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Possible application areas of machine learning techniques at MPD/NICA experiment and their implementation prospects in distributed computing environment

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At present, the accelerator complex NICA [1] is being built at JINR (Dubna). It is intended for performing experiments to study interactions of relativistic nuclei and polarized particles (protons and deuterons). One of the experimental facilities MPD (MultiPurpose Detector) [2] was designed to investigate nucleus-nucleus, proton-nucleus and proton-proton interactions.

Preparation of the physics research program requires production of a large amount of simulated data, including high-multiplicity events of heavy-ion interactions with high energy. Realistic modelling of the detector response for such events can be significantly accelerated by making use of the generative models.

Selection of rare physics processes traditionally utilizes machine learning based approaches.

During the high luminosity accelerator operation for the proton-proton interaction research program it will be necessary to develop high-level trigger algorithms, based, among others, on machine learning methods.

As the data taking proceeds, the tasks of the fast and efficient processing of experimental data and their storage in large volumes will become more and more important, requiring involvement of distributed computing resources.

In this work these problems are considered in connection to the MPD/NICA experimental program preparation.

[1] Nuclotron-based Ion Collider fAcility web-site: http://nica.jinr.ru
[2] MultiPurpose Detector web-site: http://mpd.jinr.ru

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