

## **Alexandre Sousa: Sterile Neutrino Searches in the MINOS+ and NOvA Long-Baseline Experiments**

Although the body of knowledge on neutrino physics has dramatically increased since the discovery of neutrino oscillations in 1998, the possibility that additional neutrino flavors exist is not excluded, given the present precision on neutrino oscillation measurements. Measurements of the  $Z$  decay width into neutrinos are consistent with three neutrino flavors, so a fourth neutrino would either have to be very massive to suppress the  $Z$  decays, or have an associated light mass state and not couple to the weak interaction. These light "sterile" neutrinos would open up a brand new sector in physics and could shed light on the smallness of the active neutrino masses, be viable dark matter candidates, and explain puzzling questions in the core collapse of supernovae. The purpose of my project is to develop data analysis and simulations techniques to search for sterile neutrinos using the MINOS+ and NOvA long-baseline experiments. Mixing of active neutrinos with sterile neutrinos would cause deviations from the three-flavor oscillatory behavior between the Near and Far detectors of each experiment, so energy-dependent deficits in the measured charged-current and neutral-current neutrino energy spectra would be evidence for sterile oscillations. If no deviations are found, both MINOS+ and NOvA have the potential to improve on the existing constraints from the MINOS experiment.