



Dear Editors,

we wish to submit the new manuscript entitled: “Dual oxygen and temperature luminescence learning sensor with parallel inference”, for consideration to be published in the journal Sensors. We confirm that this work is original and has not been published elsewhere, nor is it currently under consideration for publication elsewhere.

In this paper, we propose an entirely new approach to luminescence sensing, which is based on multi-task learning neural networks and allows the parallel inference of multiple quantities using one single indicator and one single measuring channel.

The classical approach to luminescence sensing is to use an approximate mathematical model describing the functional dependence of the measured quantities and to apply non-linear fitting algorithms. This task can be difficult in case of cross interferences and limits the accuracy of the sensor. In this work, we propose a method to extract multiple parameters from a single set of optical measurements, without the need for an a priori mathematical model. To estimate the performance of the sensor, we introduce a new metric, which measures the maximal error in the predictions when using a neural network approach.

The approach is demonstrated in this work by building a sensor that learns to determine oxygen concentration and temperature at the same time with unprecedented accuracy.

The proposed approach is however not limited to oxygen and temperature sensing but can be applied to the luminescence of multiple luminophores, whenever the underlying mathematical model is not known or is too complex to derive the desired quantities from a single measurement.

Sincerely,

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