

NARAYAN KUMAR

PhD Candidate and Research Assistant - Centre of Applied Coastal Research (CACR)

Civil, Construction and Environmental Engineering, University of Delaware, Newark, DE, United States

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DEGREES

- **Ph.D. in Civil Engineering (Coastal Engineering)** — University of Delaware, Newark, DE, USA (Expected Aug. 2027)
CGPA: 3.63/4.0 | Focus: CFD modeling of wave breaking and sediment transport
- **M.Sc. in Marine Technology (Hydrodynamics for Ocean Eng.)** — École Centrale Nantes, Nantes, France (June 2022)
Specialization: Fluid Mechanics, Marine Hydrodynamics, Computational Fluid Dynamics
- **B.Tech. in Mechanical Engineering** — National Institute of Technology, Agartala, India (June 2016)
CGPA: 8.85/10.0 | Focus: Fluid Dynamics, Hydraulic Machines, Thermodynamics

NARRATIVE OF RESEARCH EXPERIENCE

My research expertise centers on coastal hydrodynamics, sediment transport mechanics, nearshore wave breaking, and computational fluid dynamics (CFD) modeling. At the University of Delaware's Center for Applied Coastal Research, I develop high-fidelity numerical experiments utilizing a three-phase CFD solver (SedinterFoam) coupled with Volume of Fluid (VOF) surface wave models to quantify cross-shore morphodynamics and swash zone processes. In addition, I am integrating machine learning algorithms to predict swash zone wave dynamics directly from offshore wave parameters.

During my summer research residency at the U.S. Army Engineer Research and Development Center (ERDC) Coastal and Hydraulics Laboratory, I executed large-scale wave flume experiments investigating wave-swash interactions of consecutive solitary waves over sloping beach profiles (1/30). This work involved deploying advanced instrumentation—including Acoustic Doppler Vectrino Profilers (ADVP), Optical Backscatter Sensors (OBS), Conductivity Concentration Profilers (CCP+), and LIDAR bed profiling—to bridge experimental measurements with refined numerical model parameterization.

HISTORY OF EMPLOYMENT

- **Graduate Research Assistant** | University of Delaware, Newark, DE, USA (Aug. 2022 – Present)
Conducting CFD modeling (SedinterFoam) and machine learning research for coastal swash dynamics.
- **Summer Researcher** | U.S. Army Engineer Research & Development Center (ERDC), Vicksburg, MS (May 2025 – July 2025)
Executed coastal wave flume experiments and multi-sensor hydrodynamic data collection.
- **Community Science Fellow** | American Geophysical Union (AGU) - Thriving Earth Exchange (Feb. 2024 – Aug. 2025)
Led community science initiatives, defining project scopes and flood monitoring protocols.
- **Science & Technology Intern** | American Shore and Beach Preservation Association (ASBPA) (Dec. 2023 – Aug. 2024)
Supported Science & Tech Committee and maintained national beach nourishment database.
- **Senior Engineer (Production Engineering)** | Subros Limited, Noida, India (July 2016 – Sep. 2021)
Led process engineering, CapEx execution, cycle-time optimization, and emergency COVID ventilator production line setup.

LIST OF KEY PUBLICATIONS & CONFERENCE ABSTRACTS

- Kumar, N., Tsai, B., Mathieu, A., Hsu, T.-J., & Puleo, J. A. 'Cross-shore beach profile evolution driven by successive breaking waves in the swash Zone.' (In Preparation).
- Kumar, N., Tsai, B., Mieras, R. S., Manat, O., Hsu, T.-J., & Puleo, J. A. (2026). 'Studying Wave Swash Interaction on Cross-Shore Beach Profile Evolution Using SedinterFoam.' 39th International Conference on Coastal Engineering (ICCE).
- Kumar, N., & Gupta, K. (2025). 'Phase-Resolving Non-Hydrostatic 3D Wave Models and Coastal Resilience: A Comprehensive Review.' Indian National Conference on Coastal, Harbour and Ocean Engineering (INCHOE).

- Kumar, N., Mathieu, A., Tsai, B., Hsu, T.-J., Puleo, J. A., & Chauchat, J. (2024). 'SedInterFoam: A Multi-phase Numerical Model for Sediment Transport and Its Application to Swash Zones.' 38th International Conference on Coastal Engineering (ICCE).

HONORS, FELLOWSHIPS & AWARDS

- MTS EMERGE Program Cohort Member (Marine Technology Society), 2025 & 2026
- Recipient, 39th International Conference on Coastal Engineering (ICCE) Student Scholarship (\$2,000), 2026
- Recipient, PADI Foundation Research Grant (\$5,000), 2025
- Selected Fellow, Summer Founders Cohort (\$10,000), Venture Development Center, University of Delaware, 2025
- Awardee, Nicholas Kraus Coastal Scholar Award (\$600), ASBPA National Coastal Conference, 2023
- Selected WEDA Fellow (\$12,500), Western Dredging Association, 2023
- Recipient, Centrale Nantes Elite Scholarship for Outstanding International Students, 2021

PROFESSIONAL SOCIETY MEMBERSHIPS

American Geophysical Union (AGU) – Student Member (Since 2024); American Physical Society (APS) – Student Member (Since 2023); American Shore & Beach Preservation Association (ASBPA) – Student Member (Since 2023); American Society of Civil Engineers (ASCE) – Student Member (#000012310391, Since 2022); The Hydrographic Society of America (THSOA) – Student Member (#1520, Since 2024); Western Dredging Association (WEDA) – Student Member (Since 2023); Society for Industrial and Applied Mathematics (SIAM) – Graduate Student Member (#020996908, Since 2023); Institute of Marine Engineering, Science & Technology (IMarEST) – Student Member (Since 2021)