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 – present
PhD in Physical Oceanography @ University of Copenhagen
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 – Dec 2016
Master of Science (MSc) in Physics @ Heidelberg University
GPA of 1.2 ("very good"). Specialization in computational physics.

Sep 2013 – Apr 2014
Exchange semester @ KTH Stockholm
Exchange semester during my Bachelor's.

Sep 2011 – Sep 2015
Bachelor of Science (BSc) in Physics @ Heidelberg University
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 – Dec 2018
Software development specialist @ DHI GRAS
At DHI GRAS, I built robust data pipelines, powerful statistical tools, and optimized remote sensing workflows.

Jan 2017 – Aug 2017
Scientific assistant @ Niels Bohr Institute
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 – Dec 2016 **Research assistant @ Institute of Environmental Physics**
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 (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%2Fjtech-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%2Fs41598-021-89359-1.

[3] Dion Häfner, Roman Nuterman, and Markus Jochum. “Fast, cheap, & turbulent — Global ocean modelling with GPU acceleration in Python”. In: *Journal of Advances in Modeling Earth Systems* (Dec. 2021). DOI: 10.1029/2021ms002717. URL: https://doi.org/10.1029%2F2021ms002717.

[4] 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%2Fjoss.03419.

[5] 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%2Fjoss.02313.

[6] 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%2Fgmd-11-3299-2018.

Awards & Honors

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

References

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