Ashwin Vishnu **Mohanan**

Researcher · Software Developer

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Experience

Scientific Programmer

Mar. 2022 - present

SMHI — *Norrköping, Sweden*

- Responsible for developing `Dawsonia`, an AI/ML and image-processing tool for digitization of tabular data.
- Secured HPC allocation at LUMI, Finland and collaborated remotely with international users.
- Participated in AI strategy meetings and as mentor in a Python study group.
- Responsible for operationalizing hydrological models representing Sweden, Europe and the World and generating statistical and visualization products.
- Worked within an agile team of 4 software developers and interacted with domain experts, product owners and stake-holders, with frequent meetings.
- Introduced unit-tests and continuous integration, and raised code-coverage of an existing component from 0 to 60%.
- Helped identify, profile and optimize performance bottlenecks in several operational codes.
- Created 2 modular replacements to legacy code components. One of this will execute `Hype` the hydrological forecast model in the near future.

Postdoctoral Researcher

Oct. 2019 - Jan. 2022

Stockholm University — *Stockholm, Sweden*

- Responsible for developing a computational fluid dynamics model for the Atmospheric Boundary Layer using Fortran code `Nek5000`.
- Worked within a multi-disciplinary team comprising of researchers with applied mathematics, meteorology and engineering backgrounds.
- Created Python package `snek5000` as a scriptable framework to manage simulations. Made a post-processing Python package `pymech` 100 times faster & added user-friendly functions. Both packages are reused by other researchers and students.
- Conducted an online mini-workshop on boosting Python performance.
- Volunteered as a workshop helper to a Coderefinery training event in Karolinska Institute.
- Got certified as a Software Carpentry instructor.

Visiting Researcher

May 2016 - Jul. 2016

Université Grenoble Alpes — *Grenoble, France*

- Responsible for executing $\sim$ 100 laboratory experiments on a 13-metre wide rotating water tank which mimics ocean turbulence and developing software for measuring velocities by post-processing terabytes of images.
- Co-developed a new Python package `fluidimage`, an open-source, parallelized framework for processing large sets of images.

Graduate Engineer Trainee

Jul. 2011 - Jun. 2012

GS Engineering and Construction India, Pvt. Ltd. — *Delhi NCR, India*

- Responsible for preparing piping layouts and bill of materials.
- Gained experience working as a team in a corporate setting and completing targets in short projects.

Education

Ph.D. in Engineering Mechanics

Oct. 2014 - Sept. 2019

KTH Royal Institute of Technology — *Stockholm, Sweden*

- Studied turbulence in the atmosphere and the ocean.
- Core developer for FluidDyn project — a collection of open-source packages for research and teaching.
- Co-created Python package `fluidsim` — one of the fastest pseudo-spectral Python CFD codes available today.
- Practiced open-science and followed FAIR-software principles.
- Relevant courses: Turbulence, Advanced Compressible Flows, Geophysical Fluid Mechanics, General Circulation.

M. Tech. in Aerospace Engineering (Aerodynamics)

Aug 2012 - May 2014

Indian Institute of Technology (IIT), Kanpur — *Kanpur, India*

- First introduction to research, computational sciences, numerical methods and HPC.
- Relevant courses: Introduction to scientific computing, Advanced computational fluid mechanics.

Skills

Languages	English, Swedish (CEFR B2 level), Malayalam, Hindi
Scientific Domains	Computational fluid dynamics, turbulence, geophysical flows, boundary layers, image-processing
Programming Languages	Python, Fortran, C, C++, Rust, Nix, Lua, Awk, LaTeX, Bash, HTML, CSS, Javascript
Programming Skills	High performance computing, Object-oriented programming, Functional programming, Version control, Visualization, Shell scripting, Continuous integration, Agile development, Test driven development, Code coverage, Python packaging, GUI designing with Qt, REST API, Artificial intelligence, Machine learning
Python packages	Standard library, NumPy, SciPy, mpi4py, Cython, Pythran, Numba, Dask, requests, Jupyter, IPython, Matplotlib, h5py, h5netcdf, xarray, Sympy

Other Achievements

Science communication

Apr 2015 - July 2023

Through outreach and curation — *Internet*

- Creator and moderator of `reddit.com/r/FluidMechanics`, a community of approximately 13000 users, facilitating news and discussions around fluid mechanics.

Open-science

Aug 2014 - Present

Through open-source, open-data, open-access — *Internet*

- Volunteered as reviewer for the Journal of Open Source Software.
- Active participation in open-source projects in the form of development, bug reports, pull requests and code-review.
- Complete list of software projects available at `https://fluid.quest/pages/software.html`

Certificates & Awards

2021	**Certified instructor,** Software Carpentry	*Online and offline*
2014	**317/340,** Graduate Record Examinations (GRE)	*Delhi NCR, India*
2014	**110/120,** Test Of English as a Foreign Language (TOEFL)	*Delhi NCR, India*
2011	**All India Rank 390,** Graduate Aptitude Test in Engineering (Mechanical)	*India*
2007	**School topper, A1 grade in all subjects,** All India Secondary School Certificate Examination (AISSCE)	*India*

Research

Dissertation

Advancements in Stratified Flows through Simulation, Experiment and Open Research Software Development

Ashwin Vishnu Mohanan

PhD thesis, 2019

Selected Articles

Snek5000: a new Python framework for Nek5000

Ashwin Vishnu Mohanan, Arman Khoubani, Pierre Augier

Journal of Open Source Software 8.88 (Aug. 24, 2023) p. 5586

Reducing the Ecological Impact of Computing through Education and Python Compilers

Pierre Augier, Carl Friedrich Bolz-Tereick, Serge Guelton, Ashwin Vishnu Mohanan

Nature Astronomy 5.4 (Apr. 2021) pp. 334–335. Nature Publishing Group

FluidFFT: Common API (C++ and Python) for Fast Fourier Transform HPC Libraries

Ashwin Vishnu Mohanan, Cyrille Bonamy, Pierre Augier

Journal of Open Research Software 7.1 (Apr. 2019) p. 10

FluidSim: Modular, Object-Oriented Python Package for High-Performance CFD Simulations

Ashwin Vishnu Mohanan, Cyrille Bonamy, Miguel Calpe Linares, Pierre Augier

Journal of Open Research Software 7.1 (Apr. 2019) p. 14

Selected Conferences

Make Your Python Code Fly at Transonic Speeds!

Ashwin Vishnu Mohanan

PyCon Sweden, 2019, Stockholm