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<tr><th rowspan="2">cases</th><th>doc_1</th><th>doc_2</th><th>decision</th><th>id</th></tr>
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authors	Alex Bihlo
title	Improving physics-informed neural networks with meta-learned optimization
publication_date	2023-03-13 13:58:03+00:00
source	SupportedSources.ARXIV
journal	None
volume	
doi	
urls	http://arxiv.org/pdf/2303.07127v2 http://arxiv.org/abs/2303.07127v2 http://arxiv.org/pdf/2303.07127v2
id	id4984764988597369297
abstract	We show that the error achievable using physics-informed neural networks for solving systems of differential equations can be substantially reduced when these networks are trained using meta-learned optimization methods rather than to using fixed, hand-crafted optimizers as traditionally done. We choose a learnable optimization method based on a shallow multi-layer perceptron that is meta-trained for specific classes of differential equations. We illustrate meta-trained optimizers for several equations of practical relevance in mathematical physics, including the linear advection equation, Poisson's equation, the Korteweg--de Vries equation and Burgers' equation. We also illustrate that meta-learned optimizers exhibit transfer learning abilities, in that a meta-trained optimizer on one differential equation can also be successfully deployed on another differential equation.
versions	

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authors	A. Bihlo
title	Improving physics-informed neural networks with meta-learned optimization
publication_date	2023-03-13 00:00:00
source	SupportedSources.SEMANTIC_SCHOLAR
journal	ArXiv
volume	abs/2303.07127
doi	10.48550/arXiv.2303.07127
urls	https://www.semanticscholar.org/paper/4f9f96679e943f7447ac431dffea506767d3cf3f
id	id347980468456306197
abstract	We show that the error achievable using physics-informed neural networks for solving systems of differential equations can be substantially reduced when these networks are trained using meta-learned optimization methods rather than to using fixed, hand-crafted optimizers as traditionally done. We choose a learnable optimization method based on a shallow multi-layer perceptron that is meta-trained for specific classes of differential equations. We illustrate meta-trained optimizers for several equations of practical relevance in mathematical physics, including the linear advection equation, Poisson's equation, the Korteweg--de Vries equation and Burgers' equation. We also illustrate that meta-learned optimizers exhibit transfer learning abilities, in that a meta-trained optimizer on one differential equation can also be successfully deployed on another differential equation.
versions	

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