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Machine Learning Algorithms for prediction of regions of high Reynolds Averaged Navier Stokes Uncertainty[1] AASHWIN MISHRA, GIANLUCA IACCARINO, Center for Turbulence Research, Stanford University — In spite of their deficiencies, RANS models represent the workhorse for industrial investigations into turbulent flows. In this context, it is essential to provide diagnostic measures to assess the quality of RANS predictions. To this end, the primary step is to identify feature importances amongst massive sets of potentially descriptive and discriminative flow features. This aids the physical interpretability of the resultant discrepancy model and its extensibility to similar problems. Recent investigations have utilized approaches such as Random Forests, Support Vector Machines and the Least Absolute Shrinkage and Selection Operator for feature selection. With examples, we exhibit how such methods may not be suitable for turbulent flow datasets. The underlying rationale, such as the correlation bias and the required conditions for the success of penalized algorithms, are discussed with illustrative examples. Finally, we provide alternate approaches using convex combinations of regularized regression approaches and randomized sub-sampling in combination with feature selection algorithms, to infer model structure from data.

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