# Physics of Data. Part XIV

Physics of Data. Part XIV | Alfonso R. Reyes

Do Physics-Informed Neural Networks (PINNs) mean more accurate calculations and faster solvers than FEM, FVM, FDM, and mesh approaches?

Does it mean it's time to say goodbye to traditional PDE and ODE solvers?

PINNs are not necessarily more accurate, or faster, than traditional PDE or ODE solvers. That is not the main purpose or aim of PINNs.

What I gather from the literature - papers by Prof. Raissi, Karniadakis, Jagtap, Brunton, Cuomo, et al - is that PINNs allows you find out faster what is the best approach before you embark on a more time consuming and expensive effort with the traditional methods: FEM, FVM, FDM with meshed based simulation. Traditional solving methods are decades proven to work, and the scientific community should continue working and investing in them.

PINNs are also ideal to supplement Data Science and Machine Learning projects in real time dynamical systems - very similar to those found in the field -, to include your own hidden Physics in the algorithms. In the form of differential equations, Dynamical Systems behavior can be understood and predicted much, much better than typical pure data Driven methods if you are able to identify parameters and state variables. Just by itself, discovering and finding the right equations it's a great challenge.

In some way, we could say that PINNs and relatives enable computational Physics and scientific machine learning to advance at a pace similar to that Silicon Valley phrase of "fail fast, fail often, learn fast"

FVM: Finite Volume Method
FEM: Finite Element Method
FDM: Finite Differences Method

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