

**Doctoral School of Information and Biomedical Technologies Polish Academy of Sciences  
TIB PAN**

**Subject:** Supporting the detection of precancerous lesions in cytological smears using image recognition methods based on deep neural networks learning.

**Supervisors, contact, place of research**

Dr. hab. Anna Korzyńska, prof. IBIB PAN ([akorzynska@ibib.waw.pl](mailto:akorzynska@ibib.waw.pl), phone. 226597030 ext. 224, room 123), Nalecz Institute of Biocybernetics and Biomedical Engineering PAS, ul. Trojdena 4, 02-109 Warsaw

**Project Description:** Cervical cancer is one of the most common malignancies in the modern world [1]. It is well known that the development of this cancer can be prevented if women regularly undergo screening tests to assess the smear taken from the canal and cervical disc. Screening involves such a large number of patients that any reduction in their evaluation time leads to large savings. To date, studies are assessing cytodiagnostics and pathologists under a microscope. The goal of this project is to propose a tool for automatic detection of precancerous changes (in particular cell nuclei that indicate tumor formation process) in cytological smear and to support the screening process by reducing the working time of cytodiagnostics and pathologists e.g. eliminating from the analysis those glass slides which contain only normal cells. As a result, an experienced pathologist can spend more time on preparations indicated by the cytodiagnostis as positive or ambiguous. The literature describes such systems [4, 5], but they are not yet used in diagnostic laboratories. There is no evidence that they are sufficiently accurate and precise to be certified by organizations assessing medical devices [2, 3].

The system developed under this project will detect cells (nuclei and cytoplasm) and classify them using artificial intelligence (AI) methods, which have recently gained high recognition in analyzing various types of medical images.

In our laboratory we have experience in the use of deep machine learning in the analysis of histochemically stained histological tissue samples derived from biopsies of the salivary glands [6] and fibroblast segmentation [7] from a sequence of microscopic images documenting cell behavior in culture.

**Bibliography**

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