



Contribution ID: 113

Type: **not specified**

Extraction of global event features at the CBM experiment using PointNet

Wednesday, 25 May 2022 17:30 (20 minutes)

The upcoming Compressed Baryonic Matter (CBM) experiment will explore the phase diagram of QCD matter at the highest baryon densities. The experiment is expected to run at an unprecedented event rate of up to 10 MHz, resulting in about 1 TB/s of free-streaming raw data. This demands the development of novel analysis techniques to quickly identify the event characteristics and select interesting events for permanent storage. In this talk, we show that PointNet based Deep Learning (DL) models can be used for online event characterisation at the CBM experiment. These models make use of the inherent point cloud structure of detector output, thus enabling the models to work directly on experimental output. We demonstrate that PointNet based models can accurately extract several global features of the collisions at CBM such as the impact parameter [1, 2] of the collision or the nature of QCD transition [3]. The PointNet based models accurately determine the impact parameter of collisions at CBM directly from the hits/ tracks of particles from the detector planes. The models have their mean error varying from -0.33 to 0.22 fm for impact parameters 2-14 fm and outperform conventional methods based on a single observable such as track multiplicity. The DL models also distinguish a first order phase transition from a crossover transition at CBM using the reconstructed tracks of charged particles with an accuracy of up to 99.8%. The models are also shown to outperform methods relying on conventional mean observables. References: [1] Omana Kuttan, M., Steinheimer, J., Zhou, K., Redelbach, A., & Stoecker, H. (2020). A fast centrality-meter for heavy-ion collisions at the CBM experiment. *Physics Letters B*, 811, 135872 [2] Omana Kuttan, M., Steinheimer, J., Zhou, K., Redelbach, A., & Stoecker, H. (2021). Deep Learning Based Impact Parameter Determination for the CBM Experiment. *Particles*, 4(1), 47-52. [3] Omana Kuttan, M., Zhou, K., Steinheimer, J., Redelbach, A., & Stoecker, H. (2021). An equation-of-state-meter for CBM using PointNet. *Journal of High Energy Physics*, 2021(10), 1-25.

Presenter: OMANA KUTTAN, Manjunath (Frankfurt Institute for Advanced Studies(FIAS))