ON THE APPLICATION OF SUPPORT VECTOR REGRESSION MODELS TO THE CALIBRATION OF FAST RESPONSE AERODYNAMIC PROBES

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ABSTRACT

Calibration of pressure probes is crucial for their reliable performance. However, it remains is a very expensive process, in both time and data management terms. Aiming to alleviate the cost of this process, surrogate models are used as predictors to produce additional data and increase the resolution of the calibration maps. The training of such models requires always a finite number of measurements, which defines the cost of the overall process. Moreover, the prediction quality of the selected surrogate models heavily relies on the size of the initial training data set and the proper modeling of the uncertainties, and generally noise associated to the measurements of the training data set. Despite the fact that Kriging-based predictors are a popular choice, the modeling of noise on the input training data set, is solely based on the selection of the nugget value, hence additional knowledge input, not always available. To overcome this issue, support vector regression models are used as the predictors, alongside to their associated configuration techniques. These techniques enable the extensive investigation for the selection of the hyper-parameters configuration set, which can lead to improved noise modeling for the input training data set, particularly in case of no a priori information. The results show that the proper definition of the hyper-parameters set, using global optimization strategies can capture accurately the noise level of the training data, thus enabling the identification of the true underlying calibration model. Finally, a full investigation on the size of the training data set and its effect on the quality of the noise modeling are also delivered.