cases	doc_1	doc_2	decision	id
			DUPLICATES	215

doc_1	
authors	• Kevin Luna • Katherine Klymko • Johannes Blaschke
title	Accelerating GMRES with Deep Learning in Real-Time.
publication_date	2021-03-19 00:00:00
source	SupportedSources.OPENALEX
journal	arXiv (Cornell University)
volume	
doi	None
urls	• https://openalex.org/W3136298896
id	id1770712446202720729
abstract	
versions	

doc_2	
authors	• Kevin Luna • Katherine Klymko • Johannes P. Blaschke
title	Accelerating GMRES with Deep Learning in Real-Time
publication_date	2021-03-19 00:00:00
source	SupportedSources.INTERNET_ARCHIVE
journal	
volume	
doi	
urls	• https://web.archive.org/web/20210326220803/https://arxiv.org/pdf/2103.10975v1.pdf
id	id4822576590588596609
abstract	GMRES is a powerful numerical solver used to find solutions to extremely large systems of linear equations. These systems of equations appear in many applications in science and engineering. Here we demonstrate a real-time machine learning algorithm that can be used to accelerate the time-to-solution for GMRES. Our framework is novel in that is integrates the deep learning algorithm in an in situ fashion: the AI-accelerator gradually learns how to optimizes the time to solution without requiring user input (such as a pre-trained data set). We describe how our algorithm collects data and optimizes GMRES. We demonstrate our algorithm by implementing an accelerated (MLGMRES) solver in Python. We then use MLGMRES to accelerate a solver for the Poisson equation â€“ a class of linear problems that appears in may applications. Informed by the properties of formal solutions to the Poisson equation, we test the performance of different neural networks. Our key takeaway is that networks which are capable of learning non-local relationships perform well, without needing to be scaled with the input problem size, making them good candidates for the extremely large problems encountered in high-performance computing. For the inputs studied, our method provides a roughly 2Ã— acceleration.
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