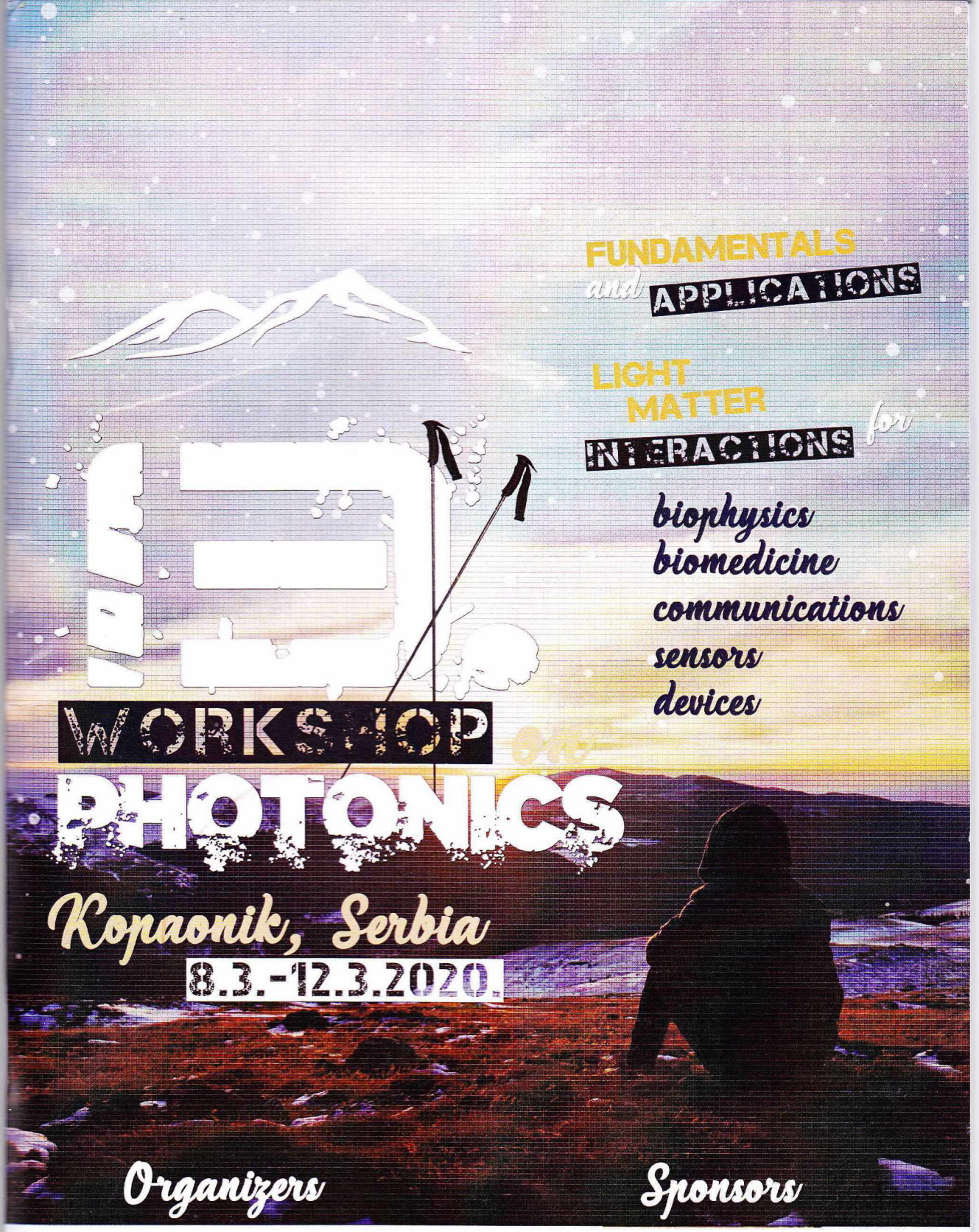

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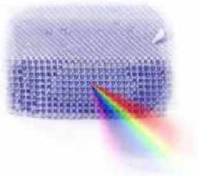

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Machine learning for laser induced fluorescence spectroscopy

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Abstract. Artificial Inteligence (AI) became the writing on the wall in regard the science and, evenmore, generally in human society. Machine learning (ML) algorithms build a mathematical model of analyzed data enabling the computer to make predictions or decisions. ML is considered as a subset of AI. Recently, we have started to follow this trend in scientific research by introducing application of ML for analysis of data obtained by laser induced fluorescence measurements. ML algorithms require large training sets; so we have decided to use, for our starting tests and exercises in ML, data obtained by our previous measurements of nanophosphor luminescence presented in [1-4]. Based on experiences of other authors [5] and references therein, where the beer luminescence was analyzed, we have selected to use ML implemented by the Solo software package (Version 8.8, Eigenvector Research Inc, USA).

Figure 1. shows principal component analysis of measurements of temperature dependence of Gd_2O_3:Er,Yb nano phosphor luminescence excited at 980 nm. It could be seen that measurement number 8 (luminescence at 660 K) strongly differs from measurements on other temperatures, so it should be discarded. The same conclusion was obtained from the classical analysis of the same data set, based on fitting error. However, in the case of very complex biomedical data, the classification is usually far from so simple; so the use of ML becomes crucial.

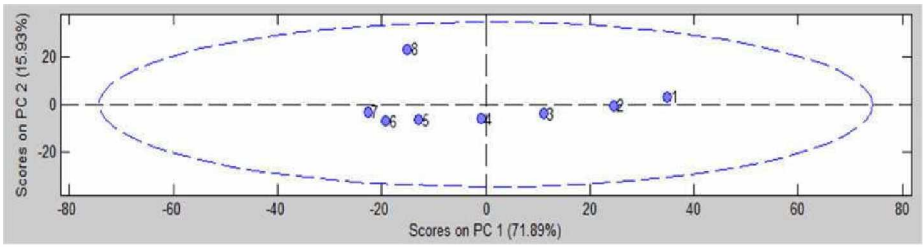

Figure 1. Scores on first two principal components of measurement data of temperature dependence of luminescence of Er and Yb doped Gd_2O_3 nanopowder.

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