# Article information:

DeepXDE: A Deep Learning Library for Solving Differential Equations  
<https://epubs.siam.org/doi/epdf/10.1137/19M1274067>

# Article summary:

1. Deep learning in the form of deep neural networks has been used very effectively in diverse applications, but has not yet been widely used in scientific computing.

2. Solving partial differential equations (PDEs) via deep learning is a potentially new subfield called scientific machine learning (SciML).

3. DeepXDE is a Python library designed to serve as an educational tool and research tool for solving problems in computational science and engineering (CSE).

# Article rating:

May be slightly imbalanced: The article presents the information in a generally reliable way, but there are minor points of consideration that could be explored further or claims that are not fully backed by appropriate evidence. Some perspectives may also be omitted, and you are encouraged to use the research topics section to explore the topic further.

# Article analysis:

The article provides an overview of the use of deep learning to solve partial differential equations (PDEs), introducing the concept of scientific machine learning (SciML) and discussing the potential benefits of using this approach. The article also introduces DeepXDE, a Python library designed to serve as an educational tool and research tool for solving problems in computational science and engineering (CSE).

The article is generally well-written and provides a comprehensive overview of the topic. However, there are some areas where it could be improved. For example, while the article does discuss some potential risks associated with using deep learning to solve PDEs, such as truncation errors and numerical quadrature errors, it does not provide any evidence or examples to support these claims. Additionally, while the article does mention that DeepXDE can be used to solve multiphysics problems, it does not provide any details on how this is done or what types of multiphysics problems can be solved with DeepXDE. Furthermore, while the article mentions that DeepXDE supports complex-geometry domains based on constructive solid geometry (CSG), it does not provide any details on how this works or what types of complex geometries can be handled by DeepXDE.

In addition, while the article discusses various PINN algorithms implemented in DeepXDE, it does not provide any information about other libraries or approaches that could be used for solving PDEs with deep learning. This lack of comparison makes it difficult to assess whether DeepXDE is truly superior to other approaches for solving PDEs with deep learning. Finally, while the article mentions that users can monitor and modify the solution process via callback functions, it does not provide any details on how this works or what types of modifications are possible.

In conclusion, while overall this article provides a comprehensive overview of using deep learning to solve PDEs with DeepXDE, there are some areas where more detail would have been helpful in order to fully understand its potential benefits and drawbacks compared to other approaches for solving PDEs with deep learning.

# Topics for further research:

* Deep learning PDEs comparison
* Multiphysics problems deep learning
* Constructive solid geometry deep learning
* PINN algorithms deep learning
* Callback functions deep learning
* Scientific machine learning applications

# Report location:

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