

# DION HÄFNER

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I am a Physics graduate specialized on all things scientific computing, with industry experience in data processing and machine learning.

My main research interest is “human learning”: How can we build machines that teach us something about our physical world?

## Education

*Dec 2018 –* **PhD in Physical Oceanography @ University of Copenhagen**

*present* In my PhD project, I infer the relative importance of different hypothesized causes of extreme ocean waves (“rogue waves”) in the real world. To this end, I analyze over 1 Terabyte of observational data with data mining and probabilistic machine learning to extract robust, interpretable insights.

*Sep 2015 –* **Master of Science (MSc) in Physics @ Heidelberg University**

*Dec 2016* GPA of 1.2 (“very good”). Specialization in computational physics.

*Sep 2013 –* **Exchange semester @ KTH Stockholm**

*Apr 2014* Exchange semester during my Bachelor’s.

*Sep 2011 –* **Bachelor of Science (BSc) in Physics @ Heidelberg University**

*Sep 2015* GPA of 1.3 (“very good”). Bachelor’s thesis at Terrestrial Physics group, IUP Heidelberg: Implementing adaptive grid refinement into DORiE, a numerical PDE solver based on the DUNE framework.

## Professional Experience

*Sep 2017 –* **Software development specialist @ DHI GRAS**

*Dec 2018* At DHI GRAS, I built robust data pipelines, powerful statistical tools, and optimized remote sensing workflows.

*Jan 2017 –* **Scientific assistant @ Niels Bohr Institute**

*Aug 2017* I developed a full-blown, high-performance ocean model in pure Python. I was responsible for everything from the implementation of the numerics and the simulation framework, to quality assurance and documentation.

Jun 2014 – **Research assistant @ Institute of Environmental Physics**

Dec 2016 Working in a small team of developers on a numerical software suite. Using C++, Python, Git; responsibilities include specification, implementation, testing, and deployment.

## Programming and Technology

**ML frameworks** I am familiar with modern machine learning workflows and have good knowledge of scikit-learn, Tensorflow / Keras, PyMC3, and JAX.

**Python** I have both deep and broad experience within the Python ecosystem, especially concerning (but not limited to) **data analysis, machine learning, visualization, and scientific computing**.

I love working with the modern scientific Python stack and am well-versed with NumPy, SciPy, matplotlib, xarray, JAX, Numba, and Pandas.

**Other languages** Basic knowledge of object-oriented programming in C++, including debugging applications with GDB. Elementary knowledge of OpenCL / CUDA.

**Tools** Experience with tools handling version control (git), documentation (Sphinx, Doxygen), build systems (CMake), deployment (Docker), testing (pytest), GUI (Qt), continuous integration (Travis CI / Github Actions), typesetting ( $\text{\LaTeX}$ ).

I am comfortable working in all major operating systems, and am familiar with basic server administration tasks.

## Other Skills & Interests

- » Strong mathematical and analytical skills, and an affection for data
- » A knack for Bayesian data analysis: I like to make my assumptions and uncertainties explicit.
- » I am passionate about open-source software development, and am a frequent contributor to various projects on GitHub (github.com/dionhaefner).
- » A special interest in **effective communication** through writing, oral presentations, and data visualization. I take the quality of my publications seriously, and love to present my work.
- » **Languages:** German (native) , English (fully proficient) , Swedish (proficient) , Danish (elementary)

## Peer-reviewed Publications

- [1] Dion Häfner, Johannes Gemmrich, and Markus Jochum. “FOWD: A Free Ocean Wave Dataset for Data Mining and Machine Learning”. In: *Journal of Atmospheric and Oceanic Technology* (May 2021). DOI: 10.1175/jtech-d-20-0185.1. URL: <https://doi.org/10.1175/jtech-d-20-0185.1>.

- [2] Dion Häfner, Johannes Gemmrich, and Markus Jochum. “Real-world rogue wave probabilities”. In: *Scientific Reports* 11.1 (May 2021). DOI: 10 . 1038 / s41598 – 021 – 89359 – 1. URL: <https://doi.org/10.1038/s41598-021-89359-1>.
- [3] Dion Häfner and Filippo Vicentini. “mpi4jax: Zero-copy MPI communication of JAX arrays”. In: *Journal of Open Source Software* 6.65 (Sept. 2021), p. 3419. DOI: 10 . 21105 / joss . 03419. URL: <https://doi.org/10.21105/joss.03419>.
- [4] Lukas Riedel et al. “DORiE: A Discontinuous Galerkin Solver for Soil Water Flow and Passive Solute Transport Based on DUNE”. In: *Journal of Open Source Software* 5.52 (Aug. 2020), p. 2313. DOI: 10 . 21105 / joss . 02313. URL: <https://doi.org/10.21105/joss.02313>.
- [5] Dion Häfner et al. “Veros v0.1 – a fast and versatile ocean simulator in pure Python”. In: *Geoscientific Model Development* 11.8 (Aug. 2018), pp. 3299–3312. DOI: 10 . 5194 / gmd – 11 – 3299 – 2018. URL: <https://doi.org/10.5194/gmd-11-3299-2018>.

## Awards & Honors

- » (2021) Virtual Outstanding Student and PhD candidate Presentation (vOSPP) by European Geophysical Union

## References

<b>Markus Jochum</b>	<b>Gustau Camps-Valls</b>	<b>Johannes Gemmrich</b>
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