Contribution ID: **21** Type: **Talk**

Fast Generation of Realistic Data-Driven Stereoscopic Shower Images using Generative Adversarial Networks (Remote)

Thursday, 30 January 2025 11:00 (30 minutes)

Effective identification and characterization of particle showers captured by ground-based cherenkov telescopes is critical for very high energy gamma-ray astrophysics. A common step employed in the field is to use synthetic gamma-ray and hadronic events generated based on computationally-expensive simulations and use them for downstream analyses. Leveraging the power of generative deep learning, various studies have developed fast emulators that can generate synthetic simulated events that mimic the simulation outputs. However, they still carry the intrinsic assumption that the emulated/simulated data is representative of the observations. In an attempt to address the aforementioned challenges, in this work, we designed and trained on real data a fully-unsupervised Wasserstein Generative Adversarial Network on stereoscopic shower images (Stereo-wGAN) from the VERITAS gamma-ray observatory. In this presentation, we highlight our model's ability to generate realistic stereoscopic events that are self-consistent in their quantitative image-wise moments (Hillas parameters) and overall reconstructed shower parameters. We also showcase the utility of our model-learnt internal feature representations in exploring the diversity of shower events as a way towards enabling future unsupervised characterization of gamma-ray and hadronic events, which is another challenging task in the field of gamma-ray astrophysics.

Type of Contribution

talk

Primary authors: Dr MANTHA, Kameswara Bharadwaj (University of Minnesota); Dr RIBEIRO, Deivid (University of Minnesota); Prof. FORTSON, Lucy (University of Minnesota); Dr DICKINSON, Hugh (Open University); Dr SANKAR, Ramanakumar (University of California, Berkeley); Dr SPENCER, Samuel (Friedrich-Alexander-Universität)

Presenter: Dr MANTHA, Kameswara Bharadwaj (University of Minnesota)

Session Classification: Talks