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Support vector machine for evaluation of autofluorescence cancer diagnostic parameters

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A number of optical techniques have been investigated for implementation in the clinical practice for cancer detection in the gastrointestinal tract. The aim of those, so called "red-flag" modalities is to navigate and point out suspicious areas with pathological alterations in the tissue. Autofluorescence diagnostic is largely preferred, since it is patient friendly and cost-effective. The main drawbacks of this technique is the scarce signal, which makes detection and data processing a challenge and the insufficient diagnostic specificity that the current diagnostic algorithm provides.

In this work we will present our evaluation of autofluorescence excitation-emission matrices with support vector machine (SVM) and multispectral analysis (MA). With the purpose of identifying diagnostically valuable parameters, which will improve the accuracy of autofluorescence diagnostics.

Spectroscopic measurements were performed of ex vivo tissue samples, excised during surgical procedure for tumor removal, without any processing. Excitation wavelengths applied were in the range of 280-440nm and the emission was detected in the range of 300-800nm.

The accuracy of differentiation based on fluorescence spectra was tested through SVM. Differentiation based on a whole spectrum will be too cumbersome for clinical implementation, which is why we used MA to define suitable diagnostic parameters. Further with SVM the diagnostic accuracy of differentiation between cancerous and healthy tissue with those parameters was tested. The results demonstrate diagnostic accuracy of more than 90%.

Primary authors: GENOVA, Tsanislava (Institute of Electronics, Bulgarian Academy of Sciences, Bulgaria); ZHELYAZKOVA, Alexandra (Institute of Electronics, Bulgarian Academy of Sciences, Bulgaria); BORISOVA, Ekaterina (Institute of Electronics, Bulgarian Academy of Sciences, Bulgaria); ZAHARIEVA, Lidia (Institute of Electronics, Bulgarian Academy of Sciences, Bulgaria); PENKOV, Nikolay (University Hospital "Tzaritza Yoanna – ISUL", Bulgaria); VLADIMIROV, Borislav (University Hospital "Tzaritza Yoanna – ISUL", Bulgaria)

Presenter: ZAHARIEVA, Lidia (Institute of Electronics, Bulgarian Academy of Sciences, Bulgaria)

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