Geoscientific

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comment

Interactive comment on "PDE-NetGen 1.0: from symbolic PDE representations of physical processes to trainable neural network representations" *by* Olivier Pannekoucke and Ronan Fablet

Anonymous Referee #2

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This paper introduced the capabilities of the software package PDE-NetGen which the authors have developed. The main components of the software package are: 1) Finite-difference discretizations of spatial operators are implemented as convolutional layers with fixed parameters 2) Implementing time discretization methods as ResNet layers 3) Using the resulting network for forward or inverse problems

The authors show examples of how the framework can be used to derive NN implementations of right-hand side functions or more interestingly, the NN model can be used for data-driven parameter estimation of incertain models. In their examples, authors show

how a difficult-to-compute term in the equations can be modeled given some idea of its dependencies. The application is interesting and software is openly accessible for researchers. This in my opinion, warrants the paper to be published, however, in its current form the paper can benefit from a round of editing and improvements in the technical representation and writing. I have attached some highlights of the sentences that need revisiting, but I encourage the authors to consider a comprehensive refinement of the text.

Some suggestions: * The authors may include some information about the. orders of accuracy available in their software, especially what is the finite difference approximation? * Eq. (4) is very long. Is there a way to represent it in a matrix form to make it shorter? * On line 135 the authors intend to show that the solutions converge. The authors may consider supplementing the information with dt of the time-integrator so that the error has a sense of scale. * The sentence on line 175 is ambiguous. Do authors intend to say that the choice of a,b,c. = (1,3/4,-2) is not based on a ground truth? Interestingly their numerical solution somewhat close to this one. *There are misspellings highlighted in the pdf.

Please also note the supplement to this comment:
https://www.geosci-model-dev-discuss.net/gmd-2020-35/gmd-2020-35-RC2-supplement.pdf

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