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NEW ALGORITHMS FOR PROCESSING NEUTRON TOMOGRAPHY DATA BASED ON CONVOLUTIONAL NEURAL NETWORKS

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Computed tomography using X-rays, neutrons, and electromagnetic fields is becoming more popular in fields like medicine, materials science, geology, and archeology. Modern materials science holds a special place for neutron tomography [1]. This method has advantages like deep penetration, sensitivity to light elements, and clear contrast for elements with similar atomic numbers because of how neutrons interact with matter.
Neutron tomography has unresolved problems such as lengthy experiments, weak image quality, and high computational resource usage. Developing neutron tomography requires new math algorithms for data processing and reconstruction. The most promising in this field are algorithms based on convolutional neural networks and deep learning [2].
In this work, the most optimal architecture of a convolutional neutron network for preprocessing and tomographic reconstruction of neutron radiographic data was implemented. The neural network was trained using a set of data obtained at neutron tomography stations at the Frank Laboratory of Neutron Physics and the National Research Center "Kurchatov Institute". The result was a program whose efficiency was compared with existing data processing methods.
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1. Podurets K. M. et al. Modern methods of neutron radiography and tomography in studies of the internal structure of objects //Crystallography Reports. –2021. –T. 66. –C. 254-266.
2. Micieli D. et al. Accelerating neutron tomography experiments through artificial neural network based reconstruction //Scientific Reports. –2019. –T. 9. –№. 1. –C. 2450.

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