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A PHYSICS INFORMED NEURAL NETWORK FOR RETRIEVING TWO-DIMENSIONAL SCALAR FIELDS OF LAMINAR DIFFUSION FLAMES

Hongxu Li, Tao Ren*

China-UK Low Carbon College, Shanghai Jiao Tong University, Shanghai, China, 201306

ABSTRACT. The paper presents a novel application of physics-informed neural networks (PINNs) for solving the problem of retrieving 2D scalar fields from axisymmetric flames using tomographic laser absorption spectroscopy. The PINN approach is used to retrieve temperature and species concentration from sparse spectral absorption data, which is known to be very sensitive to small errors in experimental measurements. By incorporating the underlying physical laws of the system into the retrieval process, the PINN approach has been shown to significantly improve the accuracy of the solution, especially in the case of noisy data. The paper presents numerical investigations of a co-flow C_2H_4 flame using both the Abel and PINN methods, demonstrating the superiority of the PINN method in terms of inversion accuracy. The results of these studies highlight the potential of the PINN approach for solving ill-posed problems and improving the accuracy of solutions in a variety of scientific and engineering applications.

*Corresponding Tao Ren: tao.ren@sjtu.edu.cn