MRI physics - Gradients

* Bore + 3 gradients
* Gz – slice selection
  + Z-axis (along B0)
  + Applied for a while
  + Strengthen -> varying precession rates (Larmor)
  + So, target region
* Gy – phase encoding
  + Y-axis
  + Applied in bursts, very short
  + Dephases precession
  + So, Gz give slice, Gy gives data from different regions (columns of slice) at different times
* Gx – frequency encoding
  + X-axis
  + Applied for a while
  + Changes precession frequency
  + So, combined with Gz/y = voxel (3 dimensions)
* (Gy/x are after RF pulse – so controlling from where in slice we receive data)

Atlas

* Standardized coordinate space (google – talairach atlas)
  + e/location defined, all anatomy has coordinates
* many standardized spaces
  + Talairach – French woman
  + Colin27 – dr colin, 27 scans (google – colin27 brain)
  + MNI - Several versions
    - 1st was 305 (google – MNI 305 atlas)
      * Mapping to talairach well defined
      * Spatial resolution
    - Newest – 152 2009
* Template
* Average of scans
  + Construct one in MNI space

Registration

* Transformations
  + Rigid – 6 df
  + Affine – 12 df
  + Diffeomorphic – 93+ million
    - Each point in space has own dfs
* Use transformations to align data with template
  + Diffeomorphic – move data into atlas coordinates
* Symmetric diffeomorphic
  + Special kind – optimized midpoint
  + Allows for bidirectional movement with no info loss

Bash

* Passing arguments (wrapper)
* Conditionals
* HW

Super Computer

* Data in compute
* Only command line
* Login on head processor (node)
  + Submit requests for jobs
* Step2\_sbatch
* Step2\_submit
* Step2\_sbatch arguments
* Step3\_sbatch arguments