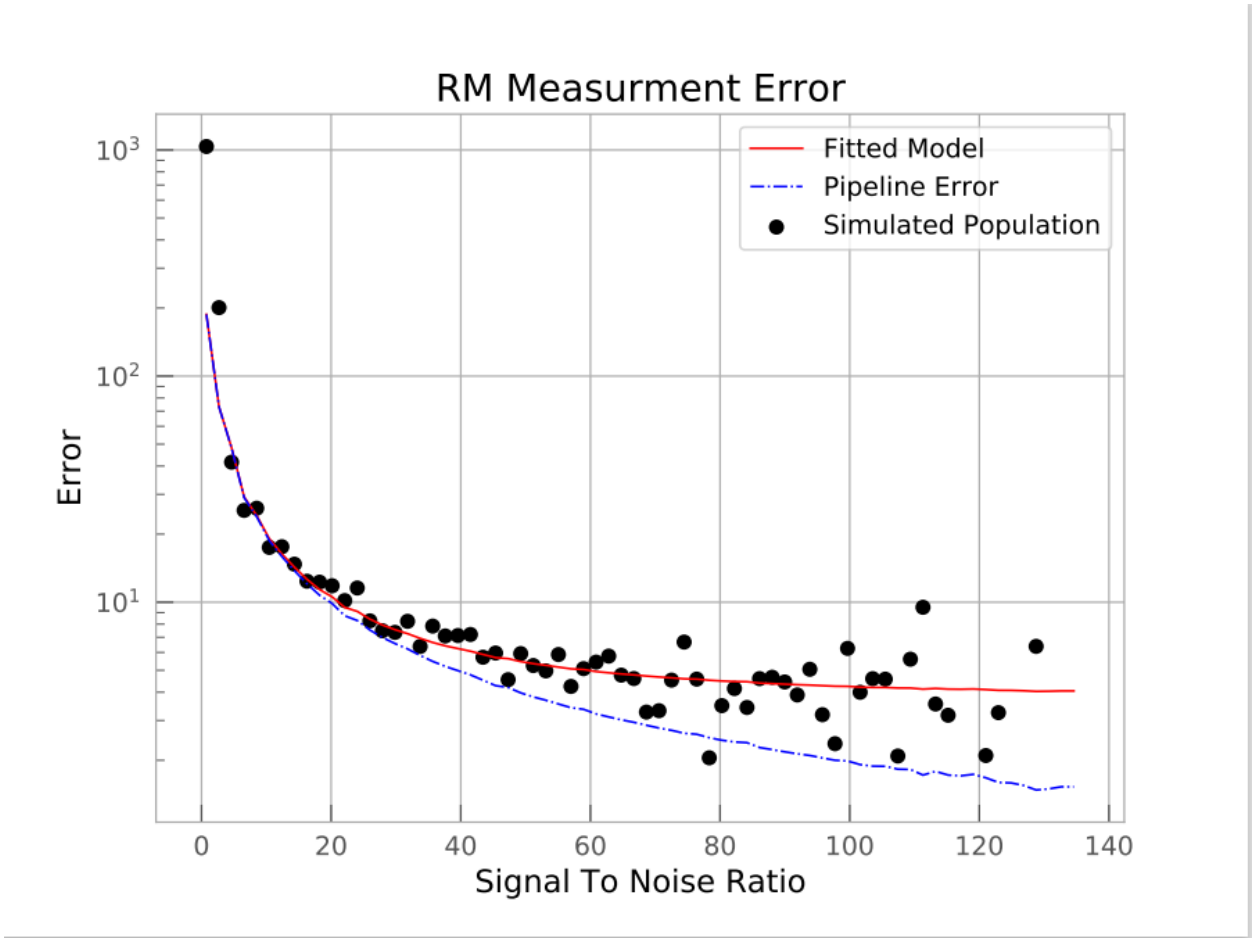
Cosmic magnetism is an area of active research, it plays a role in many different astrophysical systems yet is poorly understood. A way to study cosmic magnetism is from radio polarization surveys. **Polarization Sky Survey of the Universe's Magnetism (**POSSUM) is one of the eight major surveys to be conducted by the Australian Square Kilometer Array Pathfinder (ASKAP). POSSUM will make a catalogue of Faraday rotation measures (RMs) for around a million extragalactic radio sources – that's an increase of 20x the current known Faraday rotation measures (RMs). RMs play a major role in studying cosmic magnetism.

The goal of this project was to develop a robust error analysis of the POSSUM data as a part of the POSSUM data pipeline. Developing a robust error analysis, making sure the error bars for the pipeline are accurate is important as future research will depend on the accuracy of the errors. For (an extreme) example, having too small error bars means that future research may result in conclusions that in actuality only exist because of noise not that was not properly accounted for. Simulations I made with known ground truth parameters allowed me to test the accuracy of the pipeline. I injected compact radio source simulations into a real data set of the night sky to test the pipeline. Injecting the simulations into real data allows the testing to be as close to reality as possible. Then the test data was run into the pipeline, looking only at the simulated sources.

The key result from my project was the discovery that the output error bars from the pipeline are slightly too small. This is a problem for the pipeline and needs to be corrected. Interestingly, the accuracy of the error bars from the pipeline depends on the brightness of the source. This makes the simple correction of increasing the error bars by a constant factor impossible. However, the next simplest correction appears to be successful. I attempted adding in quadrature the pipeline error to some additional error and fitting a model, to find the value of the new error parameter. The fitted model appears to be an improvement compared to the current pipeline. Next steps for this project are further testing of how the error in the error bars depend on the source population, and implementing a correction to adjust the size of the output error bars from the pipeline.

Figure Caption: An improved fitted error model is compared against the current error model used in the pipeline and against the error from different simulated source populations.


RM Measurment Error
Fitted Model
Pipeline Error
Simulated Population
Error
10^3
10^2
10^1
0
20
40
60
80
100
120
140
Signal To Noise Ratio