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Artificial neural network approach to detector configuration optimization based on the impact parameter estimation problem.

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In our work we investigated application of artificial neural networks to event-wise analysis of heavy ion collisions data. We focused on solving the problem of impact parameter evaluation and estimation of collision vertex coordinate, using simulated data from a microchannel plate detector (MCP) [1] for potential use in NICA collider experiments [2]. Our study reveals, that such a technique can be utilized to estimate collision parameters quite accurately from raw detector data [3, 4, 5] based on QGSM event generator [6], specifically from spatial distributions of particles and time-of-flight distributions.

However, ANNs results are highly dependent on the model of event generator used to create the dataset. Repeating the experiments with data from alternative generators [7, 8] yielded different results. Despite this model dependence of the ANNs, we discuss the way they can be utilized to build model-independent algorithms. Moreover, we have shown that the detector parameters providing the best reconstruction of the event parameters do not depend on the Monte-Carlo model of the event, and, therefore, are more likely to be optimal in future experiments.

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Primary author(s) : GALAKTIONOV, Kirill; ROUDNEV, Vladimir; VALIEV, Farkhat; FEOFILOV, Grigory (Saint-Petersburg State University)

Presenter(s) : GALAKTIONOV, Kirill

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