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**Analiza tekstury obrazów tomografii komputerowej kręgosłupa
w celu wykrywania obszarów objętych osteoporozą**

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SUMMARY

Texture analysis of spine CT images to detect the areas affected by osteoporosis

Due to the fact that the population is aging, osteoporosis has become a serious disease of civilization that affects an increasing number of people worldwide. The problem of timely diagnosis has become even more topical in the face of the COVID-19 pandemic. Patients have been referred much less frequently for diagnostic tests due to which many still live in ignorance of the developing disease. Bone metabolism disorders are also influenced by glucocorticosteroids widely used in the treatment of patients affected by COVID-19. Combined with a decrease in physical activity during lockdown and poor diet, this results in a significant increase in the risk group at risk for osteoporosis. The afore-mentioned aspects justify the search for new diagnostic solutions to identify osteoporosis at its early stage, before it leads to osteoporotic fractures that can have serious consequences.

This dissertation, based on a series of four publications, presents the methods for analyzing and classifying images of the spongy tissue of the L1 vertebrae taken by computed tomography. For the purposes of the study, an image database was created containing the results of patients assigned to two groups: a control group of healthy subjects and a group of patients diagnosed with osteoporosis.

In the conducted research, three main approaches used in image analysis and classification were employed, including the application of classical machine learning methods combined with texture feature analysis, the use of deep convolutional neural networks and fractal analysis. The results presented in the publications prove the effectiveness of the selected methods, and further planned scientific activities provide an opportunity to adapt them to practical application. The developed algorithms can become the basis for the creation of a system for automatic diagnosis of defects in the microarchitecture of bone tissue allowing early identification of osteoporotic lesions.

Keywords: osteoporosis, texture analysis, fractal analysis, classification, convolutional neural networks