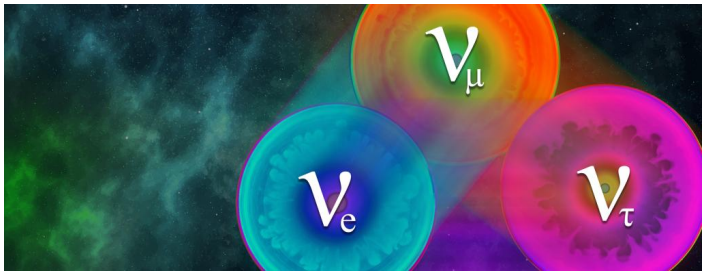

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From High-Energy Physics to Frontier Biophysics: AI-Driven Methods Across Scientific Domains

Thursday, 22 January 2026 11:45 (35 minutes)

Accurate background modeling and signal extraction are central challenges in modern neutrino, cosmology, and astroparticle physics experiments, which operate on large and complex datasets. In this talk, I present recent applications of artificial intelligence to background estimation in high-energy physics, with a focus on machine-learning–based methods developed within the CMS experiment. These approaches enable robust, data-driven modeling of complex backgrounds and enhance sensitivity to rare processes.

I further demonstrate how similar AI methodologies can be transferred to frontier problems in biophysics and drug discovery, where challenges such as high-dimensional data, limited labeled samples, and the need for physical interpretability closely parallel those encountered in astroparticle physics. In particular, I discuss AI-based techniques for computing induced molecular polarizability relevant to drug repurposing, as well as the use of graph neural networks for predicting drug–target activity.

This work illustrates how AI techniques developed for particle physics can be repurposed across scientific domains, highlighting artificial intelligence as a unifying framework for research at the frontiers of fundamental physics and biophysics.

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