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Pollution Source Localization Using Physics-Driven Deep Neural Net ROSHAN D'SOUZA, ISAAC PEREZ-RAYA, University of Wisconsin-Milwaukee — Pollution source localization is of great significance in environmental damage prevention and mitigation. While sensors can detect time-resolved chemical concentrations, spatio-temporal localization of the source is a difficult inverse problem. Here we propose a novel method based on physics-driven deep learning to detect the spatio-temporal location of pollution sources based on the time-resolved chemical concentration readings from a finite number of sensors. The chemical concentration and the mobile source spatio-temporal functions are modeled as neural nets. The training process involves minimizing a loss function that enforces data fidelity with respect to sensor readings and the physics of advection diffusion through regularization. The proposed method is purely data driven and does not require specification of geometry and boundary conditions of the domain. The method has been tested on a 1-D unsteady problem with a single mobile point source that is active for certain time duration. The reference data was generated using the commercial finite volume solver Fluent. Results show an average source location error of 1%, average source magnitude error of 12%, and average source time duration error of 2.5%.

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