

Lance Dixon – HEP seminar – April 10, 2026  
Stanford National Accelerator Laboratory

## AI for Particle Theory

Particle theory involves inference directly from experimental data, but also sometimes from patterns in 'theory data', in order to deduce new theoretical structures or ways of thinking about the world. In addition, precision theory involves computationally heavy tasks such as evaluating large collections of multi-loop Feynman diagrams, which could be eased using AI methods. Finally, describing theoretical bounds under very general assumptions -- such as the conformal and S-matrix bootstraps -- often involves scanning a large set of trial functions, for which machine learning should be ideal. I'll survey these broad opportunities for custom AI models to impact various areas of particle theory. Then I'll describe in more detail a project to use AI to learn the structure of scattering amplitudes, for a case (planar N=4 SYM) where billions of terms of 'theory data' is phrased essentially as language.