

UCLA High Energy & Astro-Particle (HEAP) Seminar

“Autonomous Model Building with Reinforcement Learning: An Application with Neutrino Flavor Symmetries”

Presented by Jake Rudolph, *UC Irvine*

To build models of Beyond the Standard Model physics, a theorist has many choices to make in regards to new fields, internal symmetries, and charge assignments, collectively creating an enormous space of possible models. We describe the development and findings of an Autonomous Model Builder (AMBer), which uses Reinforcement Learning (RL) to efficiently find models satisfying specified discrete flavor symmetries and particle content. Aside from valiant efforts by theorists following their intuition, these theory spaces are not deeply explored due to the vast number of possibilities and the time-consuming nature of building and fitting a model for a given symmetry group and particle assignment. The lack of any guarantee of continuity or differentiability prevents the application of typical machine learning approaches. We describe an RL software pipeline that interfaces with newly optimized versions of physics software, and apply it to the task of neutrino model building. Our agent learns to find fruitful regions of theory space, uncovering new models in commonly analyzed symmetry groups, and exploring for the first time previously unexamined symmetries.

Location: Knudsen 4-134

Date: Wednesday, May 14, 2025

Time: 12:00pm

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