

AKPIK 2: AKPIK II

Time: Thursday 16:30–18:00

Location: H-HS XII

AKPIK 2.1 Thu 16:30 H-HS XII

Entwicklung einer Drop-Sonde zur Messung von CO₂, Temperatur, Luftfeuchtigkeit und Luftdruck in entlegenen Gebieten — ●KONRADIN WEBER, CHRISTIAN FISCHER und DETLEF AMEND — Hochschule Düsseldorf, Münsterstr. 156, 40476 Düsseldorf

Im Rahmen dieses Projektes wird eine Sondereinheit entwickelt, die über entlegene Gebieten vom Flugzeug oder einer Drohne aus abgeworfen werden kann (Drop-Sonde), um dann eigenständig Daten von CO₂, Temperatur, Luftfeuchtigkeit und Luftdruck zu messen und beispielsweise mit GSM zu übermitteln. Interessant ist die Verwendung von solchen Einheiten beispielsweise bei entlegenen Vulkanen oder vulkanischen Gebieten, bei denen auf großen Flächen CO₂ räumlich und zeitlich variierend emittiert wird, aber durch einzelne konventionelle Messstationen nicht adäquat erfasst werden kann. Bei solchen Emissionsverhältnissen ist es wünschenswert, mit zahlreichen Messeinheiten gleichzeitig und unbeaufsichtigt Messungen durchführen zu können. In diesem Projekt werden Drop-Sonden mit folgenden Hardware-Einheiten entwickelt: ESP Processor Line 8266, CO₂ Sensor Modul Sensirion SCD30, Bosch BMP280 Sensor für Temperatur, Luftfeuchtigkeit und Luftdruck. Nach dem Abwurf einer Drop-Sonden-Einheit ist folgender Datenverarbeitungszyklus vorgesehen: Processor wake-up from deep sleep, perform a measurement, send collected data via GSM, processor switch to deep sleep e.g. for some hours, return to step 1. Die Daten sollen von den Drop-Sonden drahtlos an einen Server gesandt und von dort aus weiter verarbeitet werden.

AKPIK 2.2 Thu 16:45 H-HS XII

Accelerated Cherenkov photon propagation for air shower simulations — ●DOMINIK BAACK and JAN SOEDINGREKSO — TU Dortmund, Dortmund, Germany

In the simulation of air showers for IACTs with CORSIKA, induced through highly energetic cosmic rays, major parts of computing time are spent on the propagation of the Cherenkov radiation. With a high parallel approach, modern hardware can be used more efficiently and reduce the overall runtime requirements. With the usage of OpenCL, the code can be used on several platforms like GPUs or vectorized on the CPUs.

This talk gives an overview of the implementation and its future possibilities.

AKPIK 2.3 Thu 17:00 H-HS XII

Distributed astroparticle data access and analysis in the framework of the German-Russian Astroparticle Data Life Cycle initiative — ●VICTORIA TOKAREVA, ANDREAS HAUNGS, DONGHWA KANG, FRANK POLGART, DORIS WOCHLE, and JÜRGEN WOCHLE — Institute for Nuclear Physics, Karlsruhe Institute of Technology, DE-76021, Karlsruhe, Germany

The German-Russian Astroparticle Data Life Cycle (GRADLC) is a joint project aimed to establish efficient analysis pipeline for the data collected at different globally dispersed observatories, as well as to develop new Big Data analysis methods, to promote Open Science models, and to deliver astroparticle physics knowledge worldwide.

The talk examines the current status in the following areas of the project: upgrade of the existing data center of the KAS-

CADE collaboration, KCDC (KASCADE Cosmic-ray Data Center <https://kcdc.ikp.kit.edu/>); status of a unified GRADLC data analysis center; proof-of-principle joint multi-messenger data analysis by combining data of two independent experiments; usage of machine learning for the analysis of multi-messenger astroparticle physics data.

AKPIK 2.4 Thu 17:15 H-HS XII

Application of a CycleGAN to simulate calorimeter clusters in Belle II — ●CEDRIC LY for the Belle II-Collaboration — Desy, Hamburg, Germany

Belle II is a high precision electron-positron experiment located in Tsukuba, Japan. One goal of Belle II is to search for anomalies in the rare decays of B mesons. A very important part of Belle II analyses is the simulation of particles. A calibration sample could help to improve upon the simulation. It is especially challenging to get a calibration sample for low energetic photons, because it is difficult to validate this with real data. This talk will present a novel approach to generating calibration samples of photons in the electromagnetic calorimeter using cyclical generative adversarial networks (CycleGAN). CycleGAN prove to be a powerful model to do conversion between two unpaired supervised classes. By using control samples of real electrons in data with the trained CycleGAN, one may be able to obtain a calibration sample of *fake* data photons created from real electron clusters. The goal of the study is primarily to investigate the use of CycleGAN's in high-energy physics as an innovative new approach to generating data calibration samples of photons.

AKPIK 2.5 Thu 17:30 H-HS XII

Adversarial Neural Network for ttH — ●JOSÉ MANUEL CLAVIJO COLUMBIÉ, JUDITH KATZY, and PAUL GLAYSHER for the ATLAS-Collaboration — DESY, Notkestr.85, 22607 Hamburg

Measurements of ttH in the H->bb decay channel are attractive since this is the most frequent Higgs decay channel. However, it suffers from large tt+bb background which is usually separated by the use of classification machine learning algorithms trained on Monte Carlo simulated events. The largest uncertainty of the measurements usually stems from training bias towards a specific MC model. We apply adversarial domain adaptation to train a neural network that simultaneously classifies signal versus background events while minimizing the difference of the classifier response to two alternative background MC models by adding a discriminator with a gradient reversal layer.

AKPIK 2.6 Thu 17:45 H-HS XII

A generator cell for LHC event GANs — ●NICLAS EICH, MARTIN ERDMANN, and BENJAMIN FISCHER — III. Physikalisches Institut A, RWTH Aachen University

We present a network for generative modelling of LHC events using Wasserstein generative adversarial networks (WGAN). We use Lorentz boosts, rotations, momentum and energy conservation to build a network cell generating a 2-body particle decay. We allow for modifications of the resulting four-vectors following a StyleGAN approach. We train the generator using the Lorentz Boost Network as a pre-stage of the critic's network. We present first evaluations of the generator quality using Drell-Yan processes.