

Nicholas Kyriacou – HEP Seminar – September 1, 2026  
University of Washington

**Title:** Boosting the Higgs Boson to infinity and beyond

**Abstract:** Since discovery of the Higgs Boson in 2012, a key component of the physics program at the Large Hadron Collider (LHC) has been to further characterize the properties of this new particle. Incredible progress has been made to parametrize the role of the Higgs boson within the SM, establishing increasingly precise measurements of its properties and couplings, across its various decay channels. Such precision measurements simultaneously play an important role in probing for new beyond the Standard Model (BSM) physics involving the Higgs Boson, particularly in extreme phase-spaces, such as at high transverse momentum ( $p_T$ ). Characterization of the Higgs Boson at high- $p_T$  remains largely unexplored; in particular due to decreasing production cross-sections and unique reconstruction challenges associated with this topology. This seminar presents two new ATLAS measurements of Higgs Boson production in the high- $p_T$  regime in the  $H \rightarrow b\bar{b}$  and  $H \rightarrow \tau\bar{\tau}$  decay channels. Central to these measurements was the leveraging of advanced Machine Learning algorithms to augment the performance of reconstruction and identification algorithms of the Higgs Boson. Both results establish evidence for the production of Higgs Bosons in this high- $p_T$  regime; and provide an important precision benchmark in expanding the characterization of the Higgs Boson.