Contribution ID: **63** Type: **Poster**

An approach to minimize systematic errors in higgs events searches using ML

Tuesday, March 11, 2025 6:12 PM (2 minutes)

The exploration of fundamental particle physics has entered an era of data-driven discovery, characterized by unprecedented volumes of experimental data and advanced computational techniques. In our work, we strived to effectively quantifying and reducing uncertainties in Higgs boson detection using machine learning methodologies. Using public datasets, our study developed an machine learning framework designed to systematically analyze and incorporate epistemic uncertainties in particle detection measurements, specially those related to Higgs boson events. We follow a ML approach that directly address systematic uncertainties, such as those dependent on nuisance parameters, and techniques incorporating Bayesian neural networks for uncertainty estimation. Ultimately, this research aims to advance the application of ML in high precision measurements, contributing to the future discovery potential in particle physics.

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Session Classification: Poster session