1   Task

Write a python code using ChatGPT [1,2] and DeepSeek [3] for solving the Burger's Equation given by:

$$u_t + uu_x - (0.01/\pi)u_{xx} = 0, \quad x \in [-1, 1], \quad t \in [0, 1], \tag{1}$$

$$u(0, x) = -\sin(\pi x), \tag{2}$$

$$u(t, -1) = u(t, 1) = 0, \tag{3}$$

using (a) Physics Informed Neural Networks (PINNs) [4] and (b) Finite Difference Method (FDM) [5].

- Compare the architecture (for PINNs) and the schemes (Finite Difference Method) that each of the framework gives.

- Compare your results for ChatGPT vs DeepSeek, in terms of

  1. accuracy
  2. computational time

- Add the conversation history relevant to the code along with the suggestions for each framework. Write down your observations of these models against the prompt you provided to get the code.

1.1 References

1 Brown T, Mann B, Ryder N, Subbiah M, Kaplan JD, Dhariwal P, Neelakantan A, Shyam P, Sastry G, Askell A, Agarwal S. Language models are few-shot learners. Advances in neural information processing systems. 2020;33:1877-901.

2 OpenAI. (2025). ChatGPT (March 19 version). https://openai.com

3 Guo D, Yang D, Zhang H, Song J, Zhang R, Xu R, Zhu Q, Ma S, Wang P, Bi X, Zhang X. Deepseek-r1: Incentivizing reasoning capability in llms via reinforcement learning. arXiv preprint arXiv:2501.12948. 2025 Jan 22.

4 Randall J LeVeque. "Finite difference methods for differential equations". In: Draft version for use in AMath 585.6 (1998), p. 112.

5 Maziar Raissi, Paris Perdikaris, and George E Karniadakis. "Physics-informed neural networks: A deep learn- ing framework for solving forward and inverse problems involving nonlinear partial differential equations". In: Journal of Computational physics 378 (2019), pp. 686–707.