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# IDENTIFICATION OF IMAGES OF OBJECTS OBTAINED IN LOW LIGHT CONDITIONS USING NEURAL NETWORK TECHNOLOGIES

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***Summary.*** *The possibilities of artificial intelligence methods, in particular multilayer neural networks, are being studied for object recognition in X-ray images obtained at low photon fluxes. The achieved accuracy level (81–90 %) allows such approaches to be considered promising for further integration into intelligent data processing systems for medical and industrial radiography.*

The rapid development of X-ray imaging in medical diagnostics, industrial inspection, and materials science has led to a sharp increase in experimental data requiring fast and reliable analysis. With modern high-sensitivity digital detectors, a central challenge is processing images acquired under low illumination or with very few photons, which reduces radiation exposure but results in strong noise and unstable measurement conditions. These factors significantly limit the performance of traditional image-processing methods based on filtering, thresholding, and linear transforms.

Classical algorithms perform especially poorly on low-photon images, where informative features are stochastic and difficult to extract. A major boost to this field came with the 2024 Nobel Prize in Physics awarded to John Hopfield and Geoffrey Hinton for foundational work on artificial neural networks, demonstrating their power in pattern recognition and classification tasks. Modern AI methods, particularly neural networks, can uncover complex nonlinear dependencies and operate effectively under uncertainty [1].

Further technological progress is reflected in recent U.S. patents describing lightweight convolutional neural network architectures designed for object detection on resource-constrained devices such as microcontrollers. These models rely on depth-wise separable convolutions and residual blocks to minimize parameters and computational load while preserving detection accuracy. Such approaches illustrate how compact, efficient neural architectures can be applied to the automated analysis of noisy, low-photon X-ray images.

**References**

1. Object Image Recognition in Low Photon Flux Conditions Using Artificial Intelligence / M. N. Zhukova, I. N. Balukho, Yu. I. Dudchik, N. N. Kolchevsky // Applied Problems of Optics, Informatics, Radiophysics, Aerospace Technologies and Condensed Matter Physics: Proceedings of the 8th International Scientific and Practical Conference, May 22–23, 2025, Minsk / Ministry of Education of the Republic of Belarus, National Research University “A.N. Sevchenko Institute of Applied Physics Problems” of Belarusian State University; editorial board: P. V. Kuchinsky (chief editor) [et al.]. – Minsk: StroyMediaProject, 2025. – P. 236–237.