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Analysis of the decay of the J/ψ meson using neural networks for data analysis in particle physics.

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The presented work discusses the features of the developed fully connected three-layer neural network for data analysis. The model was created to process .root data from the open CERN data library. The goal of this model is to identify the rare process of B^+ -meson production and its subsequent decay: $B^+ \rightarrow J/\psi + K^+$, $J/\psi \rightarrow \mu^+ + \mu^-$.

B^+ mesons contain a b quark and are heavy, unstable particles. In a real experiment, most of the recorded data is “background”: random combinations of particles that, in terms of their kinematic characteristics, are similar to the decay being sought. The neural network acts here as a “smart” filter that discards anything that is not a decay. Several physical features are fed into it as input, and then the network calculates the probability that the event is a signal. Our neural network demonstrated high accuracy values (0.977) in filtering the signal from the background, thereby demonstrating the applicability of deep learning methods in collider data analysis.

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