Daniel Hayden – Colloquium Seminar – October 31, 2024
MSU

Title: Stronger Together: Comprehensively Searching for New Physics at the LHC.

Abstract: Abstract: ATLAS is one of the four major experiments at the Large Hadron Collider, based at CERN in Switzerland. The collaboration as a whole searches for a wide variety of new phenomena which could inform us about nature beyond the Standard Model of particle physics. Some examples of these searches are those looking for new heavy gauge bosons which could be part of a Grand Unified Theory, Gravitons which could help us understand Quantum Gravity, additional Higgs bosons, and new varieties of heavy quarks, or quark-lepton compositeness. These new particles would likely decay to a plethora of different possible final states, each of which ATLAS searches for independently. Though no clear sign of new physics has been discovered in these individual searches to date, statistically combining these results has the potential to greatly increase our sensitivity to new physics. This allows us to look for reinforcements or contradictions in any excesses observed by the individual searches, and disentangle some of the degrees of freedom in the new physics models which is not possible with the standalone searches. The results of this endeavour are discussed in this talk, as well as the technical and sociological hurdles that had to be overcome to achieve this ambitious plan.