Brain Scan Demo

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This demo tests Optimal Hard Thresholding applied to each slice along Z axis.

```
filename = 'ABIDE_MRI_data.nii';

Vol = niftiread(filename);

[Nvol, Dvol, snrN, snrD] = TestVolume(Vol);
[NvolSq, DvolSq, snrNSq, snrDSq] = TestVolumeSq(
```

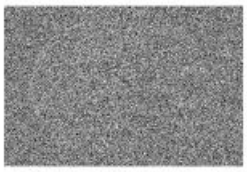
For Arbitrary thresholding

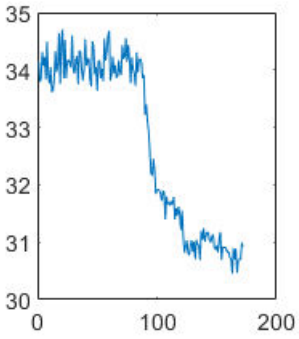
Original Signal to Noise Ratio at each Slice along Z axis

```
plot(snrN)
```

Denoised Signal to Noise Ratio at each slice along Z axis

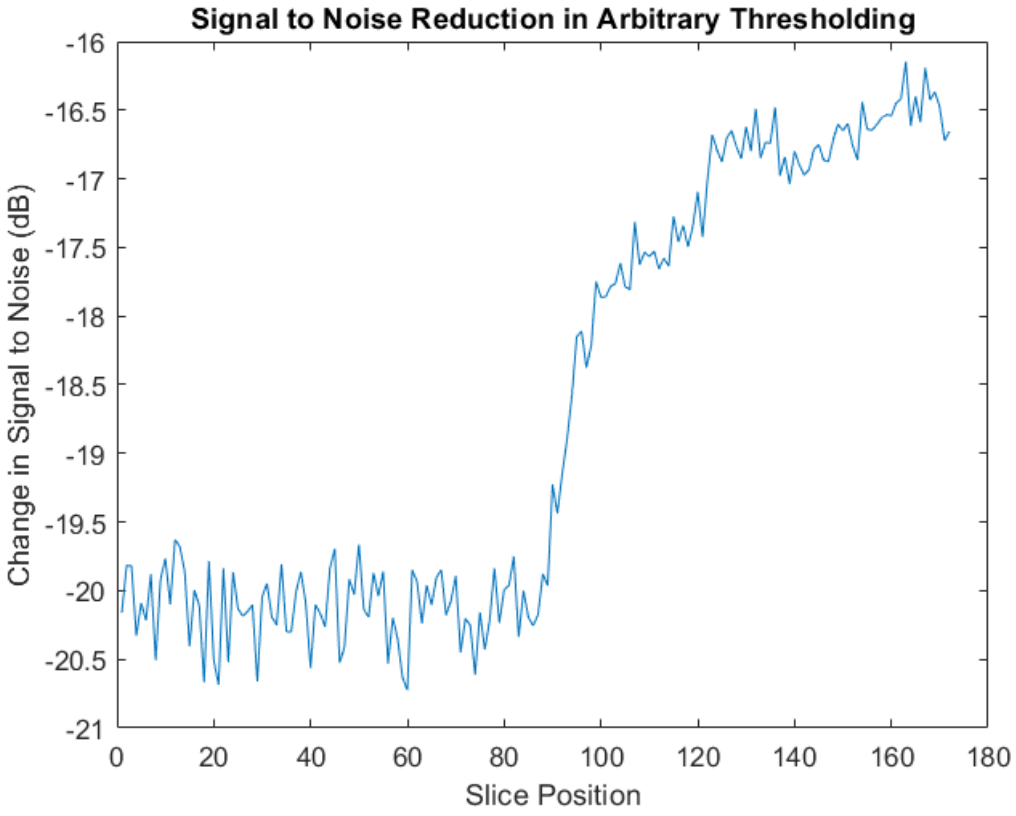
```
plot(snrD)
```





Amount of Signal to Noise Reduced by Arbitrary Optimal Hard Thresholding

```
clf
plot(snrN - snrD)
ylabel('Change in Signal to Noise (dB)')
xlabel('Slice Position')
title('Signal to Noise Reduction in Arbitrary Th
```

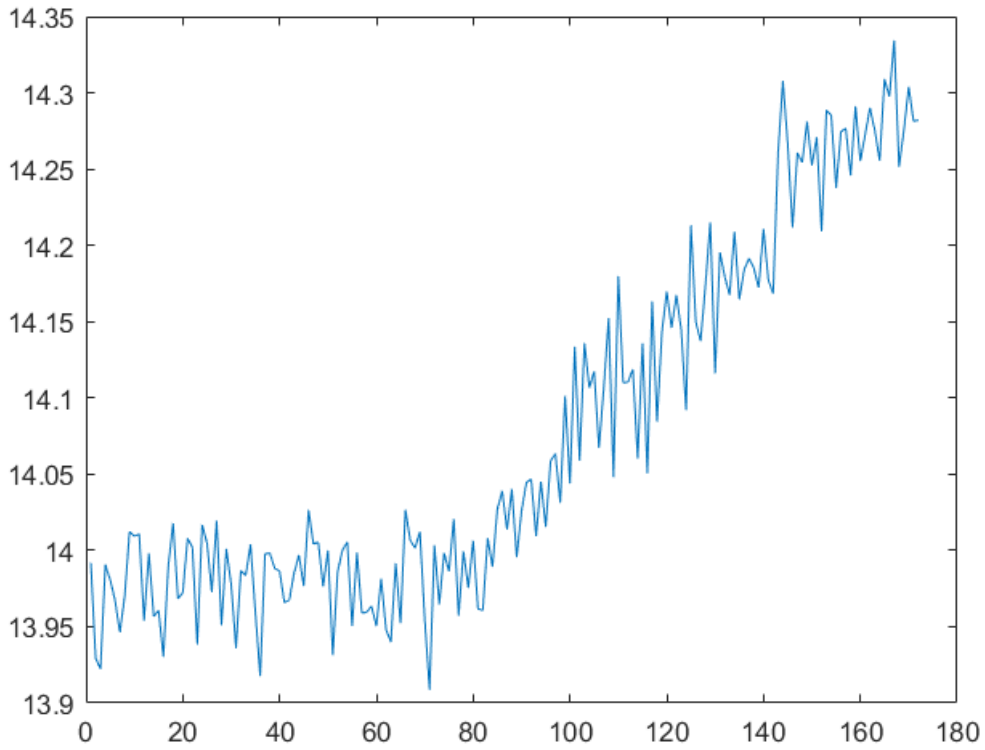


Note: Large negative values mean that we are *introducing* noise into the matrix by performing too innacurate of a reconstruction. In other words, we are *losing* both signal and noise, with too much signal lost.

For non-arbitrary square thresholding

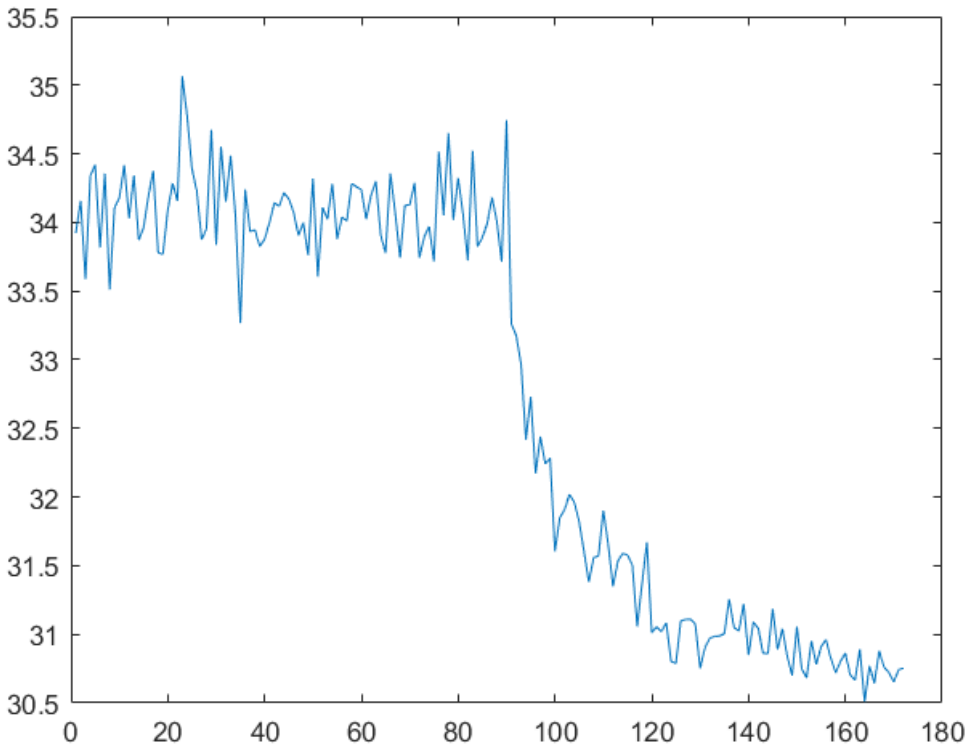
Original Signal to Noise Ratio at each slice along Z axis

```
plot(snrNSq)
```



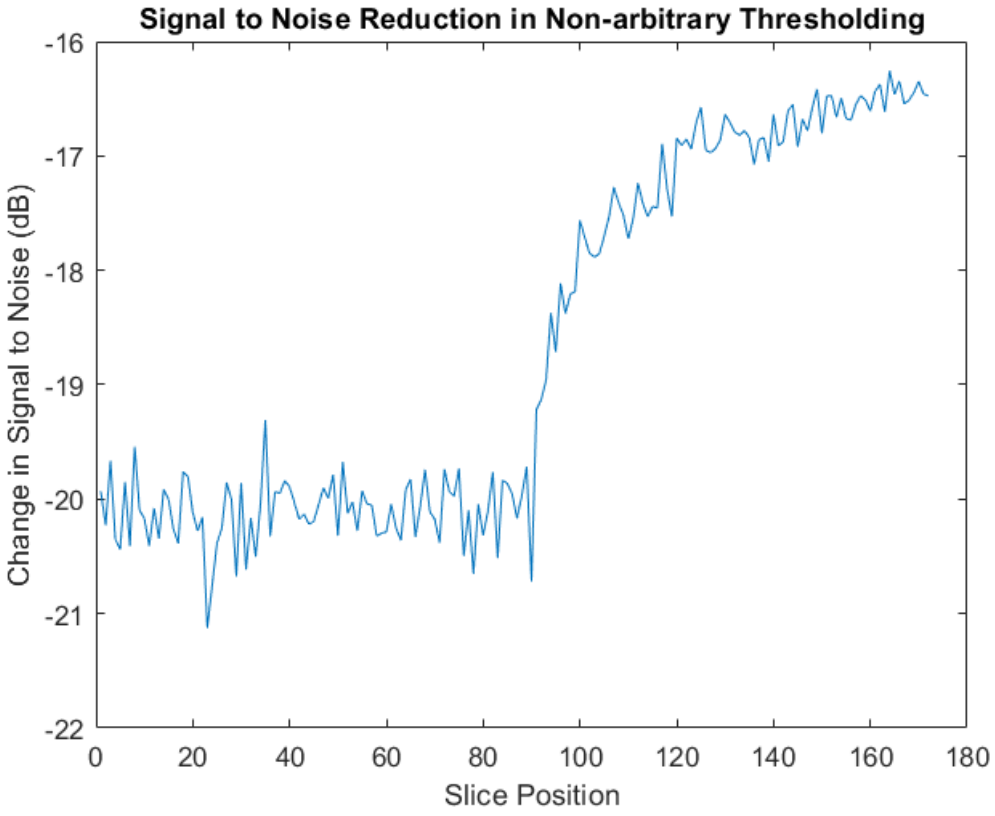
Denoised Signal to Noise Ratio at each slice along Z axis

```
plot(snrDSq)
```



Amount of Signal to Noise Reduced by Non-arbitrary Optimal Hard Thresholding

```
clf
plot(snrNSq - snrDSq)
ylabel('Change in Signal to Noise (dB)')
xlabel('Slice Position')
title('Signal to Noise Reduction in Non-arbitrar
```



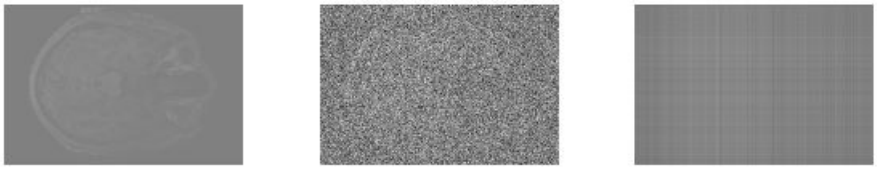
Example Brain Scan (Original, Noisey, Denoised)

Arbitrary Thresholding

```
subplot(1,3,1)
imshow(Vol(:, :, 140));

subplot(1,3,2)
imshow(Nvol(:, :, 140));

subplot(1,3,3)
imshow(Dvol(:, :, 140))
```

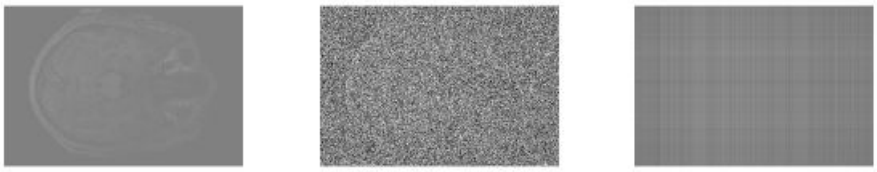


Non-arbitrary thresholding

```
clf
subplot(2,3,1)
imshow(Vol(:, :, 140));

subplot(2,3,2)
imshow(NvolSq(:, :, 140));

subplot(2,3,3)
imshow(DvolSq(:, :, 140))
```



Average of SNR for Noisy and Denoised volumes

```
avgNoisy = mean(snrN)
```

```
avgNoisy = 14.0756
```

```
avgDenoised = mean(snrD)
```

```
avgDenoised = 32.7578
```