

Understanding Channel State Information in Wireless Communication

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The Reconfigurable Ecosystem for Next-generation End-to-end Wireless project, also known as the RENEW project, at Rice University provides an open-source massive MIMO platform for research in wireless networking. The RENEWLab, a program that offers researchers methods for channel characterization, waveform evaluation, and creating datasets for machine learning, is one of the software frameworks utilized in the RENEW project. We run this on a Linux-based host machine using the SoapySDR software, an open-source generalized API and runtime library for interfacing with SDR devices, to communicate with the Iris Software Defined Radio hardware used in the wireless experiments. RENEWLab uses the C++-based framework Sounder, a python-based collection of analysis tools, and a Matlab-based collection of scripts to collect, record, and read the channel state information CSI obtained from the radios. The CSI is a mathematical characterization of a signal's effects when it travels from a transmitter to a receiver. The overarching objective we are trying to achieve from this research is to develop a tool that will visually and statistically fit different probability distributions to this channel data. We accomplish this by plotting histograms from the channel data, choosing a specific distribution to overlay on top of this data, and running a statistical test on which distribution is the best fit for the dataset. In the future, this research will increase the efficiency of the RENEWLab program by providing a simplified method for interpreting CSI datasets collected from radios.