

Machine Learning and Uncertainty Quantification at SCC

16/09/2022
Jörg Meyer



Helmholtz AI

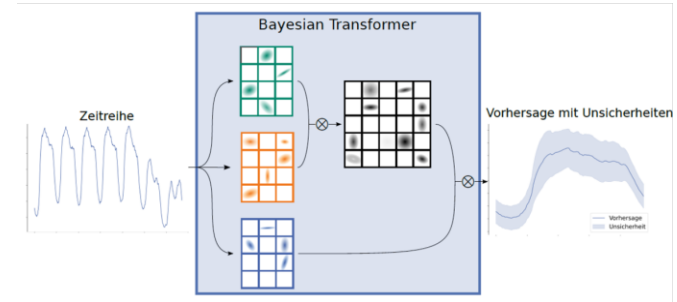
- <https://www.helmholtz.ai/themenmenue/our-research/consultant-teams/helmholtz-ai-consultants-kit/index.html>
- Head: **Markus Götz**
- Energy-focused AI consultants
- HeAT - Helmholtz Analytics Toolkit

- See Markus' presentation

Robust and Efficient AI (RAI)

■ Junior Research Group by **Charlotte Debus**

- BMBF project EQUIPE
- Skalierbare, effiziente Methoden zur Quantifizierung von Unsicherheiten in der KI-basierten Zeitreihenvorhersage
- Topics
 - Time series predictions
 - Uncertainty quantification
 - Attention based transformer networks
 - Sparse Networks
 - Application to smart power grids
 - ...

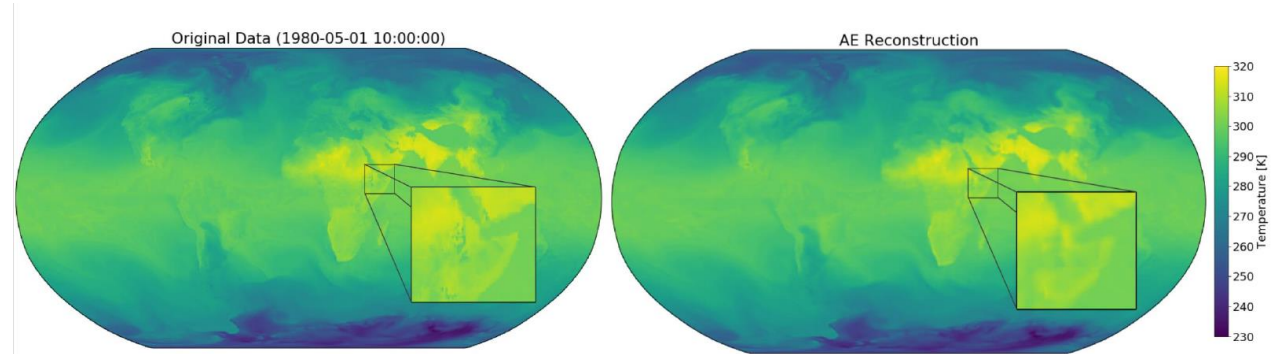
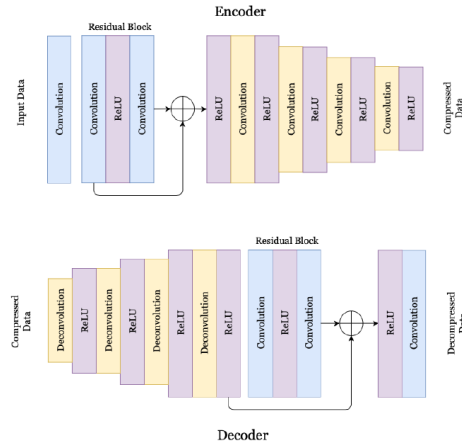


- European Project: Artificial Intelligence for the European Open Science Cloud
- Contact at SCC: **Valentin Kozlov**
- enhanced set of advanced services for the development of Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL) models and applications in the European Open Science Cloud (EOSC)
- comprehensive platform:
 - advanced features such as distributed, federated and split learning
 - novel provenance metadata for AI/ML/DL models;
 - event-driven data processing services or provisioning of AI/ML/DL services based on serverless computing.

Simulation and Data Life Cycle Labs

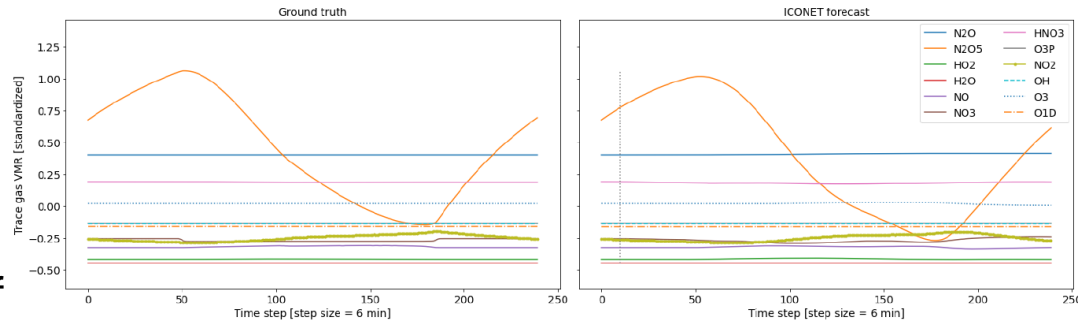
- The Simulation and Data Life Cycle Labs (SDL) support collaborations and knowledge transfer focusing on supporting data and simulation scientists across projects
- Funded by Helmholtz Program “Engineering Digital Futures” (EDF) and Nationalen Hochleistungsrechenzentrum (NHR)
 - SDL Particle and Astroparticle Physics (**Max Fischer**)
 - COBaID, Lapis, TARDIS
 - SDL Earth System Science (**Ugur Cayoglu**)
 - SDL Engineering for Energy and Mobility (**Jordan Denev, Charlotte Debus**)
 - SDL Materials Science (**Ivan Kondov, Rossella Aversa**)

■ Master Thesis [Silke Donayre Holtz](#) (Computer Science): Climate Data Compression with Deep Convolutional Autoencoders



■ Collaboration of SCC, ITI (theoretical computer science), and IMK (climate institute)

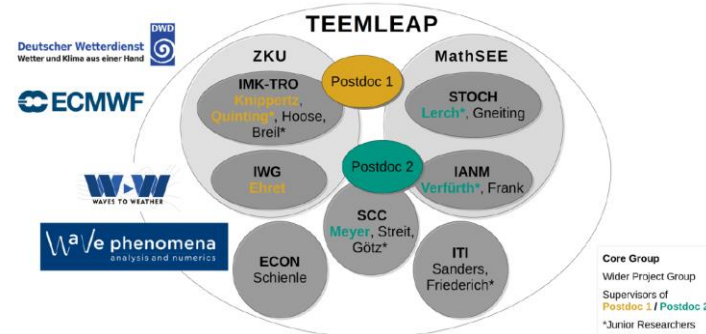
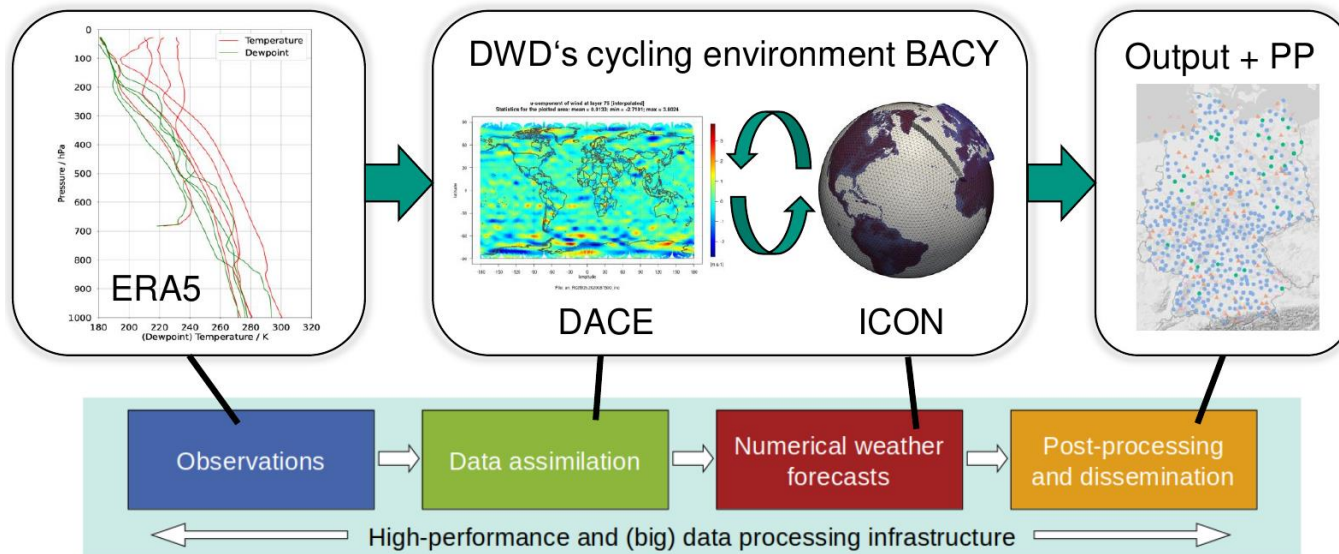
- PhD Thesis [Elnaz Azmi](#) (Computer Science, ongoing): Approximation and Optimization of Environmental Simulations in High Spatio-Temporal Resolution with Neural Networks



- Prediction of
- Long-term short-term memory (LSTM)
- PhD Thesis [Maqsood Mubarak Rajput](#) (Math, ongoing): Uncertainty Quantification in MECCA box models and ICON-ART

SDL ESS: TEEMLEAP

- A New Testbed for Exploring Machine Learning in Atmospheric Prediction
- Future Fields Stage 2 Project (ExU)



Mathematics

- **Martin Frank**, Computational Science and Mathematical Methods
- **Sebastian Krumscheid**, Junior Research Group Uncertainty Quantification
- <https://www.scc.kit.edu/en/aboutus/rg-csмм.php>
- Uncertainty Quantification
 - <https://www.helmholtz-uq.de/>

Quantum Machine Learning

- QML group headed by **Eileen Kühn**
- <https://www.scc.kit.edu/en/research/qc.php>
 - PhD Thesis (ongoing) by **Melvin Strobl** on Quantum Machine Learning in High Energy Physics

