SCIENTIFIC MACHINE LEARNING IN INDUSTRIAL SETTINGS

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ABSTRACT

Scientific machine learning (SciML) has shown great promise in the context of accelerating classical physics solvers and discovering new governing laws for complex physical systems. However, while the SciML activity in foundational research is growing exponentially, it lags in real-world utility, including the reliable and scalable integration into industrial pipelines. SciML algorithms need to advance in maturity and validation, which in the context of traditional and advanced industrial settings, requires operating in cyber-physical environments marked by large-scale, three-dimensional, streaming data that is confounded with noise, sparsity, irregularities and other complexities that are common with machines and sensors interacting with the real, physical world.

In this talk, I will highlight some of the current challenges in applying SciML in industrial contexts. Special attention will be on the generation of fast and flexible neural network surrogates, from fluid flow in industrial components to industrial control and process systems.

REFERENCES

[1] R. J. Gladstone, H. Rahmani, V. Suryakumar, H. Meidani, M. D'Elia, A. Zareei, Mesh-based GNN surrogates for time-independent PDEs, Nature Scientific Reports, 2024.