HW10: Answer Key

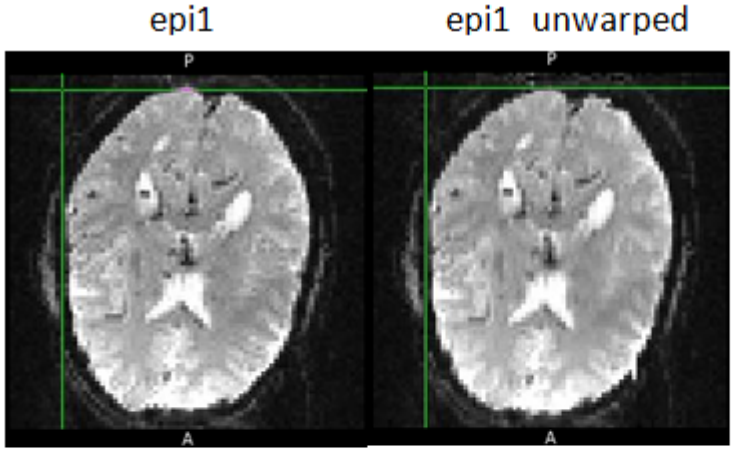
Problem 1: data conversion. Which option did you use?

dinifti has the convenience of less typing and the ability to specify the output filename.

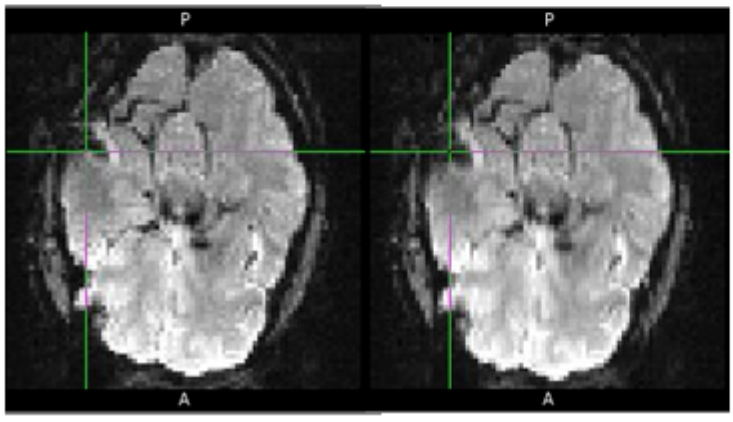
dcm2nii (provided with Mricron) has the advantage of being widely distributed and perhaps more accurate in the way it handles orientation information in the header. And the thing we've learned recently is that dinifti won't work with data from the Skyra, so dcm2nii's our only option from here on out.

Problem 2: where is distortion evident and what does it look like?

Some notable locations: in inferior temporal cortex, signal from anterior temporal cortex blurs back across the missing signal over the auditory canal; in inferior occipital cortex, the brain is sticking out too far back in the original EPI data and is tucked back in nicely in the _unwarped file.

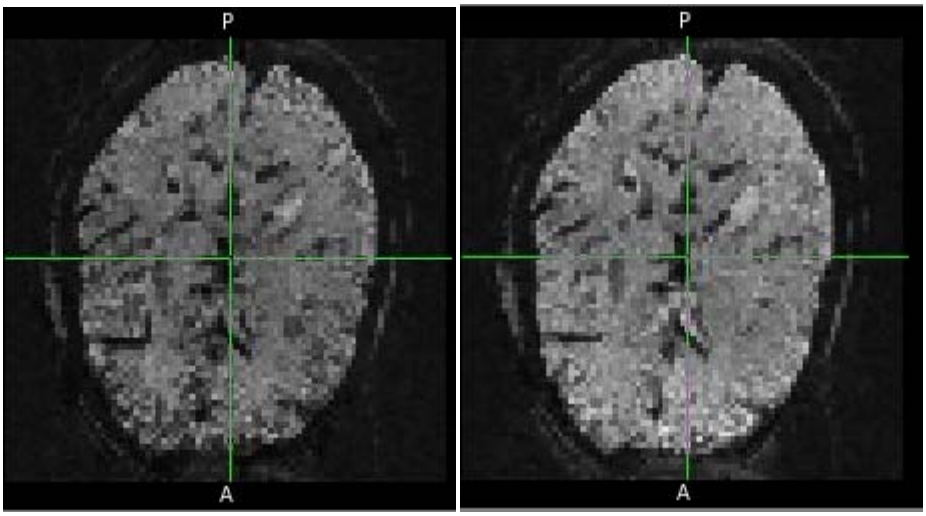


Occipital cortex and frontal cortex are both less pointy as signal gets moved forward



Signal from anterior temporal cortex is moved forward, revealing true size of signal loss over auditory canals.

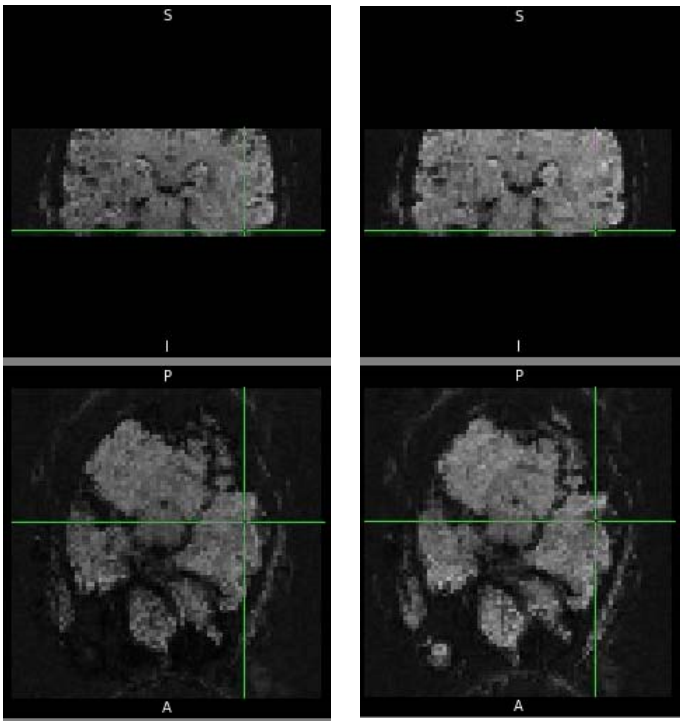
Problem 3: which of the 2 acquisitions has higher SNR?



The above images show both maps viewed with the same color scale [0 80]. Therefore the lower intensity in the image on the right (epi1_SNR) corresponds to lower SNR in epi1 than in epi2. The difference is not dramatic – an average SNR of ~35 vs. an average SNR of ~30. But this is about right for a change in voxel volume of 20%.

Note that the SNR is lower in GM in some parts of the brain and not in others, suggesting that these images have roughly equal contributions of physiological noise and thermal noise (the acquisition was right on the cusp of where thermal SNR is high enough that physiological noise starts to dominate).

Problem 4: which of the 2 acquisitions has the thinner slices? Where, if anywhere, did the thinner slices work to recover data? Why was the thin-slice acquisition not more effective?



The thin-slice acquisition (epi1) on the left shows higher SNR at the location of the crosshairs, in right inferior temporal cortex. In general, however, through-slice dephasing was not meaningfully mitigated by decreasing slice thickness from 2.4 mm (epi2, image on right) to 2.0 mm (epi1, image on left). This is likely because the 20% decrease in thickness was not enough to significantly affect the through-slice dephasing where the unwanted through-slice field perturbations were strong.