Course on „Model-data integration for natural sciences“

Short Description: The course will concentrate on model-data integration for natural sciences. It will start with general insight about the modelling as a scientific process and will link this to recent developments in data-science and machine learning. The course will treat model parameter estimation of mechanistic models, non parametric modelling with artificial neural networks and applied deep learning, and finally so-called hybrid modelling approaches (Reichstein et al. 2019). Upon interest some visualizations techniques (3D) can be introduced. The course will have a strong (75%) hands-on programming component in R with rTorch (=R + Pytorch). The teaching example will come from ecosystem science (ecosystem flux observations), but the concept and code will be general enough to also address other datasets of the participants. Indeed, depending on progress we make, the 3rd and 4th day could be used, to work on your own examples.

Requirements for this course are medium knowledge in the R language, ideally tidyR, and some quantitative, applied mathematical background (e.g. you should know what a derivative, or a gaussian distribution is). You should have R and rTorch installed on your computer (GPU usage is not required). A simple working example will be provided a week before, so you can see whether your installation was successful for the purpose of the course.

Dates: 20, 21, 27 & 28 Jan, 9-12 am

Place: The workshop will be held online.

If you are **interested in participating** or have any **questions** please send an e-mail to michael.bahn@uibk.ac.at **by 4 Jan 2021**.

The course will only be held if sufficient interest has been expressed.

Prof. Dr. Markus Reichstein is Director at the Max-Planck-Institute for Biogeochemistry in Jena and LFUI-Guest Professor 2020/21. He is a leading expert in model-data-integration for understanding the Earth System, with particular focus on the terrestrial carbon cycle. Reference: Reichstein M. et al. (2019) Deep learning and process understanding for data-driven Earth system science. Nature 566, 195 - 204.