

Supplementary Materials for Fluid Mechanics Dataset

NOTE: The main paper defines a new ML4Sci task (physics hypothesis selection), so supplementary materials are NOT required. We provide the following information on one of the datasets created in the project only to improve the application and understanding of our task.

1 Dataset Documentation

We follow the Datasheets documentation framework.

Motivation. The dataset is created to validate the feasibility of our defined task and baselines.

Composition. The dataset includes three scenarios: S1, S2 and S3. Each scenario has two numpy zip files for training and testing, respectively. Each file consists of several numpy float arrays:

1. ux: the velocity along the x-axis at the grids.
2. uy: the velocity along the y-axis at the grids.
3. rho: the density at the grids.
4. p: the pressure at the grids.
5. T(only for S3): the temperature at the grids.
6. x: x position of grids
7. y: y position of grids
8. t: time of grids.

Collection Process. The dataset is collected from COMSOL simulation.

Preprocessing. Optionally, the data grids near the boundaries can be clipped for better numerical stability.

Uses. Currently, the dataset is used for the project in the main paper only. But it might also be used for other tasks such as PDE Symbolic Regression and PDE Solving.

Distribution. The dataset is uploaded to Zenodo, and the DOI is 10.5281/zenodo.11530770. During the review, the dataset is anonymous, and we provide a

temporary data link¹ and code link² for reviewers only. The dataset will be publicly available once the paper is accepted. The dataset distribution license is the Creative Commons Attribution 4.0 International.

Maintenance. The first author's affiliation Will be responsible for hosting/supporting/maintaining the dataset. It will ensure access to the data and will provide the necessary maintenance.

2 Author Statement

We bear all responsibility in case of violation of rights, etc., and confirmation of the data license.

¹<https://zenodo.org/records/11530771?token=eyJhbGciOiJIUzUxMiJ9.eyJpZCI6IjgwZGFkMTJiLTUyNjYtNGY0MS04YzI4LTZkMzRjNmM2ZGRlZCI9ImRhdGEiOnt9LCJyYW5kb20iOiI0NTA4MjU5MzIxOGU4YjYwNjdlMGJkYmUzY2NmYjM5YSJ9.50vo70qCuAfIokz6KsUps-DaQbpbGM75joD8DpyLi-61Vn3DGgtTDzv6MSgRx2w19RmTi8T1yJx785gHJuEyvA>

²<https://zenodo.org/records/14163760?token=eyJhbGciOiJIUzUxMiJ9.eyJpZCI6IjYyYjgwMjExLTU4NTItNGY3Yy1hNDRmLTZjMzRkYTU2ZDEyYyIsImRhdGEiOnt9LCJyYW5kb20iOiI0ZGU5NDUzZGIyODZiZWU3MjZiZjZmMD11NTM3ZjA1NiJ9.P9GKJpCiR9i18IITsCdrXM0pqOweLt0IMvH871I4AyeadF67jDgBAQ71oMIVaGNIVREHm0St20yvbTjC0kAC5A>