Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

AI in the Sciences and Engineering **2024**

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Project 1

Due date: Friday 12 April 2024, 23:59 (midnight)

The main objective of the project is to apply machine learning algorithms to solve various tasks related to the preliminary design of a thermal energy storage. The project is divided into four tasks, the solution of each of which is described in detail below.

$$\epsilon\rho_f C_f \frac{\partial T_f}{\partial t} + \epsilon\rho_f C u_f(t) \frac{\partial T_f}{\partial x} = \lambda_f \frac{\partial^2 T_f}{\partial x^2} - h_v(T_f - T_s) \quad \text{for} \quad x \in [0, L], \quad t \in [0, T], \tag{1}$$

$$(1-\epsilon)\rho_s C_s \frac{\partial T_s}{\partial t} = \lambda_s \frac{\partial^2 T_s}{\partial x^2} + h_v(T_f - T_s) \quad \text{for} \quad x \in [0, L], \quad t \in [0, T], \tag{2}$$

1. Task 1: PINNs for solving PDEs

2. Task 2: PDE-Constrained Inverse Problem

3. Task 3: Applied Regression

4. Task 4: Robustness of PINNs and Transferability (Optional)