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## **Cross-Geometry Fast Electromagnetic Shower Simulation**

Tuesday 20 May 2025 10:30 (20 minutes)

The accurate simulation of particle showers in collider detectors remains a critical bottleneck for high-energy physics research. Current approaches face fundamental limitations in scalability when modeling the complete shower development process.

Deep generative models offer a promising alternative, potentially reducing simulation costs by orders of magnitude. This capability becomes increasingly vital as upcoming particle physics experiments are expected to produce unprecedented volumes of data.

We present a novel domain adaptation framework employing state-of-the-art deep generative models to generate high-fidelity point-cloud representations of electromagnetic particle showers.

Using transfer learning techniques, our approach adapts simulations across diverse electromagnetic calorimeter geometries with exceptional data efficiency, thereby reducing training requirements and eliminating the need for a fixed-grid structure.

The results demonstrate that our method can achieve high accuracy while significantly reducing data and computational demands, offering a scalable solution for next-generation particle physics simulations.

## Would you like to be considered for an oral presentation?

Yes

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Session Classification: Contributed Talks

**Track Classification:** 3 ML for simulation and surrogate model: Application of ML for simulation or cases of replacing an existing complex model