Automated Machine Learning Pipeline for Modelling the Spectral Response of a Tapered Optical Fibre Temperature Sensor

J M Cruz-Duarte[1], J Korterik[2], H L Offerhaus[2], L de la Cruz-May[3], L F Granados-Zambrano[2], L Poveda-Wong[4], D Jauregui-Vazquez[5], E de la Cruz[5], and J A Alvarez-Chavez[6]

[1] *Centre Inria, Université of Lille, UMR 9189 CRIStAL, Lille, France*
[2] *Optical Sciences group, University of Twente, 7500AE, Enschede, The Netherlands*
[3] *Facultad de Ingenieria, Universidad Autonoma del Carmen, 24180, Campeche, Mexico*
[4] *Escuela de Ingeniería Eléctrica, Universidad de Costa Rica, 11501-2060, San José, Costa Rica*
[5] *Center for Scientific Research and Higher Education at Ensenada, Esenada, Mexico*
[6] *The Hague University of Applied Sciences, Delft, The Netherlands*
Contact Email: luis.povedawong@ucr.ac.cr

An automated machine learning pipeline is proposed to model the spectral response of a tapered optical fibre temperature sensor. The approach incorporates physics- informed features derived from the sensor behaviour and applies Bayesian hyperparameter optimisation to improve model performance. Multiple regression strategies are explored, including neural network, tree-based, and symbolic regressors. This combination enables the pipeline to capture complex spectral patterns while maintaining model interpretability. As a result, the framework provides accurate predictions together with closed-form analytical expressions that describe the sensor response, facilitating both physical understanding and practical implementation in optical fibre sensing systems.