# Research Computing Infrastructure for Image Processing of the Brain

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Institute on Aging

Cognitive Aging & Memory
Clinical Translational Research Program

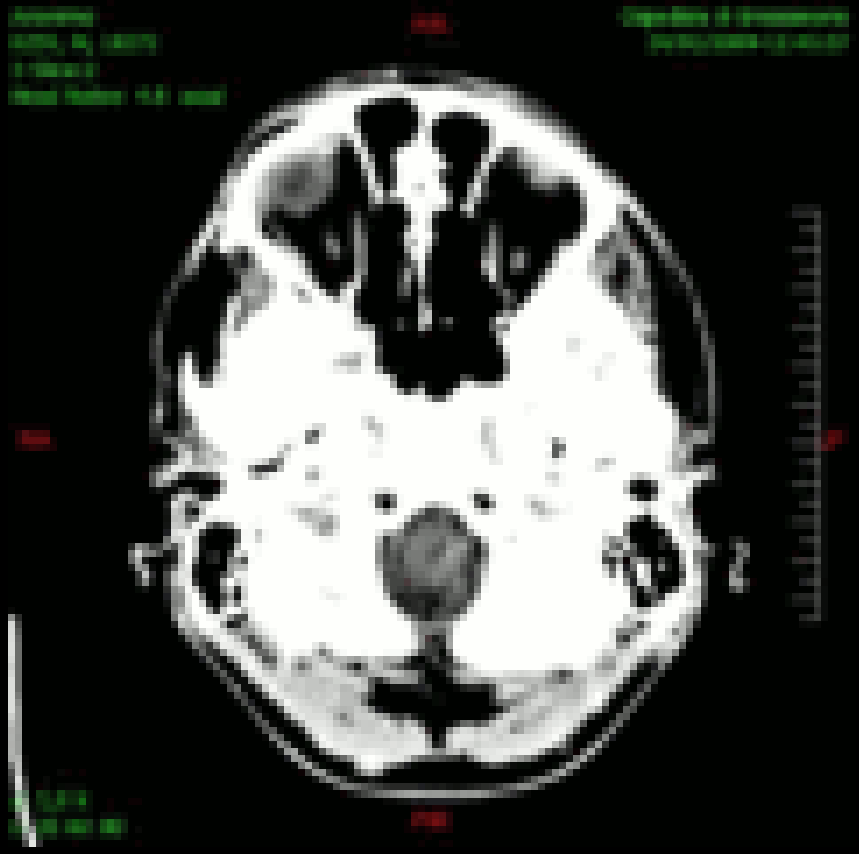
# Outline

- Historical Needs for Neuroimaging Analyses
- Modern Needs
- Large-Scale Neuroimaging Analyses
  - Current Development
    - Multi-site collaboration
    - Streamlining Neuroimaging Analyses

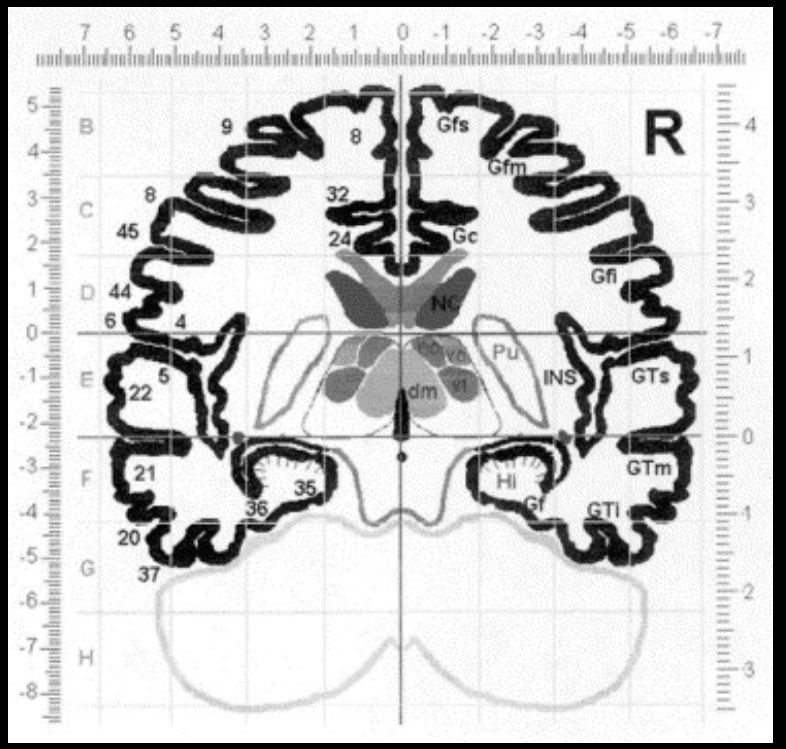
# Historical Needs for Neuroimaging Analyses

# Historical Needs

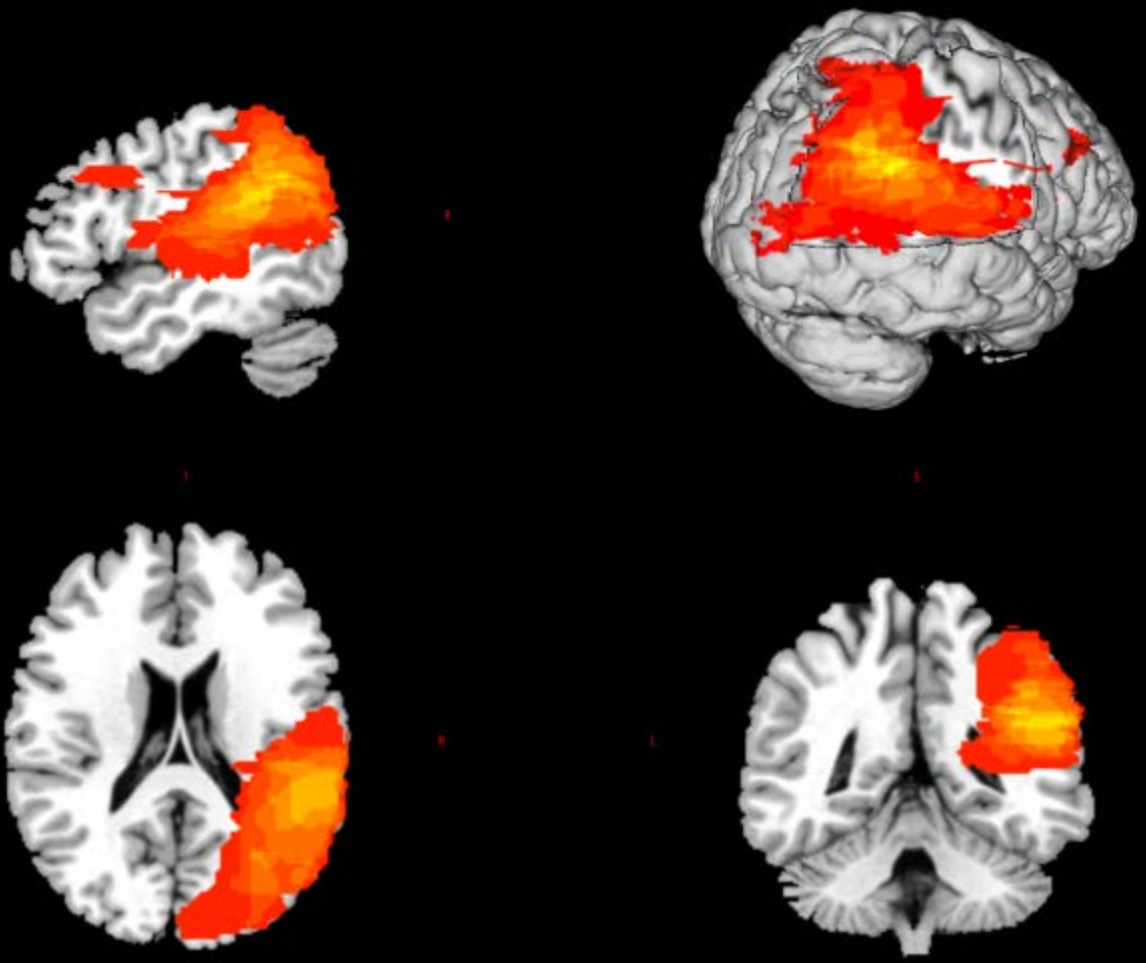
- Structural Analyses
  - CT or MRI



# Lesion Mapping



# Coverage Maps



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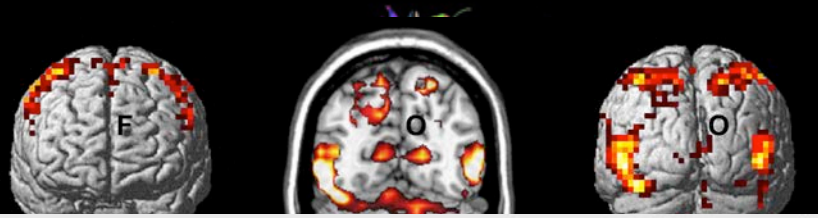
# Processing Needs

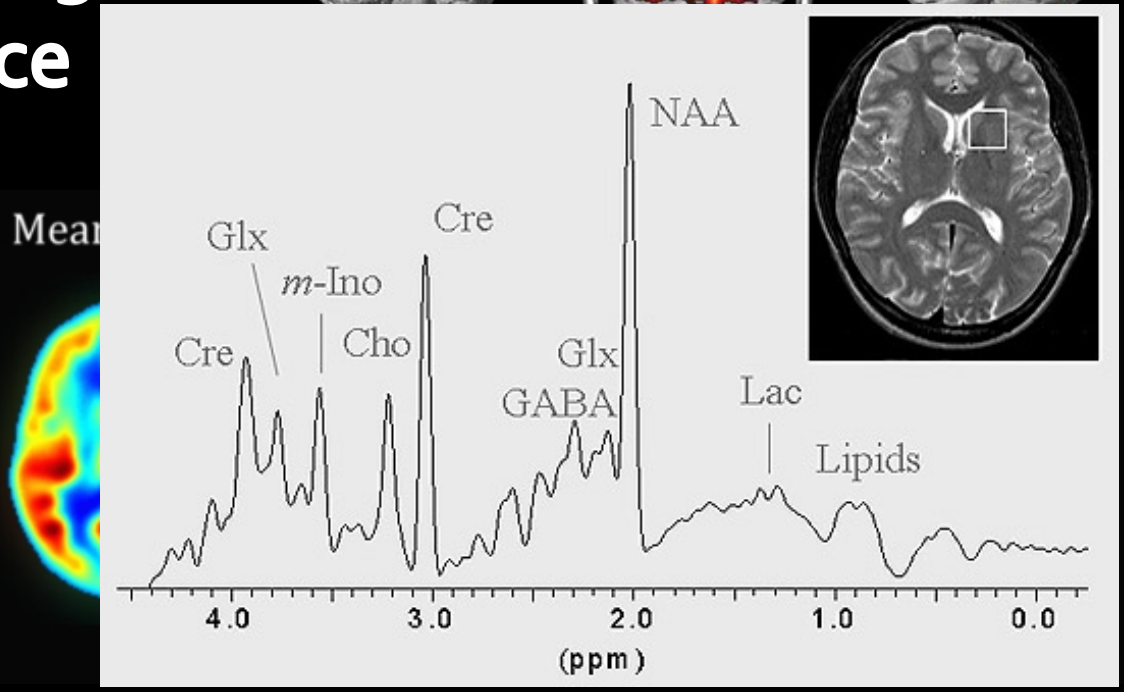
- Analysis Method
  - Overlay computed using simple addition and subtraction methods
  - Desktop computer or handmade overlay on standard templates
- Bottleneck
  - Personnel Hours

# Modern Needs for Neuroimaging Analyses

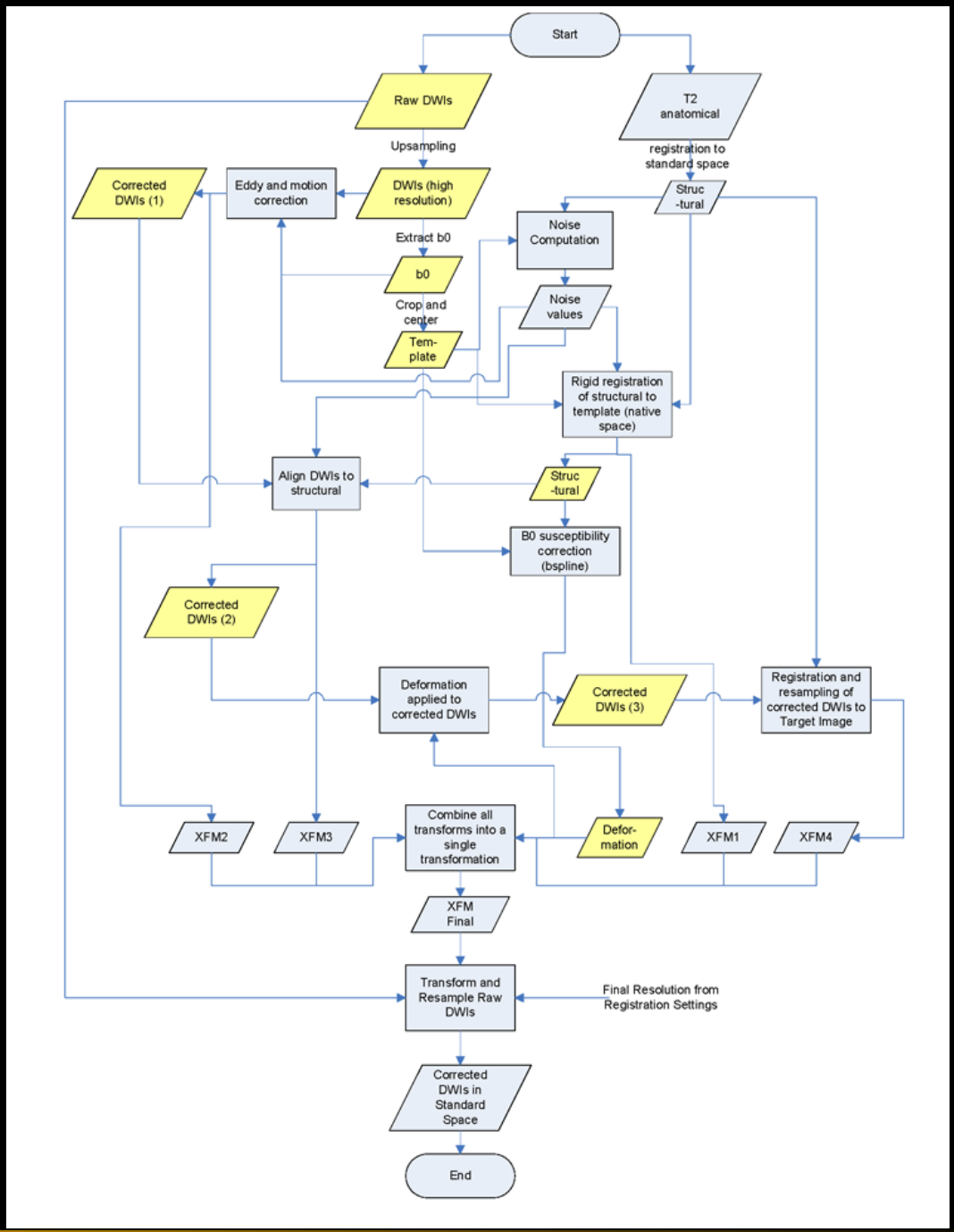
# Modern Human Neuroimaging

- Diffusion Tensor Imaging
- BOLD Functional MRI
- Arterial Spin Labeling
- Magnetic Resonance Spectroscopy
- Etc.



# Sample Analysis Pipeline



# Processing Needs

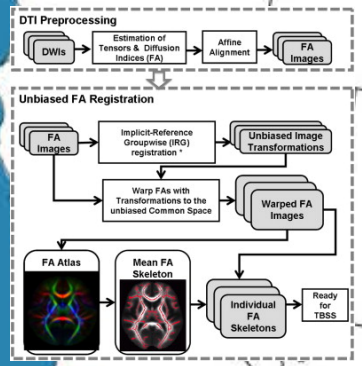
- Minimum Computational Needs
  - Multicore processor
  - 8+ GB RAM
  - Multi TB Storage Capacity
- Bottleneck
  - Computational Processing

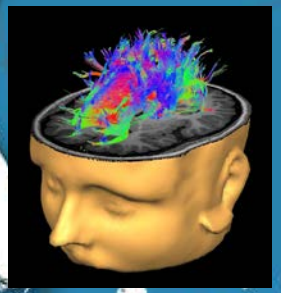
# Example

- 128 brains
- Diffusion Tensor Imaging Data
- 8 cores (3.0 GHz), 8 GB RAM, Mac Pro
- Scripts utilizing parallel processing

- Processing Time:
  - ~1000 hrs (6 weeks)
    - 16 brains/core
    - ~63 hrs/brain
  - 12 cores
    - ~4 weeks
  - 128 cores
    - ~63 hrs

# Multi-Site Collaboration



MEXICO

# HiPerGator Neuroimaging Pipeline Development

- Broad Application Neuroimaging Pipeline
  - Structural
    - Voxel-based morphometry
    - Cortical thickness
    - DTI
    - FLAIR
  - Functional
    - BOLD
    - ASL
    - MRS



# Thank you!

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