		doc_1			doc_2	decision	id
cases	authors	• Ekhi Ajuria Illarramendi • Michaël Bauerheim • Bénédicte Cuenot	authors		• Bénédicte Cuenot • Michaël Bauerheim • Ekhi Ajuria Illarramendi	DUPLICATES	167
	title	Performance and accuracy assessments of an incompressible fluid solver coupled with a deep convolutional neural network	title		Performance and accuracy assessments of an incompressible fluid solver coupled with a deep Convolutional Neural Network		
	publication_date	2022-01-01 00:00:00	publication_date		2021-09-20 00:00:00		
	source	SupportedSources.OPENALEX	source		SupportedSources.PAPERS_WITH_CODE		
	journal	Data-centric engineering	journal				
	volume	3	volume				
	doi	10.1017/dce.2022.2	doi				
	urls	• https://openalex.org/W3199810640 • https://doi.org/10.1017/dce.2022.2 • https://www.cambridge.org/core/services/aop-cambridge-core/content/view/8BBFEBD61125921CB05EB2E076A4686F/S2632673622000028a.pdf/div-class-title-performance-and-accuracy-assessments-of-an-incompressible-fluid-solver-coupled-with-a-deep-convolutional-neural-network-div.pdf	urls		• https://arxiv.org/pdf/2109.09363v2.pdf • https://gitlab.isae-supaero.fr/daep/fluidnet_supaero.git		
	id	id-5658746153533493447	id		id-3677472466523794058		
	abstract		abstract		The resolution of the Poisson equation is usually one of the most computationally intensive steps for incompressible fluid solvers. Lately, Deep Learning, and especially Convolutional Neural Networks (CNN), has been introduced to solve this equation, leading to significant inference time reduction at the cost of a lack of guarantee on the accuracy of the solution. This drawback might lead to inaccuracies and potentially unstable simulations. It also makes impossible a fair assessment of the CNN speedup, for instance, when changing the network architecture, since evaluated at different error levels. To circumvent this issue, a hybrid strategy is developed, which couples a CNN with a traditional iterative solver to ensure a user-defined accuracy level. The CNN hybrid method is tested on two flow cases, consisting of a variable-density plume with and without obstacles, demonstrating remarkable generalization capabilities, ensuring both the accuracy and stability of the simulations. The error distribution of the predictions using several network architectures is further investigated. Results show that the threshold of the hybrid strategy defined as the mean divergence of the velocity field is ensuring a consistent physical behavior of the CNN-based hybrid computational strategy. This strategy allows a systematic evaluation of the CNN performance at the same accuracy level for various network architectures. In particular, the importance of incorporating multiple scales in the network architecture is demonstrated, since improving both the accuracy and the inference performance compared with feedforward CNN architectures, as these networks can provide solutions 1 10-25 faster than traditional iterative solvers.		
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