

Machine learning for fluid dynamics

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Abstract

I will discuss the application of machine learning to building multi-scale models in fluid dynamics. The key issues involved are the adaptive generation of data and building in physical constraints in the machine learning models. To address the first issue, we will discuss the framework of concurrent machine learning. To address the latter issue, we will discuss how both static and dynamic constraints can be taken into account in the machine learning models. Applications to the Boltzmann equation, the Kuramoto-Sivashinsky equation and the Navier-Stokes equations will be presented. I will also discuss some of the challenges that we are facing.