HK 36: Computing I

Time: Wednesday 15:45–17:15 Location: SCH/A117

HK 36.1 Wed 15:45 SCH/A117

ALICE TRD: online-offline processing and electron identification in LHC Run 3 and 4 — •Felix Schlepper — Physikalisches Institut, Heidelberg, Deutschland

During the long shutdown 2 (LS2) of the LHC, the ALICE experiment was upgraded to exploit the full scientific potential. The upgrade was posed by the challenge of continuously reading out and online processing p-p and Pb-Pb collisions at rates of 1 MHz and 50 kHz, respectively. To meet these new requirements, the ALICE experiment developed a new online-offline software framework O2 for Run 3 and 4.

This talk will give an overview of the software, the calibration and particle identification (PID) strategies currently being implemented and commissioned for the Transition Radiation Detector (TRD). The TRD contributes to the electron identification capabilities of ALICE. In Run 1 and 2 a classical likelihood-based algorithm was used. Since the front end electronics (FEE) was upgraded, the data readout precision was notably reduced to cope with the higher rates. Hence, new algorithms for PID, including Machine Learning, will be used to recover and possibly improve the previous PID capabilities. First performance results will be shown as well.

HK 36.2 Wed 16:00 SCH/A117

Volunteer Computing for ALICE at CERN — •Felix Hoffmann and Udo Kebschull — Goethe Universität Frankfurt

The High Luminosity LHC era at CERN will require Monte Carlo simulations to be at an even higher level of accuracy in order for them be suited for tasks such as background subtraction and filtering of rare events. In order to be able to keep up with the required amount of computational power, distributed computing approaches such as the Worldwide LHC Computing Grid (WLCG) are combined with other measures such as frequent hardware upgrades.

This publication explores ideas of novel volunteer computing frameworks in the context of ALICE which aim to allow people from all around the world to donate available computational power to further help the experiment. In this publication, two fundamentally different approaches are described and their potential analyzed: The first approach is a traditional volunteer computing approach that builds on existing BOINC infrastructure. The second approach is blockchain-based and features a novel Proof-of-Useful-Work consensus algorithm which aims to both support real-world HEP experiments with the production of required MC data and to secure the underlying blockchain infrastructure at the same time. A prototype implementation of such an algorithm in the context of the Online-Offline simulation and analysis framework ALICE uses for Run 3 is currently being developed in C++.

HK 36.3 Wed 16:15 SCH/A117

Searching for Anomalous Hadronic Higgs Boson Decays at the LHeC — Subhasish Behera, •Manuel Hagelüken, and Matthias Schott — Johannes Gutenberg-Universität Mainz

The future Large Hadron electron Collider (LHeC) would allow collisions of an intense electron beam with protons or heavy ions at the High Luminosity-Large Hadron Collider (HL-LHC). Owing to a center of mass energy greater than a TeV and very high luminosity, the LHeC would not only be a new generation collider for deep-inelastic scattering (DIS) but also an important facility for precision Higgs physics, complementary to pp and electron-positron colliders. While anomalous hadronic decay signatures of the Higgs boson, e.g. to three or more partons, are difficult to probe at the LHC due to its enormous background rates, it might be possible to search for such decays at the LHeC. In this work, we present the expected sensitivity at the LHeC for $H \to 3jets$ and $H \to 4jets$ decay channels, assumed an integrated luminosity of 1ab^{-1}.

HK 36.4 Wed 16:30 SCH/A117

A language model based tracking algorithm for the Straw Tube Tracker of the PANDA experiment — •Jakapat Kannika[1,2], James Ritman[1,2,3], and Tobias Stockmanns[3] — [1]GSI Helmholtz Centre for Heavy Ion Research, Darmstadt, Germany — [2]Ruhr-Universität Bochum, Bochum, Germany — [3]Forschungszentrum Jülich, Jülich, Germany

The Straw Tube Tracker (STT) is designed for momentum reconstruction of charged particles in the PANDA experiment. This talk will present a tracking algorithm that can group measured hit positions of the STT into tracks of the particles based on the language model. The overall algorithm consists of two main parts, the language model which contains the probabilities for predicting the next hit point based on previous measurements, and the tracking algorithm, the program that uses the information from the language model to select the most probable track or filter possible track candidates. We performed track parameterizations perpendicular and parallel to the solenoidal magnetic field and compared the reconstructed tracks to the MC truth information. As a result, all the reconstructed parameters are shown to be reconstructed within the expected ranges according to the MC information. The algorithm is also being developed to include a branching algorithm that can select the best track out of multiple track candidates. The development involves improving the quality of hit information and creating a track selector. The talk will also present the efficiency and resolution of this algorithm to reconstruct tracks in the STT.

HK 36.5 Wed 16:45 SCH/A117

Implementation of the Acts tracking software into PandaRoot — •Ken Suzuki for the PANDA collaboration — Ruhr-Universität Bochun, Bochum, Germany — GSI Helmholtzzentrum für Schwerionenforschung GmbH

The PANDA experiment at FAIR[1] combines the stored high-precision antiproton beam from the HESR with a hydrogen/nuclear target from cluster-jet/pellet target and 4π universal detector system equipped with a modern high-rate DAQ. The unique setup allows it to provide precision data to low/middle energy hadron structures where the experimental inputs are mostly awaited. We test the Acts Common Tracking Software[2] for particle track reconstruction as an alternative to be implemented to our analysis framework, PandaRoot. We will show the status of implementation and performance comparison to our current version using Genfit.

[1] PANDA collaboration, Eur. Phys. J. A 57, 184 (2021).
[2] https://acts.readthedocs.io .

HK 36.6 Wed 17:00 SCH/A117

Dynamically assisted nuclear fusion — •Daniil Ryndyk — Helmholtz-Zentrum Dresden-Rossendorf

We consider nuclear fusion at kinetic energies in the keV regime. At such low temperatures nuclear fusion is exponentially suppressed as it occurs via quantum tunneling through the Coulomb barrier between the nuclei. Our research goal is to increase the overall tunneling probability employing short-pulsed, high-intensity electromagnetic fields thus avoiding the negative aspects of hot plasmas, e.g., heat loss.

Latest publications:
F. Queisser and R. Schützhold, PRC, 100(4), 2019
C. Kohlfürst, F. Queisser and R. Schützhold, PRR, 3:033153, 2021