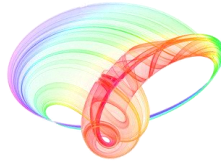


# Book of abstracts



## PHOTONICA2019

The Seventh International School and Conference on  
Photonics, 26 August – 30 August 2019, Belgrade, Serbia

& Machine Learning with Photonics Symposium  
(ML-Photonica 2019)



& ESUO Regional Workshop



& COST action CA16221



Editors: Milica Matijević, Marko Krstić and Petra Beličev

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Development Center Serbia



## Computationally intelligent characterization of a photoacoustic detector

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Artificial neural networks as machine learning techniques have proven to be suitable tools for intelligent decision making. This paper presents the application of artificial neural networks for fast and precise characterization of electret microphones by photoacoustic measurements based on optical generation of sound. The transfer function of this type of devices is usually not determined precisely enough by the producers, especially phase transfer function, because such detectors are not widely applied in scientific experiments but are rather used in audio techniques where amplitude transfer function is more important. The distorted photoacoustic experimental signal, influenced by the measurement set-up in a non-linear manner, represents the input of our model, while the outputs are the detector characteristics.

The model consists of two neural networks: the first one for the classification of the detector type and the second one for the determination of the detector parameters, related to its electronic and geometric features.

Based on this approach and the theoretical model, relying on the acoustics of small volumes, the parameters and transfer characteristics for several microphones are obtained and compared to the characteristics provided by their producers. It has been shown that the suggested method results in much better detector characterization than the one provided in the official specifications. This could be significant not only for scientific applications of microphones but also for their design and applications in audio techniques.

### REFERENCES

- [1] M. Jordović-Pavlović et al., *Artificial Neural Networks Application in Solid State Photoacoustics based on microphone response recognition in the frequency domain*, J. Comput. Electron. (in press).
- [2] S. M. Aleksić et al., *Facta Universitatis Phys. Chem. Technol.* 14, 9 (2016).
- [3] M. N. Popovic et al., *Int. J. Thermophys* 37, 1 (2016).