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## **Generative Adversarial Networks for the fast simulation of the Time Projection Chamber responses at the MPD detector**

The detailed detector simulation models are vital for the successful operation of modern high-energy physics experiments. In most cases, such detailed models require a significant amount of computing resources to run. Often this may not be afforded and less resource-intensive approaches are desired. In this work, we demonstrate the applicability of Generative Adversarial Networks (GAN) as the basis for such fast-simulation models for the case of the Time Projection Chamber (TPC) at the MPD detector at the NICA accelerator complex. Our prototype GAN-based model of TPC works more than an order of magnitude faster compared to the detailed simulation without any noticeable drop in the quality of the high-level reconstruction characteristics for the generated data. Approaches with direct and indirect quality metrics optimization are compared. A roadmap for integrating such a model into a production environment is also outlined.

### **Significance**

We present for the first time a fast simulation model of TPC that demonstrates production-ready quality in the high-level tracking characteristics. We also outline a roadmap for integrating such a model into a production environment. This result may be of high interest for other HEP experiments in general, and for the ones that utilize TPC detectors as their main tracking system in particular.

### **References**

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### **Speaker time zone**

Compatible with Europe

**Primary authors:** SUKHOROSOV, Aleksey (National Research University Higher School of Economics (RU)); ZINCHENKO, Alexander (Joint Institute for Nuclear Research (RU)); MAEVSKIY, Artem (National Research University Higher School of Economics (RU)); EVDOKIMOV, Dmitriy (National Research University Higher School of Economics (RU)); RATNIKOV, Fedor (Yandex School of Data Analysis (RU)); RIABOV, Victor (Petersburg Nuclear Physics Institute (RU))

**Presenter:** MAEVSKIY, Artem (National Research University Higher School of Economics (RU))

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