SPARSE MRI

Understanding in MRI

Compressed Sensing

Assignment

Read Lustig "Sparse MRI" paper
So far in this class we've looked at many different ways to speed up MRI.

* Non-Cartesian Acquisitions
  Collect more data, faster

* Parallel Acquisitions
  Add RF Encoding, reduce gradient encoding

* Compressed Sensing
  Just collect less data, make it up in recon

All of these can be combined!

**Basic Compressed Sensing Idea**

Compressed image has ~10% of less data than k-space data.
Why collect the other 90%?
How can we do this?

Fundamentally we want to undersample. This produces aliasing. We need to be able to tell signal from aliasing.

Consider parallel imaging.

All ghosts are equally likely. We need coil sensitivities to sort it out.
Uniform Sampling

Uniform UniformUniform

"Random" UniformUniform

For high contrast objects this may be OK

Widely exploited in anamorphosis
Particularly useful for projection reconstruction

Data sets

PR is often aggressively undersampled

Fully sampled 256 x 256 requires 256 x 4 = 1,024 projections
Undersampled set may use 32 or 64 projections

Artifacts look like noise

Basis for HYPR algorithms

Highly constrained back projection

We'll focus here on another approach

Sparse MRI

Compressed sensing

<Go to slides here>