T 12: Experimentelle Methoden I

Zeit: Montag 11:00–12:00 Raum: VMP8 SR 105

T 12.1 Mo 11:00 VMP8 SR 105

DSEA: Data Mining Methoden zur Lösung inverser Probleme — •Tim Ruhe, Mathis Börner, Tomasz Fuchs, Maximilian Meier, Thorben Menne und Alexander Sandrock — Technische Universität Dortmund, Dortmund

Die Lösung inverser Probleme, z.B. zur Bestimmung von Energiespektren, ist eine Herausforderung für die Neutrinoastronomie und andere Teilgebiete der Astroteilchenphysik. Da die Energie der gemessenen Teilchen experimentell nicht direkt zugänglich ist, werden energieabhängige Observablen zur Energierekonstruktion heran gezogen. Diese energieabhängigen Observablen sind über die Fredholm'sche Integralgleichung mit der Response-Funktion des Detektors und der zu messenden Größe verknüpft. Eine limitierte Akzeptanz und eine Verschmierung durch den Detektor selbst erschweren die Lösung zusätzlich. Im Dortmund Spectrum Estimation Algorithm (DSEA) wird das inverse Problem durch Anwendung eines Random Forests gelöst. Die Rückgabe des Forests kann dann als Approximation der Wahrscheinlichkeitsdichte einzelner Ereignisse aufgefasst werden. Eine Summation über alle gemessenen Ereignisse liefert das gesuchte Spektrum. Der Vortrag gibt einen Überblick über den aktuellen Status des Algorithmus.

T 12.2 Mo 11:15 VMP8 SR 105

VISPA: New Applications for Intuitive Data Visualisation and Analysis Creation — Martin Erdmann, Benjamin Fischer, Robert Fischer, Christian Glaser, Fabian Heidemann, Gero Müller, •Thorben Quast, Marcel Rieger, Martin Urban, Daniel van Asseldonk, Ralf Florian von Cube, and Christoph Welling — Physics Institute IIIa, RWTH Aachen University, Germany

The Visual Physics Analysis software is a framework developed at RWTH Aachen providing intuitive access and usage of experiment-specific resources via common web browsers. Through its extension mechanism, VISPA allows for interfacing a wide range of applications to meet the demands for diverse use cases. After a quick review of the internal architecture and basic functionalities, most recent updates to the system are highlighted and various newly released extensions are presented: Our data browsers facilitate the inspection of information in Pierre Auger Observatory and HEP data samples. The JSROOT project has been embedded and enables the visualisation of ROOT files. Modular analysis chains based on our HEP software library (PXL) can be interactively created and modified using the Analysis Designer. VISPA is tested both through its integration in undergraduate and elementary particle physics courses at RWTH and through its use in analysis work for CMS and Auger. Finally, instructions on how to access our cluster or to set up an own server are given.

T 12.3 Mo 11:30 VMP8 SR 105

Development of morphing algorithms for `Histfactory` using information geometry — •Anjishnu Bandyopadhyay[1], Ian Brock[1], and Kyle Cranmer[2] — [1]University of Bonn — [2]New York University

Many statistical analyses are based on likelihood fits. In any likelihood fit we try to incorporate all uncertainties, both systematic and statistical. We generally have distributions for the nominal and $\pm 1\sigma$ variations of a given uncertainty. Using that information, `Histfactory` morphs the distributions for any arbitrary value of the given uncertainties. In this talk, a new morphing algorithm will be presented, which is based on information geometry. The algorithm uses the information about the difference between various probability distributions. Subsequently, we map this information onto geometrical structures and develop the algorithm on the basis of different geometrical properties. Apart from varying all nuisance parameters together, this algorithm can also probe both small ($< 1\sigma$) and large ($> 2\sigma$) variations. It will also be shown how this algorithm can be used for interpolating other forms of probability distributions.

T 12.4 Mo 11:45 VMP8 SR 105

Performance and optimization of support vector machines in high-energy physics classification problems — •Mehmet Özgür Sahin, Dirk Krücker, and Isabell Melzer-Pellmann — DESY, Hamburg, Germany

In this talk, the use of Support Vector Machines (SVM) is promoted for new-physics searches in high-energy physics. We developed an interface, called SVM HEP Interface (SVM-HINT), for a popular SVM library, LibSVM, and introduced a statistical-significance based hyperparameter optimization algorithm for the new-physics searches. As example case study, a search for Supersymmetry at the Large Hadron Collider is given to demonstrate the capabilities of SVM using SVM-HINT.