

Akshay Patil

I am a Postdoctoral Researcher in the **3D Geoinformation** group at Delft University of Technology, specializing in environmental fluid mechanics. My work focuses on understanding hydrodynamics over complex surfaces using advanced computational methods. This research spans **coastal engineering, turbulence dynamics, urban fluid dynamics, and computational fluid mechanics**. I am also dedicated to promoting diversity in STEM and making science accessible through inclusive outreach and community engagement.

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EDUCATION

Ph.D., Civil & Environmental Engineering Environmental Fluid Mechanics Stanford University, Stanford, CA, USA	Sept. 2019 - Jan. 2023
MSc., Hydraulic Engineering Environmental Fluid Mechanics Delft University of Technology, Delft, NL	Sept. 2017 - Aug. 2019
B.E., Civil & Environmental Engineering University of Pune, Pune, IND	Jun. 2012 - Jun. 2016

RESEARCH

Postdoctoral Researcher, Delft University of Technology 3D Geo-information research group Research Focus - Environmental flows interacting with complex roughness morphology Collaborators - Clara Garcia-Sánchez, Hugo Ledoux, Pedro Costa, Wim Uijtewaal, Bernhard Vowinckel (TU Dresden)	Mar. 2023 - Current
Graduate Research Assistant, Stanford University Bob and Norma Street Environmental Fluid Mechanics Laboratory Thesis Topic - Direct numerical simulations of wave-current boundary layer over rough walls Committee Members - Oliver Fringer, Stephen Monismith, and Catherine Gorlé	Sept. 2019 - Jan. 2023
Visiting Student, University of Western Australia UWA Oceans Institute, Perth, WA, Australia Thesis Topic - Numerical investigation of nearshore wave transformation and surf-zone hydrodynamics Committee Members - Ad Reniers, Jeremy Bricker, Ryan Lowe, Niels Jacobsen, Chris Lashley, and Patrick Oosterlo	Jun. 2019
Graduate Intern, Arcadis B. V. Rivers, Coasts, and Infrastructure, Zwolle, The Netherlands Research Topic - Numerical investigation of the discharge coefficient for an intake sluice Advisor - Dr. Arjan Tuijnder	Nov. 2018 - Jan. 2019
Undergraduate Researcher, University of Pune Central Water and Power Research Station, Pune, India Thesis Topic - Numerical investigation of discharge capacity of an orifice spillway Committee Members - Sachin Khandekar, Maruti Bhajantri, and Amit Kulhare	Jun. 2015 - Jun. 2016

PROFESSIONAL ACTIVITIES

Academic Reviewer Duties

1. Results in Engineering	2023 - Current
2. Royal Society A: Mathematical, Physical and Engineering Sciences	2023 - Current
3. Journal of Geophysical Research: Oceans	2024 - Current
4. Coastal Engineering Journal - Taylor & Francis	2024 - Current
5. Building & Environment	2024 - Current

Workshops - Organised

1. GeoGeeks - Geomatics, Delft University of Technology	Nov. 2023
2. IDEA taskforce - Diversity and Social Safety Event: Speed Survey - Delft University of Technology	Jan. 2024
3. IDEA taskforce - Departmental Social Safety Training Lunch - Delft University of Technology	May. 2024

Workshops - Participation

1. OpenFOAM training - Delft University of Technology	Apr. 2019
2. Fluid Dynamics of Sustainability and Environment - Paris, France	Jul. 2022
3. Gerhard Jirka Summer School - Dresden, Germany	Jul. 2023
4. JMBC - Turbulence - Delft University of Technology	Nov. 2023
5. JMBC - Particle-Methods - Eindhoven University of Technology	Jan. 2024
6. Women's Day Celebration Quiz Winning Team - Delft University of Technology	Mar. 2024
7. CFDPar School - Gran Sasso Science Institute	July. 2024

Invited Talks

- **Patil, A.**, and Fringer, O., Direct numerical simulations of wave-current boundary layers over bumpy walls, Western Coastal Collaboratorium Seminar, University of Washington, Seattle, WA, USA *Apr. 2022*
- **Patil, A.** and García-Sánchez, C., How CFD engineers use Geomatics information to predict wind and dispersion?, Urban Data Science meet with Dutch Kadaster, Delft University of Technology, The Netherlands *May 2024*
- **Patil, A.**, Understanding the Turbulence Dynamics in Environmental Flows with Complex Roughness, Barcelona Super Computing Center, Barcelona, Spain *Sept. 2024*
- **Patil, A.** and García-Sánchez, C., Quantifying the impact of varying geometric level of detail in multi-directional urban RANS simulations tailored for urban air-mobility viability, Wind Engineering Symposium, Dutch-Flemish Wind Engineering Association, Delft University of Technology, The Netherlands *Dec. 2024*

Visiting Fellowships

- **University of Western Australia** - Fully funded research visit supported by Prof. R. Lowe, Oceans Department, UWA, Perth, Australia *Jun. 2019*

Professional Memberships

- **Young Professional** - International Association of Hydro-Environment Engineering Research *2023 - Current*
- **Research Affiliate (Breathe Lab)** - Delft Computational Science and Engineering *2023 - Current*
- **Research Affiliate (Breathe Lab)** - J. M. Burgers Centrum, Delft University of Technology *2023 - Current*

RESEARCH FUNDING**XSEDE Computing Grant, Stanford University***Jan. 2021 - Dec. 2021*

Direct numerical simulations of wave-current interactions over hydraulically smooth and rough walls: Compute grant equivalent to \$409,340 for conducting research on the stampede2 computing cluster at the University of Texas, USA.

Role: Named researcher* - Developed the research plan along with a proposal that ensured feasibility and scientific novelty as part of the PhD research.

NWO small compute grant, SURFSara, NL (0.4 Million CPU hours)*May 2023 - May 2024*

Unraveling the Turbulence Dynamics: Investigating Wave-Induced Turbulence over Corals: Small compute grant for the TURBOCOR project supported by the NWO equivalent to €6,400.

Role: Named Researcher* - Primary lead for the development of the research plan and drafting of the proposal which ensured successful funding.

NWO large compute grant, SURFSara, NL (4 Million CPU hours)*Sept. 2024 - Sept. 2026*

Large compute grant titled "Multi-fidelity computational modelling of environmental fluid systems" supported by the NWO equivalent to €64,000.

Role: Named Researcher* - Led the development of the successful funding proposal in addition to conceptualizing the research direction, drafted the main proposal document, developed the research plan, ensuring technical feasibility in collaboration with the peers involved.

*Applications to these funding calls cannot be made without a permanent position at the university. Consequently, the Dutch academic funding routes consider post-doctoral ineligible to be principal investigators.

TEACHING EXPERIENCE**CEE 101B: Mechanics of Fluids (Undergraduate), Stanford University***Aug. 2021 - Dec. 2021*

Role: Teaching Assistant - Prepared and taught supplementary sessions every week for a class size of 11 students. Held weekly office hours and graded the problem sets. Designed midterm and final exams in coordination with the professor.

CEE 262C: Coastal Ocean Modelling (Postgraduate), Stanford University*Mar. 2022 - Jun. 2022*

Role: Teaching Assistant - Held review sessions, weekly office hours and programming recitations for a class size of 6 students. Mentored with programming exercises and graded the problem sets.

CEE 101B: Mechanics of Fluids (Undergraduate), Stanford University*Aug. 2022 - Dec. 2022*

Role: Teaching Assistant - Prepared and taught supplementary sessions every week for a class size of 15 students. Held weekly office hours and graded the problem sets. Designed midterm and final exams in coordination with the professor.

GEO 5015: Modelling Wind and Dispersion in Urban Environments (Postgraduate), TU Delft*Apr. 2023 - Jun. 2023*

Role: Teaching Assistant & Instructor - Prepared about 10% of the lectures and supported all the lab sessions for a class size of 10 students.

ENV 1800: Atmospheric measurements and modelling (Postgraduate), TU Delft*Feb. 2024 - Apt. 2024*

Role: Teaching Assistant & Instructor - Prepared about 10% of the lectures and supported all the lab sessions for a class size of 4 students. In addition to the teaching responsibilities, also responsible for grading project work and lab reports.

MENTORSHIP

PhD mentorship

- C. Yan Toe (ongoing - PhD, CiTG, TU Delft) - Turbulence resolved simulations of flow under plastic debris carpets, *Primary Role*: Support and advice on aspects pertaining to computational fluid dynamics as well as drafting the research plan and scientific writing, *Supervising Team*: Prof. W. Uijtewaal (Promoter), Asst. Prof. D. Wüthrich, Asst. Prof. P. Costa, Dr. B. Hardy, and **Dr. A. Patil** Aug. 2024 - Current

MSc mentorship

- J. van Gorsel (MSc., CiTG, TU Delft) - Numerical analysis of broken regular wave forces on a shoal-mounted cylinder, *Primary Role*: Weekly supervisor with a focus on computational fluid dynamics, *Supervisory Team*: Assoc. Prof. A. Antonini (Chair), Assoc. Prof. J. Bricker, Asst. Prof. S. Pearson, and **Dr. A. Patil** May. 2020 - May. 2021
- S. Zhang (MSc., ME, TU Delft) - Development of a Large-Eddy Simulation model for flows over urban areas, *Primary Role*: Advice on using the computational fluid dynamics framework and scientific advice, *Supervisory Team*: Prof. W. P. Breugem (Chair), Prof. P. Costa, Prof. S. de Roode (external examiner), and **Dr. A. Patil** Mar. 2023 - Dec. 2023
- E. Forte (MSc., CiTG, TU Delft) - Experimental and numerical study on the impact of tsunami waves on composite breakwaters, *Primary Role*: Weekly supervision on all aspects of the thesis, *Supervisory Team*: Assoc. Prof. A. Antonini (Chair), Asst. Prof. D. Wüthrich, and **Dr. A. Patil** Feb. 2024 - Aug. 2024
- O. Post (MSc., BK, TU Delft) - The City Stack: A Morphology Based City Analysis and Generation Framework, *Primary Role*: Designed and proposed the research project along with weekly supervision and advising, *Supervisory Team*: Assoc. Prof. H. Ledoux (Chair), **Dr. A. Patil**, and Asst. Prof. C. Forgaci Dec. 2023 - Nov. 2024
- G. Brouwer (MSc., BK, TU Delft) - Automated Data-Driven Generation of 3D Coral Reef Models: Assessing and Integrating Empirical Data Sources, *Primary Role*: Designed and proposed the research project along with weekly supervision and advising, *Supervisory Team*: Assoc. Prof. H. Ledoux (Chair), **Dr. A. Patil**, and Ir. E. Verbree Nov. 2023 - Nov. 2024
- E. Kalitsounakis (ongoing - MSc., CiTG, TU Delft) - Effect of Urban Morphology on wind flow using a Large-Eddy Simulation framework, *Primary Role*: Designed and proposed the research project along with weekly supervision and advising, *Supervisory Team*: Asst. Prof. C. García-Sánchez (Chair) and **Dr. A. Patil** Dec. 2024 - Current
- B. Manden (ongoing - MSc., BK, TU Delft) - Effect of voxelisation using a Reynolds-Averaged Navier-Stokes simulations, *Primary Role*: Designed and proposed the research project along with weekly supervision and advising, *Supervisory Team*: Asst. Prof. C. García-Sánchez (Chair), **Dr. A. Patil**, and Ir. J. van der Vaart Dec. 2024 - Current

PUBLIC ENGAGEMENT & OUTREACH

SURA Graduate Mentorship Program, Stanford University

Sept. 2020 - Jun. 2021

Mentored two prospective graduate students at the Civil & Environmental Engineering department

Seminar Co-convener, Stanford University

Jun. 2020 - Jun. 2021

Organised and managed the Environmental Fluid Mechanics seminar series along with another colleague at the Civil & Environmental Engineering Department, Stanford University, USA.

Inclusion, Diversity, Equality, and Accountability (IDEA) Committee

2023 - Current

Co-founder of the working group engaged with various aspects of promoting IDEA within the 3DGeoInformation research group and the section of Urban Data Science at the Faculty of Architecture and the Built Environment ([IDEA-Webpage-3DGeoInfo](#))

3DTea@UDS, Delft University of Technology

2023 - Current

Organise and manage the 3DTea@UDS seminar series in the Urban Data Science section, Faculty of Architecture and the Built Environment, Delft University of Technology, NL.

ACADEMIC SERVICE

Delft Young Academy, PoC Faculty of Architecture and the Built Environment

2024 - Current

Satellite point of contact at the Faculty of Architecture and the Built Environment for the Delft Young Academy. My primary responsibilities are to act as a facilitator between the academy and the faculty.

PhD Interview Panel - Project UrbanAIR

Dec. 2024

Part of the 4-person PhD interview panel aimed at recruiting a research scholar for the UrbanAIR funding call.

PERSONAL DEVELOPMENT

University Teaching Qualification - Delft University of Technology

2023 - Current

Completed the *DEVELOP*, *SUPERVISE*, and *ASSESS* modules as part of the University Teaching Qualification (UTQ) at the Delft University of Technology. Completing the four modules certifies the instructor to develop course modules at the MSc. level within the 4TU education system. Anticipated competition May 2025.

MPI programming (DCSE) - Delft University of Technology

23 Nov. 2023

This one-day course was educational to further the understanding of developing compute- and memory-efficient parallel code using C, C++, and Fortran.

PUBLICATIONS

Refereed Papers

Patil, A., and Fringer, O. (2022). Drag enhancement by the addition of weak waves to a wave-current boundary layer over bumpy walls. *Journal of Fluid Mechanics*, 947, A3

Patil, A., and Fringer O., (2023), Characterizing the Roughness in Channel Flows Using Direct Numerical Simulations. *Journal of Hydraulic Engineering*, 149(11), 04023049.

Refereed Conference Publications

Patil, A., Mudiyansele, S. D., Bricker, J., Uijtewaal, W., Keetels, G., (2018), Effect of overflow nappe non-aeration on tsunami breakwater failure, *Coastal Engineering Proceedings*, 36, 18-18

Conference Abstracts

van Gorsel, J., **Patil, A.**, Bricker, J., Pearson, S., Raby, A., Dassanayake, D., Antonini, A. (2021), Numerical Investigation of breaking and broken regular wave forces on a shoal-mounted cylinder

Patil, A., and C. García-Sánchez, (2024), Understanding the impact of varying geometry level of detail in multi-direction urban RANS simulations tailored for urban air-mobility viability, *EMS Annual Meeting*, Barcelona, Spain,

Thesis

Patil, A., (2019), Numerical investigation of nearshore wave transformation and surf-zone hydrodynamics (MSc Thesis)

Patil, A., Fringer O., Gorle C., Monismith S., and Stanford University (2023), Direct numerical simulations of wave-current interactions over bumpy walls (PhD Thesis)

Patil, A., Fringer O., Gorle C., Monismith S., and Stanford University (2023), Direct numerical simulations of wave-current boundary layer over rough walls. Stanford Digital Repository [Numerical Dataset]

Manuscripts under review

Patil, A. and C. García-Sánchez, (in review, [Physics of Fluids](#)), Synthetic turbulence to achieve swift converged turbulence statistics in a pressure-driven channel flows

Patil, A., C. García-Sánchez, (in review, [JGR: Oceans](#)), Hydrodynamics of In-Canopy Flow in Synthetically Generated Coral Reefs Under Oscillatory Wave Motion.

Patil, A., U. C. K. Paranjothi, and C. García-Sánchez, (in review, [SoftwareX](#)), GenSDF: An MPI-Fortran based signed-distance-field generator for computational fluid dynamics applications.

Patil, A., C. García-Sánchez, (in review, [Building & Environment](#)), Understanding the impact of varying level of detail in urban areas on the wind prediction capabilities using Reynolds-averaged Navier-Stokes models with a focus on urban air-mobility viability.

Open-Source Software

Patil, A. and C. García-Sánchez, (2024). riskMap: Initial Release (0.1.0). Zenodo. <https://doi.org/10.5281/zenodo.11207890>

Patil, A. and C. García-Sánchez, (2024). Synthetic Turbulence Field Generator, <https://github.com/AkshayPatil1994/Synthetic-Eddy-Method-KCX2013>

Patil, A., U. C. K. Paranjothi, and C. García-Sánchez, (2024). GenSDF: Signed-Distance-Field Generator, <https://github.com/AkshayPatil1994/GenSDF>

COMPUTATIONAL COMPETENCIES

- **Programming** - Fortran, C, C++, Python, MPI (CPU), CUDA (GPU), Git, \LaTeX
- **Computational Fluid Dynamics** - OpenFOAM, CaNS, uDALES, CP3D, Nek5000

REFERENCES

Prof. Jantien Stoter (Post-doctoral Mentor)
Delft University of Technology | ✉ j.e.stoter@tudelft.nl

Asst. Prof. Clara García-Sánchez (Post-doctoral Advisor)
Delft University of Technology | ✉ c.garcia-sanchez@tudelft.nl

Prof. Oliver Fringer (PhD Advisor)
Stanford University | ✉ ofringer@stanford.edu

Assoc. Prof. Jeremy Bricker (MSc. Thesis Advisor)
University of Michigan | ✉ jeremydb@umich.edu