

**Prof. Philip Harris**

**Assistant Professor of Physics  
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(MIT)**



**Tuesday, May 3rd, 2022  
12:00 PM – 1:00 PM**

**Register in advance for this  
meeting:**

**[https://bnl.zoomgov.com/  
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vJl5dumqrTgtHcbntruScLR0Fe5t  
QGymWoA](https://bnl.zoomgov.com/meeting/register/vJl5dumqrTgtHcbntruScLR0Fe5tQGymWoA)**

**Host: Jin Huang, Physics Dept.**

## *Using Deep Learning to observe the Higgs Boson in Real-time*

**Abstract:** With a raw data rate exceeding 1 Petabit per second, particle detectors at the Large Hadron Collider (LHC) at the Europe Center for Nuclear Research (CERN) contend with some of the largest data rates ever encountered. With planned upgrades in the near future, these rates will continue to grow, further complicating our ability to process data effectively to continue understanding the universe's fundamental properties. To process data in real-time, we rely on specialized computing systems using Field Programmable Gate Arrays (FPGAs) and, in later stages of data acquisition, Graphics Processor Units (GPUs). Despite the enormous challenge, we are finding that deep learning is not only capable of handling these incredible data rates but is significantly enhancing our ability to process data in real-time. In this talk, we present a strategy for integrating deep learning into the LHC data acquisition. We show how it dramatically improves the quality of physics measurements we can perform downstream. Finally, we discuss the scientific implications emerging from this work in a broad range of scientific fields, including nuclear physics, astrophysics, materials science, and neuroscience.

**Biography:** Philip Harris joined the MIT faculty in 2017. Since joining MIT, Philip has helped found the Fast Machine Learning group aimed at deploying processor accelerated machine learning algorithms for real-time and high throughput scientific applications, including the LHC. Additionally, Philip leads the real-time particle reconstruction group on the CMS experiment. He is the deputy director of the new NSF institute A3D3 (Accelerated AI Algorithms for Data-Driven Discovery). Born in Sao Paulo, he received his B.S in Physics from Caltech in 2005 and his Ph.D. from MIT in 2011 on research performed at CERN with the CMS experiment. From 2011 to 2013, Philip was a CERN fellow working on the Higgs Boson discovery. From 2014 to 2017, he was a CERN staff scientist leading the effort on dark matter searches at the CMS experiment.