Advances in 21cm EoR Imaging Pipelines

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The first generation of radio arrays has been built to detect the highly redshifted 21cm neutral hydrogen line from the Epoch of Reionization (EoR), and second generation instruments are on the horizon. These arrays produce huge data sets, and it is a monumental task to overcome foregrounds and systematics to reduce the data to a precision cosmology measurement. This challenge is being met by several collaborations around the globe, and two primary analysis philosophies have emerged - delay spectrum analysis, and imaging based analysis. Delay spectrum analysis leverages the inherent symmetry of redundant arrays to calibrate and combine data to form a power spectrum measurement. On the other hand, imaging analysis utilizes knowledge of the sky to understand the array and the effect it has on the data, with the ultimate goal of creating images of the intergalactic medium during the EoR. I will describe the fundamental differences between these strategies and outline some of the benefits to each. Drawing heavily on observations from the Murchison Widefield Array, I will detail several lessons learned in the imaging approach, and how they can be applied in the wider community. These lessons range from technical problems like calibration, foreground removal, and preserving data quality through the pipeline, to strategic questions like how to design future arrays and observing campaigns. By pushing the limits of interferometric analysis, we are paving the way to create high fidelity images of the intergalactic medium as it is ionized. These images will be necessary for cross-correlation studies with probes at other wavelengths, unlocking the full potential of EoR science.