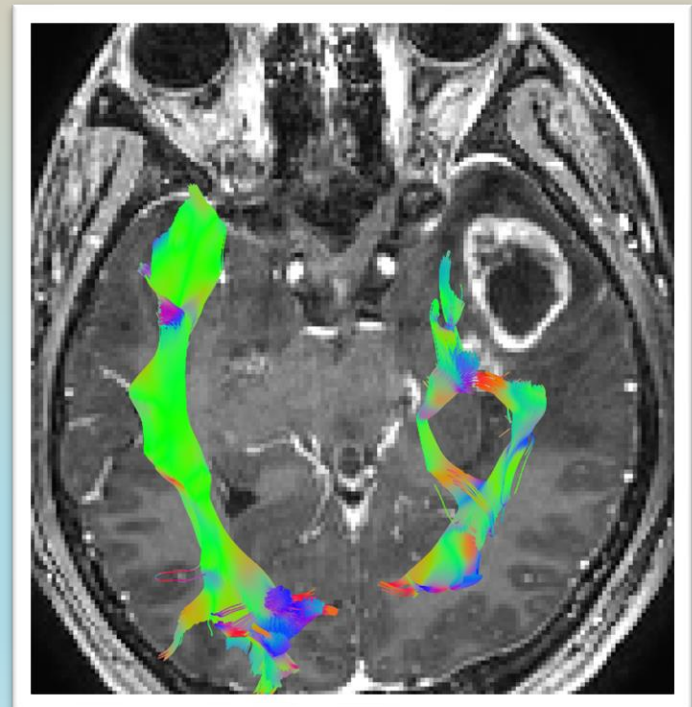
- Superior longitudinal Fasciculus
  - Arcuate Fasciculus



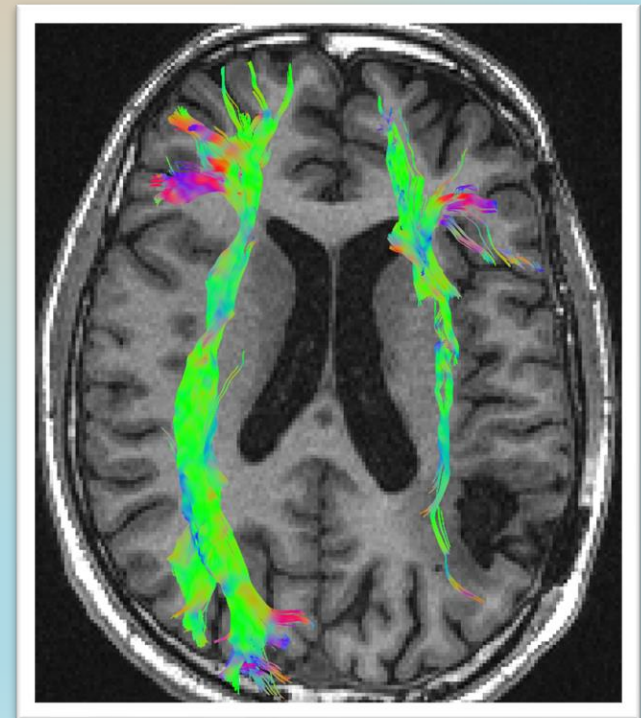
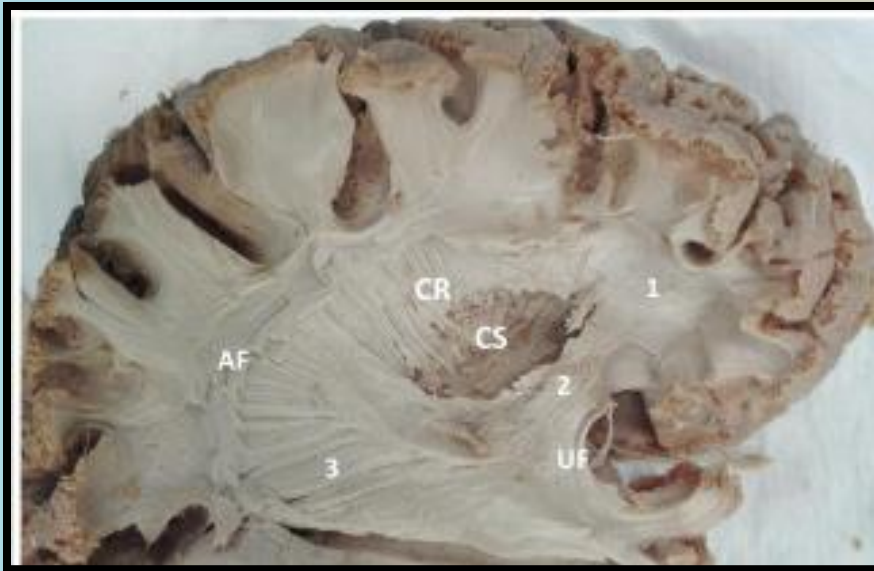
- Inferior Longitudinal Fasciculus



No. 2

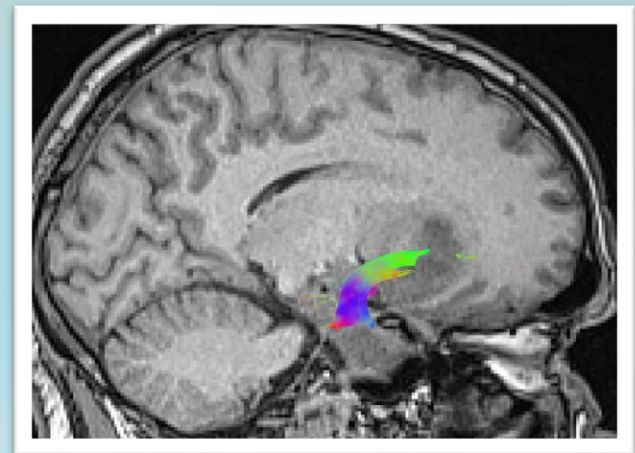
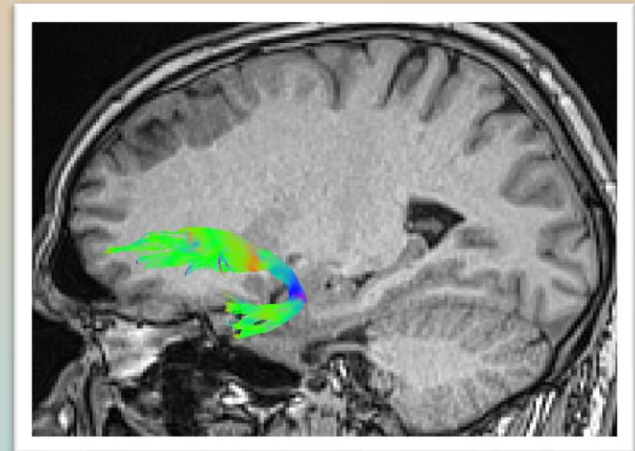
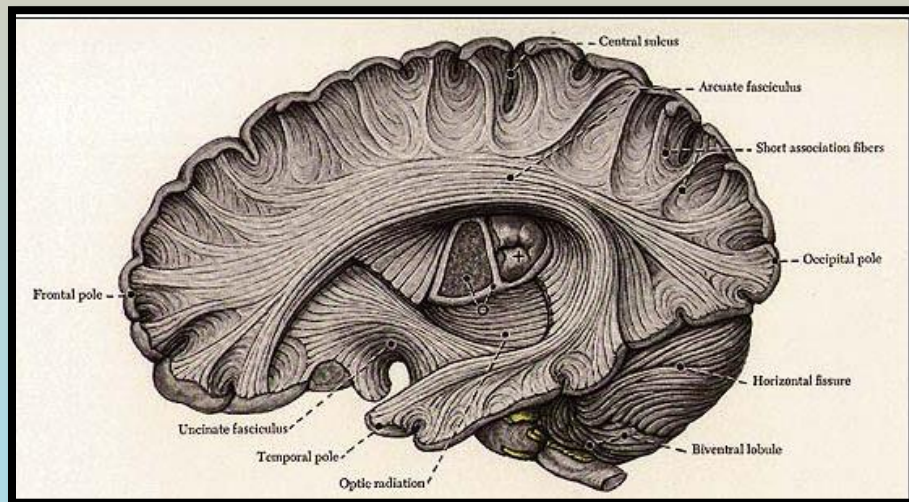


- Inferior Fronto-occipital fasciculus



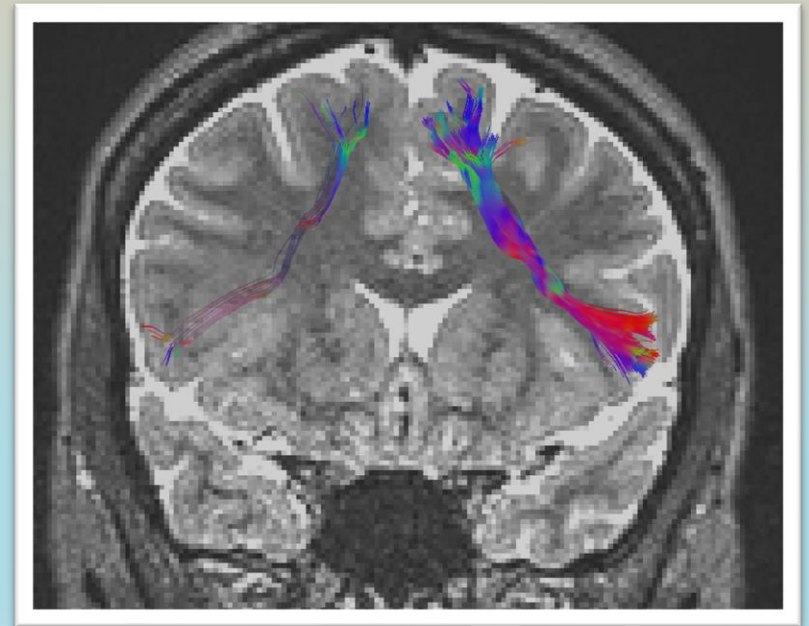
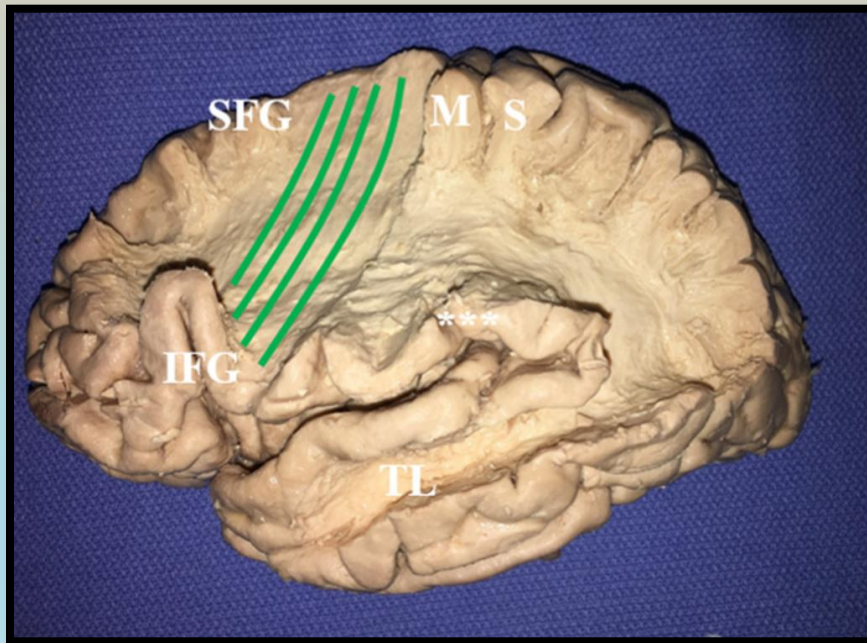


- Uncinate Fasciculus



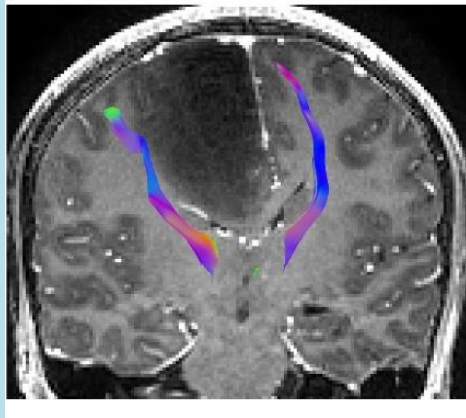
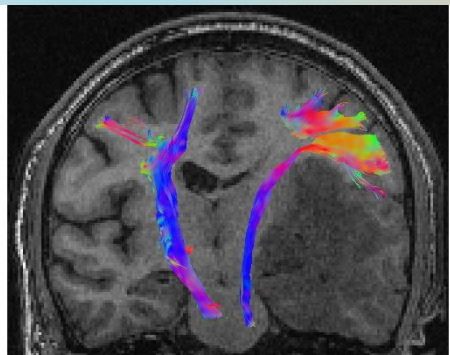


- Aslant

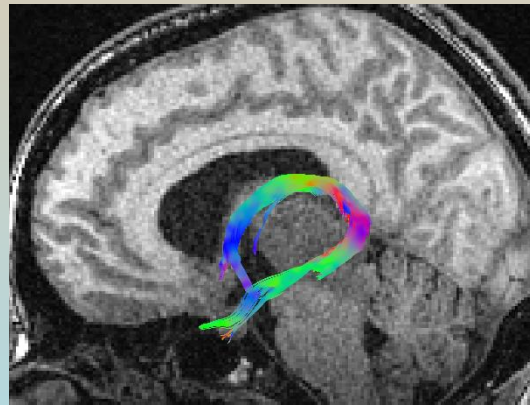


# Other Fiber Pathways

- Motor



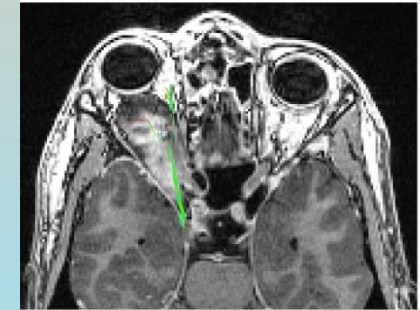
## Memory



## Cerebral Nerve 1-6



CN III

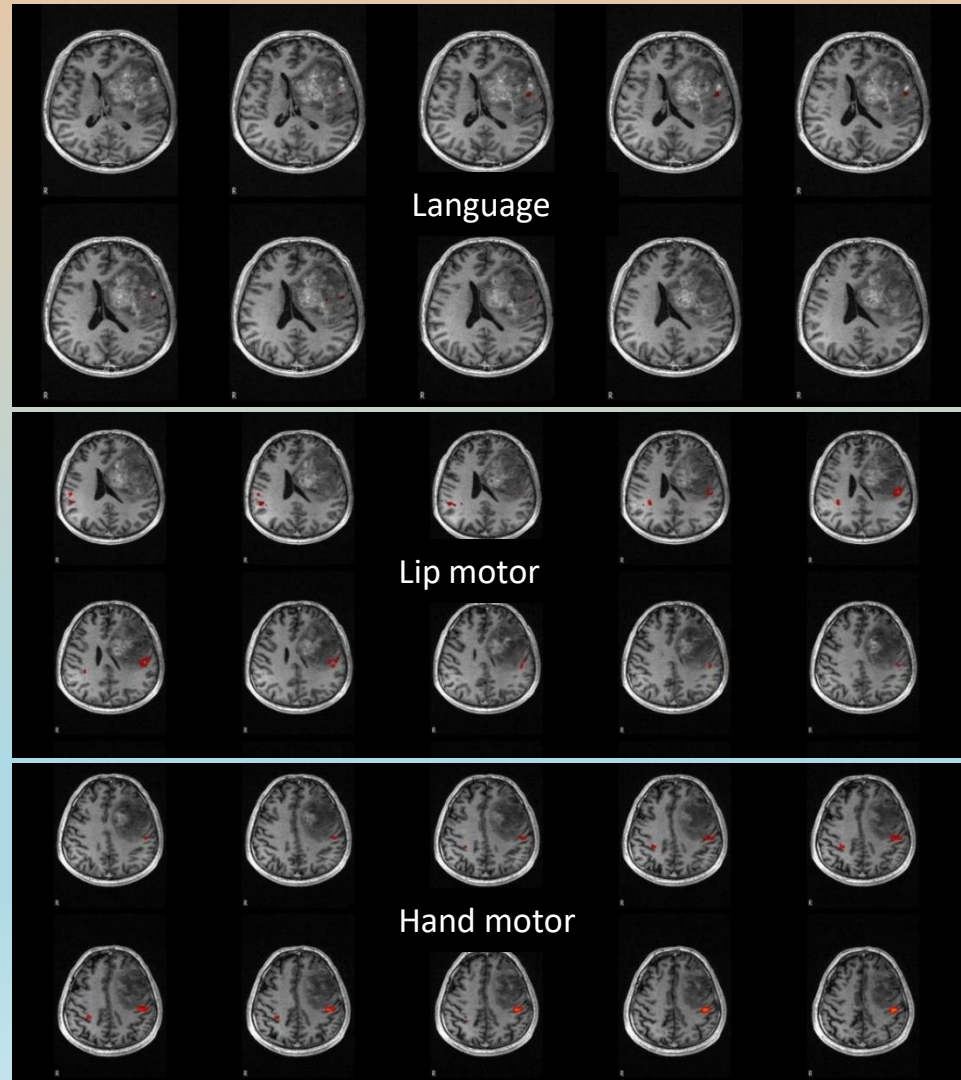
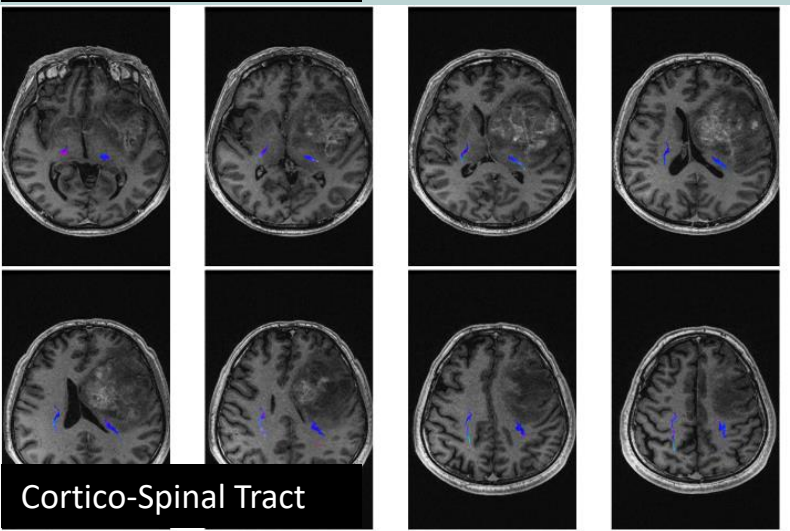
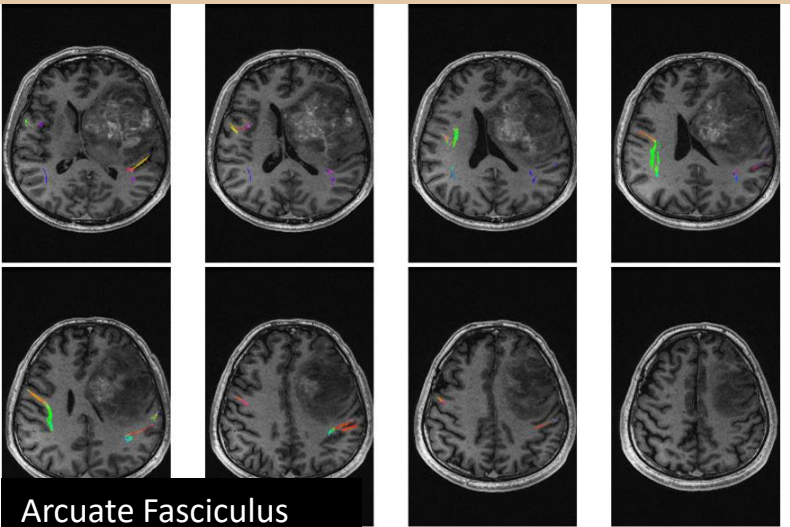


CN IV



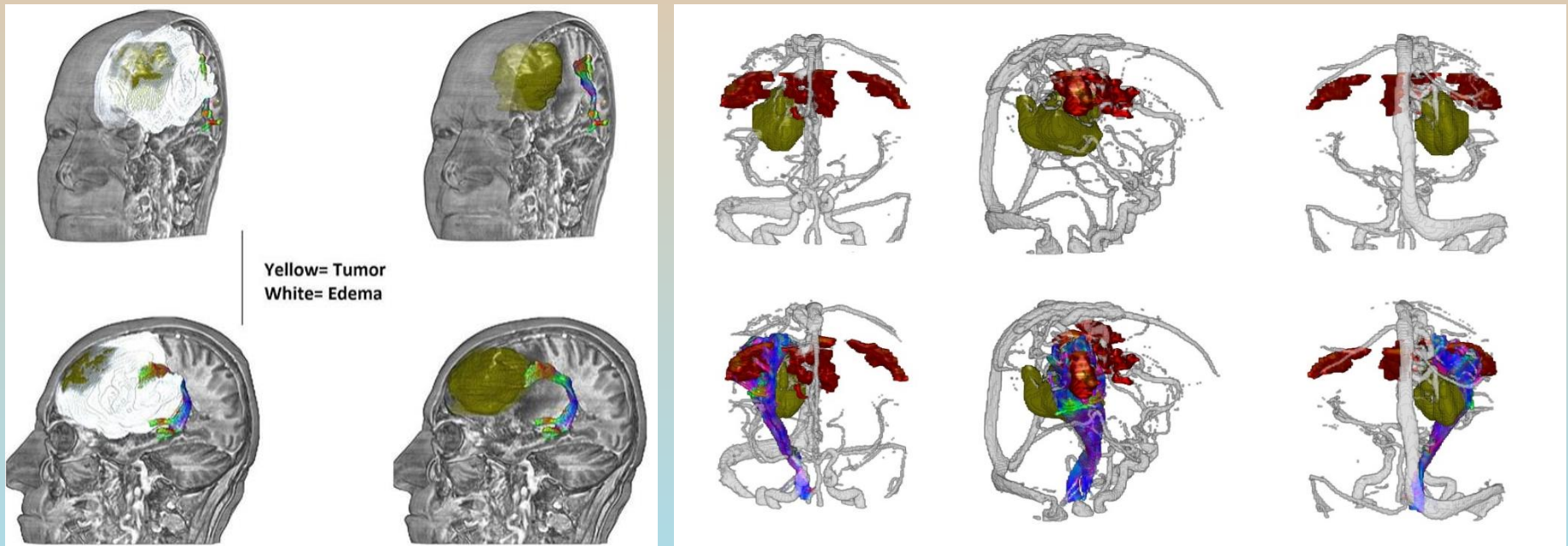
CN V

# Analysis Presentation





# Segmentation of Tumor, Edema and vessel





# Ongoing Projects

- Predicting postoperative language outcome using fMRI/DTI, following evaluation of functional language mapping compared to Cortical Stimulation mapping
- Evaluation of patient motor performance due to tumor invasion in motor area
- Cognitive alteration due to tumor invasion in white matter tracts