



◆ 新闻动态

- 科研进展
- 综合新闻
- 传媒扫描

现在位置: 首页 > 新闻动态 > 科研进展

物理机制神经网络基于失效信息的自适应采样 (周涛)

2023-12-13

Physics-informed neural networks (PINNs) have emerged as an effective technique for solving PDEs in a wide range of domains. It is noticed, however, that the performance of PINNs can vary dramatically with different sampling procedures. For instance, a fixed set of (prior chosen) training points may fail to capture the effective solution region (especially for problems with singularities). To overcome this issue, we present in this work an adaptive strategy, termed failure-informed PINNs (FI-PINNs), which is inspired by the viewpoint of reliability analysis. The key idea is to define an effective failure probability based on the residual, and then, with the aim of placing more samples in the failure region, the FI-PINNs employs a failure-informed enrichment technique to adaptively add new collocation points to the training set, such that the numerical accuracy is dramatically improved. In short, similar to adaptive finite element methods, the proposed FI-PINNs adopt the failure probability as the posterior error indicator to generate new training points. We prove rigorous error bounds of FI-PINNs and illustrate their performance through several problems.

Publication:

SIAM Journal on Scientific Computing Vol. 45, Iss. 4 (2023)

<http://dx.doi.org/10.1137/22M1527763>

Author:

Zhiwei Gao

School of Mathematics, Southeast University, Nanjing 210096, China.

Liang Yan

School of Mathematics, Southeast University, Nanjing 210096, and Nanjing Center for Applied Mathematics, Nanjing 211135, China.

Tao Zhou

LSEC, Institute of Computational Mathematics, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, Beijing 100190, China.

Email: tzhou@lsec.cc.ac.cn

[【打印本页】](#) [【关闭本页】](#)

[电子政务平台](#) | [科技网邮箱](#) | [ARP系统](#) | [会议服务平台](#) | [联系我们](#) | [友情链接](#)

