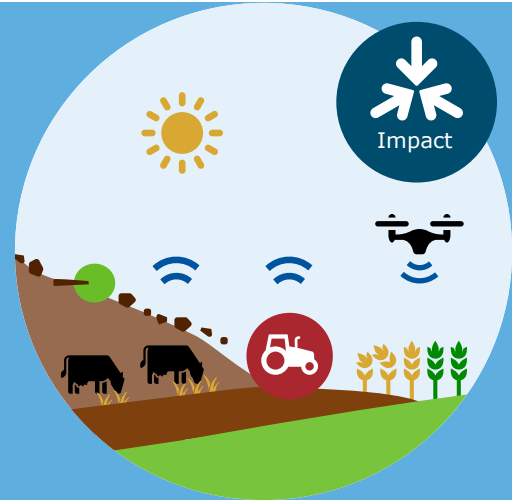


Scientific machine learning to simplify hydrological modelling in a changing climate

Emerging DS/AI methods



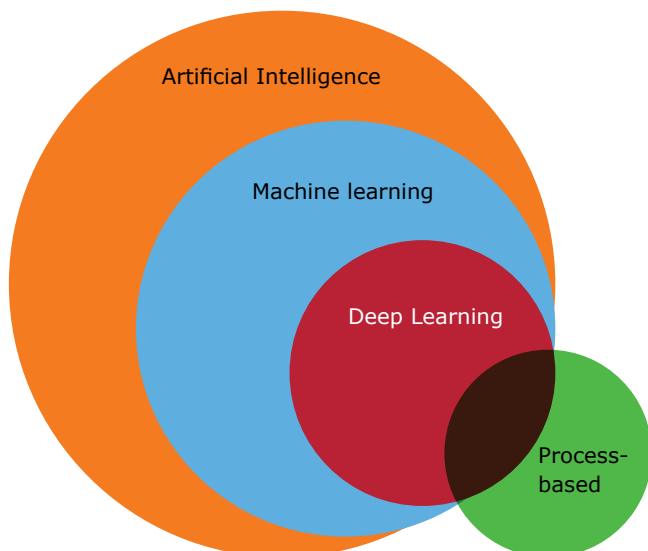
Data Driven Discoveries in a changing climate (D3C2)

Objective: The aim of this project is to investigate the potential of scientific machine learning for hydrological modelling.

Activities and results

This project consisted of a combination of literature research coding and organised meetings with others who did related work, to exchange ideas and knowledge.

We did an extensive literature review on scientific machine learning (SciML) and SciML in hydrology in particular. Furthermore, we wrote computer code that replaces a complicated physics-based soil-crop evapotranspiration model by a deep learning model. We also worked on a basic soil physical model with the aim to replace parts of it by deep learning models like our evapotranspiration model.



Achievement

Due to time and budget limitations, we did not succeed yet to combine the soil physical model and the evapotranspiration model. We had to write most things from scratch because the available SciML libraries do not support the solution of our type of differential equation yet. What we did achieve, is increased knowledge of the highly relevant and quickly evolving field of SciML, both deeper and broader. Also, we have made contacts with other people interested in this topic. People we would normally not have cooperated with, probably.

Outlook

We want to continue doing research on this topic. Prerequisite is that funding is available. Furthermore, we continue to contribute to a growing multidisciplinary SciML-network within Wageningen University & Research.

Deliverables

- The establishment of the WUR Scientific Machine Learning Network. Our research and that of other D3C2 projects is presented there. This website will provide a stage for Wageningen projects on SciML, and will serve as communication medium between researchers. An actual symposium will take place later in 2023, funded by a D3C2 wildcard.
- The Gitlab repository.

Lessons learned

We learned the following lessons:

- Cooperation with people from other WUR-disciplines who are working to develop implementations of the same technique (SciML) is highly valuable. Starting cooperation early, like we have done, can help save time and duplicate work.
- The cooperation with others doing similar research was highly valuable to get inspired and to test our own ideas and to obtain feedback. This yielded the WUR Scientific Machine Learning Network, which is now official due to a D3C2 wildcard grant.

Contact



Joost Iwema

Hydrology researcher (project manager)

joost.iwema@wur.nl

Wageningen University & Research
P.O. Box 47
6700 AB Wageningen
The Netherlands
T +31 317 48 07 00
www.wur.eu

Project members

Dennis Walvoort
Marius Heinen
Geerten Hengeveld
Bernardo Maestrini
George van Voorn
Aalt-Jan van Dijk
