Ashwin Vishnu **Mohanan**

Researcher · Software Developer

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Experience

Stockholm University — *Stockholm, Sweden*

Researcher — *Oct. 2019 - Jan. 2022*

- Project: Improving boundary conditions and turbulence models for simulation of atmospheric boundary layer (ABL) flows.
- Made Python package `pymech` 100 times faster & added user-friendly functions.
- Developed an ABL solver using spectral element code Nek5000.
- Created Python package `snek5000` as a scriptable framework for Nek5000.
- Worked within a multi-disciplinary team comprising of researchers with applied mathematics, meteorology and engineering backgrounds.

Université Grenoble Alpes — *Grenoble, France*

Visiting Researcher — *May 2016 - Jul. 2016*

- Hands-on experience with experimental fluid dynamics and Particle Image Velocimetry (PIV).
- Development of a new package FluidImage, a libre framework for scientific treatments of large sets of images.

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

Graduate Engineer Trainee (Piping) — *Jul. 2011 - Jun. 2012*

- First job as an engineer.
- Prepared material take-off and isometric drawings of piping lines for various oil refineries.

Education

KTH Royal Institute of Technology — *Stockholm, Sweden*

Ph.D. in Engineering Mechanics — *Oct. 2014 - Sept. 2019*

- Co-created Python package `fluidsim` — one of the fastest pseudo-spectral Python CFD codes with performance similar to compiled codes.
- Core developer for FluidDyn project — a collection of open-source packages for research and teaching.
- Simulated shallow water models to study geophysical turbulence with focus on energy cascade and wave-vortex interactions.
- Relevant courses: Turbulence, Advanced Compressible Flows, Geophysical Fluid Mechanics, General Circulation.

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

M. Tech. in Aerospace Engineering (Aerodynamics) — *Aug 2012 - May 2014*

- Thesis: Mixed convection instablities with and without Boussinesq approximation.
- Experience in developing accurate finite-difference schemes, and analysing numerical error dynamics.
- Relevant courses: Introduction to scientific computing, Advanced computational fluid mechanics.

Skills

Natural Languages	English, Malayalam, Hindi, Swedish (B1 level)
Scientific Domains	Fluid dynamics, turbulence, geophysical flows, boundary layers
Scientific Computing	Numerical methods, Finite difference, Spectral methods
Programming Languages	Python, Fortran, C, C++, Awk, LaTeX, Bash, HTML, CSS and several GNU/Linux commands
Programming Skills	High performance computing, Object-oriented programming, Functional programming, Version control, Visualization, Continuous integration, Testing, Code Coverage, Python packaging, GUI designing with Qt, Basic web development
Python packages	Standard library, NumPy, SciPy, mpi4py, Cython, Pythran, Numba, Dask, requests, Jupyter, IPython, Matplotlib, h5py, h5netcdf, xarray, Sympy

Extracurricular Activity

Software Carpentry — *Online and offline*

Certified instructor — *Nov 2021 - Present*

- Trained to teach and organize workshops using the Carpentries course material

Outreach and science communication — *Reddit*

Creator and moderator of reddit.com/r/FluidMechanics — *Apr 2015 - Present*

- An active community of approximately 7500 users, facilitating news and discussions around fluid mechanics.

Open-science through open-source, open-data, open-access — *Internet*

Developer and contributor — *Aug 2014 - Present*

- Active participation in GitHub and open-source software in the form of development, bug reports, pull requests and code-review.
- Maintainer of a handful of packages in Python Package Index (PyPI), conda-forge and Arch Linux User Repository (AUR).
- Complete list of software projects available at `https://fluid.quest/pages/software.html`

Certificates & Achievements

2017	**Student travel grant,** American Geophysical Union (AGU) Fall Meeting	*New Orleans, USA*
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

Pymech: A Python Package for Nek5000 and Simson

Ashwin Vishnu Mohanan, Guillaume Chauvat, Vitor Kleine, Nicolo Fabbiane, Jacopo Canton

Journal of Open Source Software In preparation (2022)

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

FluidDyn: A Python Open-Source Framework for Research and Teaching in Fluid Dynamics by Simulations, Experiments and Data Processing

Pierre Augier, Ashwin Vishnu Mohanan, Cyrille Bonamy

Journal of Open Research Software 7.1 (Apr. 2019) p. 9

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

FluidImage, a Libre Framework for Scientific Treatments of Large Sets of Images

Pierre Augier, Cyrille Bonamy, Antoine Campagne, Ashwin Vishnu Mohanan

Congrès Francophone de Techniques Laser (CFTL), 2016