SHAGUN AGARWAL

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Website [↗] | Google Scholar [↗] | Scopus [↗] | ResearchGate [↗]

EDUCATION

Indian Institute of Technology Madras (Jul 2017 – Aug 2022)
PhD in Ocean Engineering
Thesis: Wave-structure interaction by coupled Boussinesq (FEM) and Navier-Stokes (particle-based) models in 3D

Indian Institute of Technology Madras (Jul 2015 – Jul 2017)
Master of Technology in Applied Mechanics (Dual Degree)
CGPA: 8.72/10
Thesis: Numerical Investigation of Fluid-Structure Interaction Using Immersed Boundary Method

Indian Institute of Technology Madras (Jul 2012 – Jul 2017)
Bachelor of Technology in Naval Architecture and Ocean Engineering (Dual Degree)
CGPA: 8.71/10, Minor in Systems Engineering

SKILLS

Programming: FORTRAN (Advanced) / C/C++ (Advanced) / OpenMP (Advanced) / Python (Intermediate) / OpenACC (Intermediate) / MPI (Basic)

Numerical methods: Finite Element Method (Advanced) / Meshless Local Petrov-Galerkin Method (Advanced) / Finite Difference Method (Intermediate) / SPH (Basic)

Simulation: ANSYS Fluent (Intermediate) / STAR-CCM+ (Intermediate) / OpenFOAM (Basic)

Analysis and Presentation: MATLAB (Intermediate) / Mathematica (Intermediate) / Paraview (Intermediate) / Tecplot (Basic) / Inkscape (Basic)

Others: LaTeX (Advanced) / MS Office (Intermediate) / git (Intermediate) / Raspberry Pi and Arduino Microcontroller (Intermediate) / AutoCAD (Basic)

EXPERIENCE

PMRF Research Fellow — Indian Institute of Technology Madras (Jul 2017 – Aug 2022)
Guided by Dr V. Sriram [↗] and Prof K. Murali [↗]

- Developed 3D particle-based model for viscous flow for studying wave-structure interaction. Validated against experimental results on interaction of structure with steep focusing waves.
- Developed 2D FEM model for 2DH potential flow equations for near-shore wave-transformation. Validated against field results. Demonstrated real-world application to ship-generated waves.
- Implemented and validated 3D coupling between the two models for large-domain hybrid simulations. Validated the hybrid model against experimental and numerical references.
- Coordinated comparative study of 20+ numerical models organised by Dr Sriram for ISOPE-2020. Processed experiment results. Compiled, analysed, compared all numerical submissions.

Visiting Researcher — City, University of London (Feb 2022 – Jun 2022)
Guided by Prof Shiqiang Yan [↗] Funded by SPARC

- Implement QSFDI technique for improved gradient calculation across MLPG_R model.
- Large-eddy simulation of solitary wave dissipation by wave-vegetation interaction.
- Selected for CCP-WSI Hackathon at Univ. of Exeter for incorporating UKRI-STFC's MUI library.

Visiting Researcher — City, University of London (Jun 2019 – Oct 2019)
Guided by Prof Shiqiang Yan [↗] Funded by DST-UKIERI

- Devised and implemented semi-analytical integration technique for 3D MLPG_R method.
- Validated the particle-based model for interaction of cylinder with regular and focusing waves.
- Studied wave-structure interaction through simulations using hybrid qaleFOAM code and UCL's Hydro3D LES turbulence modelling code.
- Joined CCP-WSI community and participated at 1st CCP-WSI Hackathon in Portaferry, UK

Part-time Consultant — Planys Technologies, India [↗] (Jun 2018 – Mar 2019)

- Design and physical testing of Kaplan series screw propellers for commercial underwater ROV.
- Obtained 80N thrust from 100mm propeller using 500W motor, competitive with market options.

Graduate Research Assistant — IIT Madras (Mar 2016 – Jun 2017)
Guided by Prof K. Murali [↗] and Dr K. Arul Prakash [↗]

- Developed 2D FEM model for viscous flow and implemented IBM for fluid-structure interaction. [↗]
- Teaching assistant at fluid mechanics lab, guided undergraduates through hands-on experiments.

Research Assistant — Indian Institute of Technology Madras (Aug 2014 – Mar 2016)
Guided by Prof Prabhu Rajagopal [↗]

- Underwater ROV [↗] and crawler [↗] for NDT inspection of industrial tank-floors & pipes.
- Developed electronics, navigation and software support for sensors and actuators.
- Conducted experiments to validate and demonstrate the capabilities of the system.

AWARDS

- **Prime Minister's Research Fellowship (PMRF)** — Ministry of Education (Jul 2018) [↗]
  One among only 135 scholars across the country awarded the research fellowship for pursuing PhD in STEM at premier Indian institutes based on research proposal, credentials & personal interview.
- **Innovative Student Project Grant** — IIT Madras (Oct 2014) [↗]
  Institute undergraduate research grant awarded for project titled "Control and tethered navigation for submersible ROV" based on competitive and deliverable proposal.
- **Kishore Vaigyanik Protsahan Yojana Research Fellowship** — DST, India (2011) [↗]
  One of 220 high-school students across the country awarded the fellowship accompanied by funded workshops at IISc and IISER aimed at encouraging students to take up research careers

RESEARCH INTERESTS

Wave elastic-structure interaction	Wave-breaking	Mesh-less methods
Near-shore plastic transport	Ship-generated waves	Storm surge due to cyclones
Turbulence modelling	Offshore-renewables	Underwater robotics

JOURNAL PUBLICATIONS

[8] **Agarwal, S.**, Sriram, V., Murali, K. (2022) Three-dimensional coupling between Boussinesq (FEM) and Navier-Stokes (particle based) models for wave structure interaction. *Ocean Engineering* 263, 112426.

[7] **Agarwal, S.**, Sriram, V., Liu, P. L.-F., Murali, K. (2022) Waves in waterways generated by moving pressure field in Boussinesq equations using unstructured finite element model. *Ocean Engineering* 262, 12202.

[6] **Agarwal, S.**, Sriram, V., Yan, S., Murali, K. (2021) Improvements in MLPG formulation for 3D wave interaction with fixed structures. *Computers & Fluids* 218, 104826.

[5] Saincher, S., Sriram, V., **Agarwal, S.**, Schlurmann, T. (2022) Experimental investigation of hydrodynamic loading induced by regular, steep non-breaking and breaking focused waves on fixed and moving cylinder. *European Journal of Mechanics - B/Fluids* 93, 42–64.

[4] **Agarwal, S.**, Saincher, S., Sriram, V., Yan, S., et al. (2021) A Comparative Study on the Nonlinear Interaction Between a Focusing Wave and Cylinder Using State-of-the-art Solvers: Part B. *International Journal of Offshore and Polar Engineering* 31, 11–18.

[3] Sriram, V., **Agarwal, S.**, Yan, S., Xie, Z., et al. (2021) A Comparative Study on the Nonlinear Interaction Between a Focusing Wave and Cylinder Using State-of-the-art Solvers: Part A. *International Journal of Offshore and Polar Engineering* 31, 1–10.

[2] Sriram, V., **Agarwal, S.**, Schlurmann, T. (2021) Laboratory Study on Steep Wave Interactions with Fixed and Moving Cylinder. *International Journal of Offshore and Polar Engineering* 31, 19–26.

[1] **Agarwal, S.**, Jhunjhunwala, T., Saikiran, N., Rajagopal, P. (2018) Demonstration of control and inspection by circumferentially guided ultrasonic waves using novel Remotely Operated Underwater Vehicle. *ISSS Journal of Micro and Smart Systems* 7, 97-105.

INTERNATIONAL CONFERENCE PAPERS AND PRESENTATIONS

[2] **Agarwal, S.**, Sriram, V., Murali, K. (2019) Interaction of Fixed Cylinder With Waves Through Weakly Coupled FNPT and Lagrangian Navier-Stokes, in: *Proceedings of the ASME OMAE 2019 38th International Conference on Ocean, Offshore and Arctic Engineering*, Glasgow, Scotland, UK.

[1] **Agarwal, S.**, Sriram, V., Murali, K. (2019) Modelling Wave Interaction with Porous Structures Using Boussinesq Equations, in: *Proceedings of the Fourth International Conference in Ocean Engineering ICOE 2018*. Springer, Singapore, pp. 573–583.

REFEREES

- Dr V. Sriram — PhD Research Guide, email: vsriram@iitm.ac.in [↗]
  Associate Professor, Indian Institute of Technology Madras, Chennai, India
- Prof K. Murali — PhD Research Co-Guide, email: murali@iitm.ac.in [↗]
  Professor and Dean (Faculty), Indian Institute of Technology Madras, Chennai, India
- Prof Shiqiang Yan — Research Collaborator, email: shiqiang.yan@city.ac.uk [↗]
  Professor, City, University of London, London, United Kingdom

Please click the bullet point for link to each publication.