IRN Terascale @ IP2I Lyon

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Recueil des résumés

Contents

1

Welcome

2

In memoriam Ulrich Ellwanger

3

SMC meeting

Methods and Tools / 7

MicrOMEGAs 6: new developments and physics applications

Auteur: Andreas Goudelis[1]

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MicrOMEGAs is a computer program to compute different dark matter observables. In this talk we will present some new features of its latest release, version 6, and discuss some of their physics applications.

Methods and Tools / 8

SModelS v3: Going Beyond Z2 Topologies

Auteurs: Andre Lessa[None]; Camila Ramos[None]; Mohammad Mahdi Altakach[None]; Sabine Kraml[None]; Sahana Narasimha[None]; Timothée Pascal[None]; Wolfgang Waltenberger[None]; Yoxara Villamizar[None]

SModelS is a public tool for fast reinterpretation of LHC searches for new physics based on a large database of simplified model results. While previous versions were limited to models with a Z2-type symmetry, version 3 can now handle arbitrary signal topologies. To this end, the tool was fully restructured and now relies on a graph-based description of simplified model topologies. In this talk, I will discuss the main conceptual changes and novel features of SModelS v3.

Methods and Tools / 10

Hyperiso: A general BSM calculator for flavour observables

Auteurs: Nazila Mahmoudi[1]; Niels FARDEAU[None]; Théo REYMERMIER[2]

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Hyperiso is a refactored and expanded version of the flavour code SuperIso allowing for efficient calculations of flavour observables. While SuperIso was dedicated to SM, THDM and several SUSY models, Hyperiso now implements a transparent interface with MARTY (a public tool to perform analytical QFT calculations) to extend SuperIso's observable calculation routines to generic BSM scenarii. In this talk, we will present the main structural changes and new features of the MARTY–Hyperiso pipeline.

Methods and Tools / 11

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.