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Machine Learning in PDE: Discovering New, Unstable Solutions

jeudi 22 mai 2025 14:50 (50 minutes)

In this talk I will explain several recent results combining machine learning techniques and more traditional mathematics. The overarching theme is the interplay between modern (ML) and classical methods in order to discover new solutions of certain PDE with low or very low numerical error. I will also outline how to turn the numerical approximate solutions into a rigorous proof via computer-assisted methods, leading in some cases to singularity formation, or to the existence of certain special solutions (e.g. traveling waves). In particular, unstable solutions are now amenable to be discovered. While the motivation is originally coming from fluid mechanics' equations such as Euler or Navier-Stokes some of the methods can be tuned to other PDE.

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