2024 NSF CYBER-PHYSICAL SYSTEMS PRINCIPAL INVESTIGATORS' MEETING

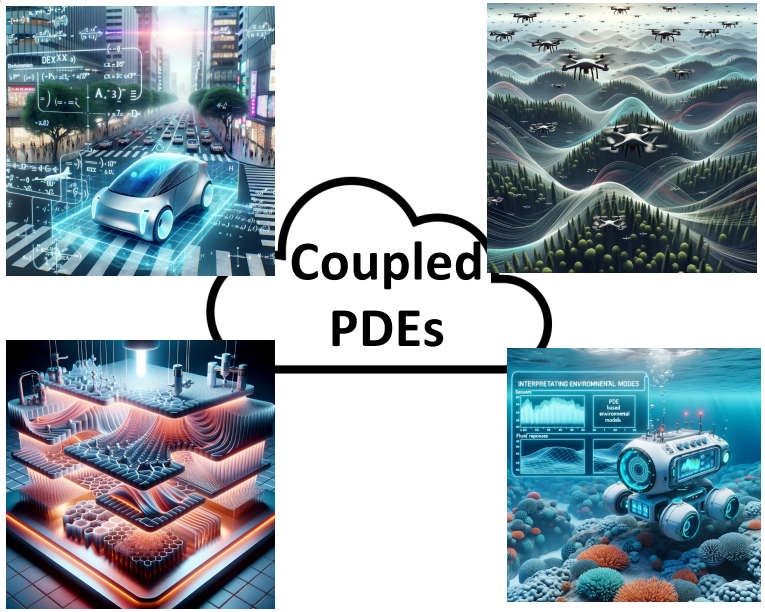
CPS: Small: Uncertainty-aware Framework for Specifying, Designing and Verifying Cyber-Physical Systems

Award #1932620 / Paul Bogdan and Jyotirmoy Deshmukh, University of Southern California

A novel multiwavelet neural operator for real-time decision-making in CPSs navigating uncertain unstructured environments!

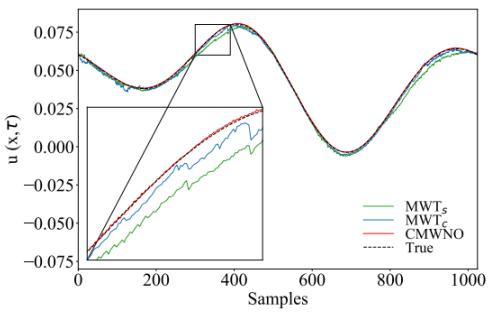
Challenge:

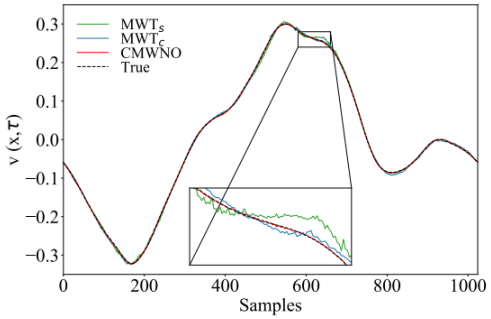
- How to facilitate the ***prediction and control*** of multi-agent systems governed by the ***coupled partial differential equations (PDEs)***?
- How to learn coupled PDEs in a data-driven manner?



Solutions:

- Learn the underlying PDEs through the multiwavelet neural operator (MNO)
- Proposed the first MNO to learn PDEs from small data
- Propose the first coupled MNO through a dice strategy to decouple the coupled PDEs in the multiwavelet space.
- Synthetic experiments demonstrate a 4X performance advantage over existing models.





NSF CNS-1932620, Univ. of Southern California
PI Paul Bogdan pbogdan@usc.edu
Co-PI: Jyotirmoy Dshmukh jdeshmukh@usc.edu

Xiongye Xiao, et al. "Coupled Multiwavelet Neural Operator Learning for Coupled Partial Differential Equations" *International Conference on Learning Representations* (ICLR), 2023.
https://par.nsf.gov/biblio/10446642