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sPHENIX novel use of generative AI for physics measurements

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Generative artificial intelligence (AI) has been transforming industry and science. sPHENIX, a new experiment at RHIC, has been at the cutting edge in adopting innovative generative AI to accelerate simulation, reconstruction, and analysis in a robust manner. In this talk we will highlight three recent works on (1) diffusion model based full detector full event heavy ion collision simulation [DOI: 10.1103/PhysRevC.110.034912], (2) heavy ion background subtraction on calorimeter jets using unsupervised generative learning [arXiv:2510.23717], and (3) a scalable and generalizable foundation model for tracking reconstruction [arXiv:2508.14087]. The implications of these new technologies for the physics of heavy flavor and strange probes of the QGP will be highlighted.

Authors: LI, Shuhang (Columbia University); SPHENIX COLLABORATION

Presenter: LI, Shuhang (Columbia University)

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