

P318. New approach to detection and analysis of cancer-associated proteins in fluorescent digital microscopy

A Drobintseva (RU) [1], S Cenevska (MK) [2], A Andreev (RU) [3], D Sergeev (RU) [4], P Drobintsev (RU) [5]

Quantification of immunofluorescence staining is a widely used technique in biomedicine. However, techniques that rely on human vision are prone to inter- and intraobserver variability, and they are being tedious and time consuming. Creation of new software algorithms with artificial intelligence is necessary to avoid issues above.

The aim was to detect and analyze protein expression using fluorescence imaging with usage of new methods of computer vision and machine learning.

For the study, Ki-67 and ER antibodies with nuclear reaction were selected. Both of them are largely used for diagnosis and prognosis of endometrial and breast cancer. At first we were investigating cell staining in endometrial cell culture (200 digital images) obtained by confocal microscope. Immunopositive nucleuses were rose, negative-blue. With usage of deploying computer vision algorithms the nucleuses were identified with ~95% probability. Second step was to detect endometrial glands and stroma in a digital image. It is very important to separate different histological structures of endometrium, because diagnosis can depend on the markers distribution. Due to this, 1000 confocal images with blue stained nucleus, with magnification of 200, were tested. The result of this research was in creation of neural network based algorithm to detection of glandular and stromal endometrial structures. In the forthcoming future this could be used to help specialists in analyzing big amount of histological images. The third step was to measure the number of immunopositive cells marked with ER in endometrium in glandular and stromal tissue, separately. The neuron network was learned on confocal images and positive results on detection of immunopositive nucleus were obtained. At this stage, the convolutional neural network was applied to identify immunopositive nucleus from simple ones (cell culture) to more complicated endometrium with different tissue structure. Usage of described approaches allow to reduce the number of errors in processing of digital image analysis of fluorescent images. In future the same approach could be used with the light microscopy images for routine diagnostics.

[1] Ott Research Institute of Obstetrics, Gynecology, and Reproductology, [2] Peter the Great St.Petersburg Polytechnic University, [3] Peter the Great St.Petersburg Polytechnic University, [4] Peter the Great St.Petersburg Polytechnic University, [5] Peter the Great St.Petersburg Polytechnic University