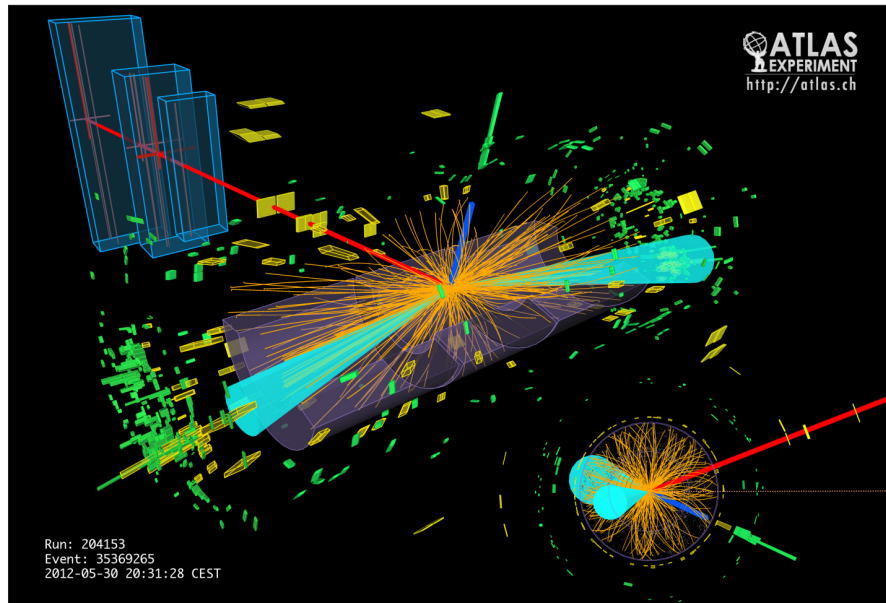# Wright Laboratory

Arianna García Caffaro
Yale

WIDG

December 5, 2023 at 10:00 a.m. in WL-216

Probing the Higgs CP Structure and Quantifying QCD Systematics in Jet Substructure Techniques

Since the Higgs boson's discovery in 2012, the High Energy Physics community has centered its efforts on thoroughly studying this particle's properties. As a step towards that goal, the ATLAS Collaboration has undertaken a study of the CP nature of the Higgs Yukawa coupling to the tau lepton. A Run 2 analysis has measured the CP mixing angle to be 9 ± 16°, excluding the pure CP-odd Higgs hypothesis at 3.4σ. The next iteration of this analysis with partial Run 3 data is underway. In the absence of a significant boost in statistics, new machine learning based methods for measuring the CP mixing angle and increasing the analysis sensitivity will be discussed. Furthermore, in view of the rapidly increasing interest on jet substructure measurements, a study on the robustness of Neural Networks (NNs) commonly used for jet tagging will be presented. As a step towards better understanding the role QCD systematics play in Machine Learning applications, this study proposes new metrics to quantify the NNs' robustness against non-perturbative uncertainties.

Host: Jiaxiang Wang