



Purdue Quantum Science and Engineering Seminar



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Souvik Das received his Ph.D. in High Energy Physics from Cornell University in 2011 for the prediction and first observation of electromagnetic three-particle decays among charm quark mesons at CLEO, and his contributions towards the CMS experiment at the LHC. He held a post-doctoral position at University of Florida where he contributed to the search for the Higgs boson at CMS, leading to its discovery in 2012. As a Distinguished Researcher at the LHC Physics Center at Fermilab he led the search for Higgs pair production. Currently he leads research groups at the Purdue Silicon Detector Facility into the design and fabrication of next generation detectors for the CMS experiment in anticipation of upgrades to the LHC.

**Reconstructing Proton-Proton Collision
Positions at the Large Hadron Collider
with Quantum Annealing**

**Monday, January 27, 2020
3:30 – 4:30 p.m.
BRK 2001**

The Large Hadron Collider (LHC) circulates counter-rotating beams of protons in closely packed bunches that cross at designated interaction points. Particle physics experiments at these interaction points detect particles created at each proton-proton (p-p) collision to reconstruct physics at the TeV energy scale. Reconstructing the positions of each p-p collision from the detected tracks of charged particles is thus of primary and paramount importance. We use D-Wave 2000Q quantum annealer to perform this reconstruction on artificial events where the positions of p-p collisions and tracks resemble LHC distributions. We demonstrate this on events with up to 5 p-p collisions, and benchmark it against simulated annealing on a commercial computer. We note an intriguing quantum advantage for the cases of 2 and 3 p-p collisions in an event.