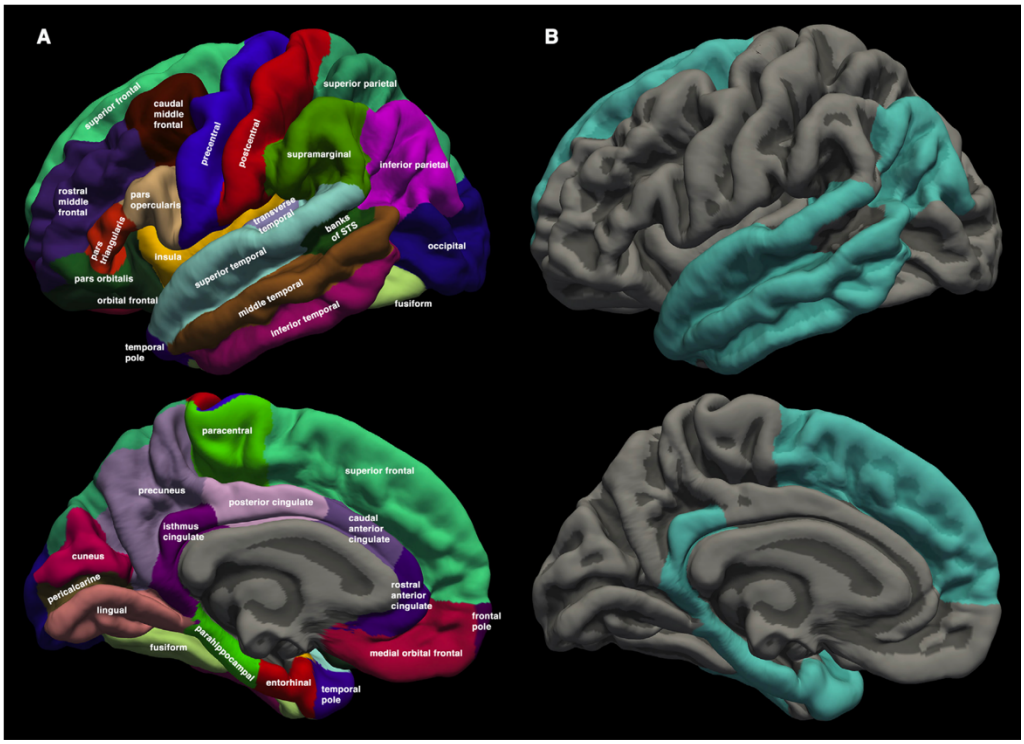
Measuring radiation effects on the brain

Radiation therapy is an effective treatment for brain tumors, but patients can experience cognitive impairment after treatment. We found that radiotherapy-related damage can be measurable with sophisticated MRI. Moreover, we found that some regions of the brain (involved with memory, attention, executive function, and emotions) appear to be more vulnerable to radiation damage than others (e.g., parts of the brain involved in vision, hearing, touch, and walking).



(A) Regions of the human cerebral cortex from the Desikan-Killiany atlas available in the FreeSurfer neuroimaging software suite. (B) Cortical regions with significant radiation dose-dependent atrophy are shown in cyan. Adapted from Seibert et al., *IJROBP* 2017.

- Selected publications:
  - Seibert et al., *International Journal of Radiation Oncology * Biology * Physics* 2017 https://pubmed.ncbi.nlm.nih.gov/28333012/
  - Seibert et al., *International Journal of Radiation Oncology * Biology * Physics* 2016 https://pubmed.ncbi.nlm.nih.gov/28068234/
  - Huynh-Le et al., *Radiotherapy and Oncology* 2019 https://pubmed.ncbi.nlm.nih.gov/31015128/
- Ongoing projects:
  - An ongoing trial at UC San Diego is measuring changes on imaging and changes on neurocognitive tests in patients who undergo radiotherapy to the brain. (Principal Investigator: Dr. Jona Hattangadi-Gluth, MD from UC San Diego)
  - We are building tools to help physicians preserve patients' cognitive function by use of AI. E.g., see Feng et al., *Radiation Oncology* 2020 https://pubmed.ncbi.nlm.nih.gov/33126894/