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Type: **Invited talk**

A statistical tour of physics-informed learning

Monday, March 2, 2026 4:00 PM (45 minutes)

We will begin by discussing the limitations inherent in the training of Physics-Informed Neural Networks (PINNs), which, despite their conceptual appeal, often face practical challenges (such as convergence issues, sensitivity to hyperparameters, and the need of large data volume). In a second step, we will recast and characterize the problem of physics-informed learning as a kernel method. This reformulation allows us to draw upon the rich body of work in statistical learning theory, particularly kernel methods, to gain deeper theoretical insights into favorable mechanisms in physics-informed learning. Furthermore, it opens the door to the development of alternative approaches. In particular, it motivates the Physics-Informed Kernel Learning (PIKL) algorithm, which integrates PDE priors into the learning process in a more principled, theoretically grounded and potentially more robust manner. Finally, we have also developed a GPU-compatible implementation of PIKL, enabling large-scale learning and making the method practical for real-world scientific applications.

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