More details on the project

The filter we have used thus far contains only one simulated r-mode signal's information, which represents an ideal matched filter: the best enhancement occurs only if that signal is exactly present in the data. It would be better to create a filter that can work well on many types of signals: different durations, different initial frequencies, etc. But adding signals to our 'template bank' does not necessarily enhance the image. If the signals' power spectra overlap, then the models of our signals are not optimal, resulting in a lower signal-to-noise ratio.

The studies we would like to do include simulating r-mode signals with different frequencies, durations, and saturation amplitudes to create our filter, and determine which combinations provide overall high enhancement for a large number of unknown r-mode signals embedded in the data. We also would like to determine this enhancement as a function of how strong the r-mode signals are that we inject into the data.

Additionally how we choose to apply the filter will affect how enhanced the image is (for example, a filter that cubes the power spectra of the model will act differently than one that relies on the ratio of the power spectra of the signal to that of the noise). It is important to determine both what template to use as a filter, and how to apply the filter to r-mode injections such that the enhancement of the image is maximized.