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Machine Learning the likelihoods

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In recent years, the ATLAS collaboration has released full statistical models for some of their analyses, allowing for precise reinterpretation of experimental limits. These models incorporate numerous nuisance parameters and correlations between signal bins, but their complexity often results in prolonged computation times. This project seeks to develop a method for efficient yet accurate reinterpretation of experimental results in phenomenological studies. We are training Deep Neural Networks (DNNs) to act as surrogates for full statistical models by performing likelihood interpolation. This approach significantly reduces computation times, often by several orders of magnitude, while preserving a high level of accuracy.

In my talk, I will present the project and highlight recent progress, including the creation of a framework that uses Markov Chain Monte Carlo (MCMC) techniques to generate data, the training of Neural Networks to interpolate likelihoods, and the validation of these models on real-world analyses.The long-term objective is to develop a publicly accessible and maintainable database of trained machine learning models, which can be integrated into various reinterpretation tools, offering a valuable resource for the particle physics community.

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