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Data I

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HW 5

1. The white noise spectrum is plotted in blue. The spectrum is white in nature. The autoregressive spectrum with noise is plotted in orange. The spectrum is red in nature.
2. The errorbar is plotted in black.
3. The pdf of my Monte Carlo simulation of 200 realizations of the white noise spectrum looks like a chi-square distribution for large degrees of freedom. It appears skewed to lower values, though only slightly. I believe that the distribution is chi-squared because throwing all of the data from the Monte Carlo simulation in (not organized by realization, meaning the segments are not summed or averaged), the pdf looks exactly like a chi-squared distribution for 2 degrees of freedom. This is what we would expect since without any segmentation, there are two degrees of freedom. Further, I plotted the pdf for a chi-squared distribution with 200 degrees of freedom. The shape is very similar to the pdf of the 200 realizations. I am unsure about the values on the x and y axis – there is potentially a normalization that I do not understand. Further, the error bars from the Monte Carlo simulation are consistent with those from the first spectrum calculated using the chi-square lookup table. The ratio between upper and lower limits for the 95% confidence interval is 2.43 for the first spectrum and 2.39 for the Monte Carlo simulation, sorting the 200 realizations.
4. The error after applying the Hanning window is still comparable to the error from the chi-square lookup and from the Monte Carlo without the Hanning window. The ratio between upper and lower limits for the 95% confidence interval is 2.40. Applying the Hanning window does not change the uncertainties.