Contribution ID: **23** Type: **not specified**

Physics Informed Neural Network Approach for Numerical Solution of Heat Equation

Background: Heat conduction is a fundamental physical process governing thermal energy transport across diverse media. While traditional numerical methods (e.g., Finite Difference) are physically powerful, they often require complex meshing and can be computationally expensive for high-dimensional. The heat equation serves as the primary mathematical framework for modeling these diffusion-driven transport phenomena.
Purpose: The objective of this work is to obtain the solution of the heat equation using Physics-Informed Neural Networks (PINNs).
Methodology: A physics-informed neural network is formulated by embedding the governing heat equation, along with the prescribed initial and boundary conditions, into the loss function through residual based terms of a neural network. Automatic differentiation is employed to compute the required spatial and temporal derivatives. The network is trained using collocation points sampled across the space–time domain, without the need for labeled training data.
Results: The PINN-based solution exhibits excellent agreement with the actual solution of the one-dimensional heat equation, correctly reproducing the spatial temperature profiles and their temporal evolution. The study highlights the effectiveness of PINNs as a reliable alternative to traditional numerical methods and establishes a foundation for extending the approach to higher-dimensional heat conduction problems.

Author: RATHORE, Gargi

Co-authors: Mrs SHARMA, Arushi; Prof. SASTRI, O.S.K.S

Presenter: RATHORE, Gargi