

Mohammad Javad Javaherian

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EDUCATION

Ph.D. in Aerospace Engineering - Ocean, August 2021

Kevin T. Crofton Department of Aerospace and Ocean Engineering, Virginia Tech, Blacksburg, VA
Dissertation: *An experimental study of the fluid-structure interactions of water entry of compliant structures*

Advisor: Professor Christine Gilbert

M.Sc. in Naval Architecture – Hydromechanics, April 2013

Department of Maritime Engineering, Amirkabir University of Technology, Tehran, Iran
Thesis: *Flow visualization and pressure analysis of a two-dimensional wedge in water impact*

Advisor: Professor Hamid Zeraatgar

B.Sc. in Marine Engineering - Naval Architecture, September 2009

Department of Engineering, Persian Gulf University of Bushehr, Bushehr, Iran

RESEARCH INTERESTS

- AI-Driven Modeling and Design of Marine Structures
- Experimental and Computational Fluid Dynamics
- Offshore Energy and Sustainability
- Fluid-Structure Interaction
- Naval Architecture & Marine Hydrodynamics
- Visualization and Image Processing

TEACHING INTERESTS

- Fluid Dynamics
- Marine Hydrodynamics
- Marine Dynamics and Control
- Ship Structural Analysis and Design
- Mechanics of Materials
- Mechanics of Composites
- Numerical Methods
- AI/ML for Engineering Design

RESEARCH EXPERIENCE

Postdoctoral Research Fellow, University of Michigan (September 2022–Present)

Naval Architecture & Marine Engineering Department

Offshore Renewable Energy Systems:

- Implementing **AI/ML** in ice and wave modeling for cold-climate regions
- Modeling of coupled wave-ice interactions using **Finite Volume Community Ocean Model (FVCOM)**
- Evaluating ice loads and risks for engineering design of offshore platforms in the Great Lakes
- Studying challenges and resources for **offshore wind** and **wave energy** development in the Great Lakes
- Evaluating aero-hydrodynamics and structural response of floating offshore wind energy platforms under various loads
- Conducting outreach and community engagement activities with region's remote communities and native tribes for education and partnerships in future marine renewable energy projects

Postdoctoral Researcher, Virginia Tech (October 2021–August 2022)

Kevin T. Crofton Department of Aerospace and Ocean Engineering

Fluid-Structure Interaction Experiments:

- Designed and assembled an experimental setup for **Particle Image Velocimetry (PIV)** tests
- Conducted PIV experiments on water entry and heaving oscillation of highly flexible panels to measure the velocity field around the moving panel (inspired by manta ray fins)
- Applied dynamic masking in PIV leveraging image processing with edge detection algorithm

Towing Tank Experiments:

- Assisted in preparing a mold and fabricating a composite Generic Prismatic Planing Hull (GPPH)
- Designed and performed resistance tests for the GPPH model at the VT Advanced **Towing Tank**

Graduate Research Assistant, Virginia Tech (August 2017–August 2021)

Kevin T. Crofton Department of Aerospace and Ocean Engineering

Wedge Water Entry Experiments:

- Designed and assembled an experimental setup for **water entry experiments**
- Manufactured composite panels for the wedge bottom plating to study the effect of flexural rigidity in wedge water entry
- Conducted **Stereoscopic-Digital Image Processing (S-DIC)** technique to measure the full-field deformation of the flexible bottom plates in wedge water entry experiments
- Visualized the spray root propagation using **high-speed video recording**
- Conducted **image processing** with edge detection algorithm to quantify the spray root propagation for flexible wedges and structural deformation for highly flexible panels
- Proposed a new hybrid technique to predict pressure distribution on the bottom of a wedge using spray root propagation
- Mentored more than 5 undergraduate students to conduct water entry research in the lab

Slamming in Towing Tank Experiments:

- Conducted a study on the individual slamming events in towing tank experiments of a **Generic Prismatic Planing Hull (GPPH)** conducted at United States Naval Academy (USNA)
- Developed a **2D+t method** based on wedge water entry experiments to predict **motion and hydrodynamics** of a prismatic planing craft

TEACHING, MENTORSHIP AND GRANT WRITING EXPERIENCE

Postdoctoral Research Fellow, University of Michigan (September 2022–Present)

Naval Architecture & Marine Engineering Department

- **Co-instructing** Marine Dynamics III (NA 540), a graduate-level course
- Completed the Postdoc Teaching Essentials (PTE), a professional development course to equip postdocs with building instructional toolkits as future lecturers
- Completed Postdoctoral Short Course on College Teaching in STEM, another professional development course to prepare postdocs to teach effectively as future faculty members
- **Mentored graduate students** to conduct research on offshore wind platforms
- **Served as advisor for 5 undergraduate students** to conduct research on offshore wind developments through Undergraduate Research Opportunity Program (UROP)
- Designed and delivered guest lectures on experimental fluid dynamics, and ice-wave modeling for graduate level courses
- Wrote or contributed to **more than 12 different grant proposals** submitted to DOE, NSF, NOAA, OESI, Michigan Sea Grant, etc. (**2 were funded**)
- Wrote proposals **for 4 different DOE energy prize competitions (2 were funded)**

Postdoctoral Researcher, Virginia Tech (October 2021–August 2022)

Kevin T. Crofton Department of Aerospace and Ocean Engineering

- Designed course materials and experiments for mid-school students through VT Imagination Summer Camps (2021 and 2022)
- **Mentored 3 graduate students** to conduct water entry, particle image velocimetry (PIV), and oscillatory heave motion experiments
- **Mentored 5 undergraduate students** to conduct fluid dynamics and composite experiments

Graduate Research Assistant, Virginia Tech (August 2017–August 2021)

Kevin T. Crofton Department of Aerospace and Ocean Engineering

- Conducted experiments for mid-school students through VT Imagination Summer Camp 2021
- Managed several undergraduate students in summer 2020 on the study of the slamming of a GPPH in towing tank experiments
- Involved in the DURIP project for renovating the Virginia Tech Advanced Towing Tank Facility

Teaching Assistant, Amirkabir University of Technology (October 2011–June 2013)

Department of Maritime Engineering

- Hydrostatics: Held office hours, graded assignments and final exams

- Hydrodynamics: Held office hours, graded assignments and final exams
- Damage Stability (Graduate course): Held office hours, graded assignments and final exams, prepared and graded the term project

PATENT

M. J. Javaherian, H. Zeraatgar, M. Barjasteh, R. Yousefnejad, “A Universal Setup for Impact Test,” IR 84387 (G01L class), Nov 24, 2014

PUBLICATIONS

Journal Papers:

1. **M. J. Javaherian**, H. Abdelhady, D. Cannon, J. Wang, A. Fujisaki-Manome, L. Zuo, “Assessing Ice Risks for Offshore Wind Development in the Great Lakes,” *Ocean Engineering* (2026).
2. **M. J. Javaherian**, C. Gilbert, “Predicting Kinematics and Hydrodynamic Loading Using Spray Root Propagation in Wedge Water Entry,” *Physics of Fluids* (2026).
3. **M. J. Javaherian**, D. Cannon, J. Wang, A. Fujisaki-Manome, P. Bai, L. Zuo, “Simulating Ice-Wave Interactions in the Laurentian Great Lakes Using a Fully Coupled Hydrodynamic-Ice-Wave Model,” *Ocean Modelling* (2025).
4. **M. J. Javaherian**, A. Wang, L. Hall, L. Zuo, “Offshore Wind Development in Great Lakes; Challenges, Resources, and Technical Solutions,” *Ocean Dynamics* (2025).
5. C. Gilbert, J. Gilbert, **M. J. Javaherian**, “Water entry of a flexible wedge: How flexural rigidity influences spray root and pressure wave propagation,” *Physical Review Fluids* (2023).
6. C. Gilbert, **M. J. Javaherian**, C. Woolsey, and M. Shephard, “Virginia Tech Advanced Towing Carriage,” *Journal of Engineering for the Maritime Environment* (2023).
7. Z. Ren, **M. J. Javaherian**, C. Gilbert, “A Verification and Validation Study on A Loosely Two-way Coupled Hydroelastic Model of Wedge Water Entry,” *Journal of Ship Research* (2023).
8. **M. J. Javaherian**, Z. Ren, C. Gilbert, “Flow Visualization, Hydrodynamics, and Structural Response of a Flexible Wedge in Water Entry Experiments,” *Journal of Ship Research* (2022).
9. Z. Ren, **M. J. Javaherian**, C. Gilbert, “Vertical Wedge Drop Experiments as a Model for Slamming,” *Journal of Ship Research* (2021).
10. Z. Ren, **M. J. Javaherian**, C. Gilbert, “Kinematic and inertial hydroelastic effects caused by vertical slamming of a flexible V-shaped wedge,” *Journal of Fluids and Structures* (2021).
11. H. Zeraatgar, J. Malekmohammadi, **M. J. Javaherian**, H. Moradi, “Sampling rate effect on wedge pressure record in water entry by experiments,” *Ocean Engineering* (2019).
12. M. Barjasteh, H. Zeraatgar, **M. J. Javaherian**, “An experimental study on water entry of asymmetric wedges,” *Applied Ocean Research* (2016).
13. H. Zeraatgar, E. Hassani, R. Yousefnejad, **M. J. Javaherian**, “Parametric Investigation of Pressure Distribution on Wedge Water Entry by Experiment,” *International Journal of Marine Technology* (2012).

Conference Peer-Reviewed Papers:

1. **M. J. Javaherian**, H. Abdelhady, D. Cannon, J. Wang, A. Fujisaki-Manome, L. Zuo, “A Machine Learning Framework for Efficient Ice Cover Forecasting in the Great Lakes Leveraging Long-Term Extensive Simulation Data,” *ASME 2026 45th International Conference on Ocean, Offshore and Arctic Engineering*, Grand Tokyo, Japan, June 2026.
2. **M. J. Javaherian**, H. Abdelhady, D. Cannon, W. Wong, T. Hung, L. Zuo, “Integrated Modeling of Ice-Structure Interactions for Fixed Offshore Platforms in Cold-Climate Regions,” *Offshore Technology Conference*, Houston, USA, May 2026.
3. T. Hung, **M. J. Javaherian**, D. McGrath, B. Fang, L. Zuo, “Enhancing Semi-Submersible Floating Wind Platform Stability Using Low-Frequency Vertical Tuned Mass Dampers,” *Offshore Technology Conference*, Houston, USA, May 2026.
4. **M. J. Javaherian**, H. Abdelhady, D. Cannon, J. Wang, A. Fujisaki-Manome, L. Zuo, “Evaluating Ice Risks for Offshore Wind Development in the Great Lakes Using Simulated Historical Ice Conditions (1940–2022),” *Oceans Conference*, Chicago, USA, October 2025.
5. J. Wang, **M. J. Javaherian**, D. Cannon, A. Fujisaki-Manome, D. Beletsky, L. Zuo, “Simulating Two-Way Ice-Wave Interactions in the Great Lakes Using Fully Coupled Unstructured-Grid

FVCOM-CICE-SWAN Models,” The 27th IAHR International Symposium on Ice, Gdansk, Poland, June 2024.

6. L. Hall, T. Hung, **M. J. Javaherian**, L. Zuo, B. Fang, “Non-linear tuned mass-damper-inerters for vibration reduction and energy harvesting within semi-submersible offshore wind platforms,” Offshore Technology Conference, Houston, USA, May 2024.
7. **M. J. Javaherian**, R. Royce, R. Datla, C. Gilbert, “Hydrodynamics of High-Speed Planing Craft: Savitsky Method and 2D+ t Approach,” SNAME International Conference on Fast Sea Transportation, Providence, Rhode Island, USA, October 2021.
8. A. Bhardwaj, **M. J. Javaherian**, N. Husser, S. Brizzolara, C. Gilbert, “Vertical Wedge Water-Entry through Experiments and Simulation to Explore Three-Dimensional Hydrodynamic Flow Characteristic,” SNAME International Conference on Fast Sea Transportation, Providence, Rhode Island, USA, October 2021.
9. Z. Ren, **M. J. Javaherian**, C. Gilbert, “A Verification and Validation Study on A Loosely Two-way Coupled Hydroelastic Model of Wedge Water Entry,” SNAME Maritime Convention, Houston, USA, October 2020.
10. **M. J. Javaherian**, Z. Ren, C. Gilbert, “Reconstructed Kinematics and Hydrodynamic Loading Using Spray Root Propagation in Wedge Water Entry,” SNAME Maritime Convention, Houston, USA, October 2020.
11. **M. J. Javaherian**, Z. Ren, C. Judge, C. Gilbert, “Structural Response due to the Slamming of High-Speed Craft by Water Entry and Towing Tank Experiments,” 33rd Symposium on Naval Hydrodynamics, Osaka, Japan, June 2020.
12. **M. J. Javaherian**, Z. Ren, C. Gilbert, “Flow Visualization, Hydrodynamics, and Structural Response of a Flexible Wedge in Water Entry Experiments,” SNAME Maritime Convention, Tacoma, USA, October 2019.
13. Z. Ren, **M. J. Javaherian**, C. Gilbert, “Vertical Wedge Drop Experiments as a Model for Slamming,” SNAME Maritime Convention, Tacoma, USA, October 2019.
14. Z. Ren, **M. J. Javaherian**, Z. Wang, F. Stern, C. Judge, C. Ikeda-Gilbert, “Structural Response due to the Hydroelasticity of a Slamming Impact of a Small Craft in Waves,” 32nd Symposium on Naval Hydrodynamics, Hamburg, Germany, August 2018.
15. **M. J. Javaherian**, H. Zeraatgar, E. Hassani, “Experimental investigation of asymmetric entry of a wedge-shaped body,” Proceeding of 2nd International Conference on Violent Flows, Nantes, France, 2012.

Selected Conference Presentations:

- **M. J. Javaherian**, D. Cannon, J. Wang, L. Zuo, “Beyond the Winter Gap: A 50-Year High-Resolution Wave Energy Resource Assessment of the Great Lakes Accounting for Ice-Induced Attenuation,” UMERG Conference, Hoboken, New Jersey, USA, August 2026.
- **M. J. Javaherian**, N. Scianna, C. Gilbert, “Reconfiguration of a Highly Flexible Plate Impacting a Free Surface,” American Physical Society, Division of Fluid Dynamics (APS DFD), Phoenix, USA, November 2021.
- **M. J. Javaherian**, Z. Ren, C. Gilbert, “Water Entry of Flexible Panels: Pressure-Load Estimations from Contact Line Measurements and Theory,” American Physical Society, Division of Fluid Dynamics (APS DFD), Houston, USA, November 2020.
- **M. J. Javaherian**, Z. Ren, C. Gilbert, “Water Entry of a Flexible Wedge: The Correlation between Instantaneous Jet Root, Pressure History and Structural Response,” American Physical Society, Division of Fluid Dynamics (APS DFD), Atlanta, USA, November 2018.
- **M. J. Javaherian**, Z. Ren and C. Ikeda-Gilbert, “Water Entry of a Flexible Wedge: The Correlation between Instantaneous Jet Root, Pressure History and Structural Response,” Fluids Mechanics Symposium (FFMS), Blacksburg, VA, November 2018.
- **M. J. Javaherian**, Z. Ren, C. Gilbert, “An Experimental Investigation of Water Entry of a Flexible Wedge: The Effects of the Structural Response on the Hydrodynamics,” Multi-Agency Craft Conference, Baltimore, USA, July 2018.

Submitted or Under Preparation Papers:

- **M. J. Javaherian**, C. Gilbert, “Spatial Pressure Measurements on Highly Flexible Plates Using Particle Image Velocimetry,” (in progress).

Selected Poster Presentations:

- **M. J. Javaherian**, D. Cannon, J. Wang, A. Fujisaki-Manome, P. Bai, L. Zuo, “Fully Coupled Ice-Wave Interaction in the FVCOM for Future Offshore Wind Technology Developments in the Great Lakes,” AGU Fall Meeting, 2024.
- C. Touloukian, **M.J. Javaherian**, “Increasing Horizontal Axis Wind Turbine Efficiency”, University of Michigan Research and Discovery Scholars (MRADS) Symposium, 2024.
- O. Schroder, **M.J. Javaherian**, “Analysis and mitigation of environmental impact of offshore wind in the Great Lakes”, University of Michigan Undergraduate Research Opportunity Program (UROP) Symposium, 2024.
- A. Jamil, **M.J. Javaherian**, “Offshore Wind Turbine Power Handling”, University of Michigan Undergraduate Research Opportunity Program (UROP) Symposium, 2023.

AWARDS AND CERTIFICATIONS

- Postdoctoral Professional Development Award, University of Michigan, 2025
- Certificate of Completion Postdoctoral Short Course on College Teaching in STEM, Center for Research on Learning and Teaching, University of Michigan, 2024
- Collegiate Wind Competition Phase I Winner, United States Department of Energy (DOE), 2023 and 2024
- Future Leaders in Mechanical/Aerospace Engineering, Nominated by Aerospace and Ocean engineering Department of Virginia Tech, 2022
- Best Graduate Paper Award of the Year, Society of Naval Architecture and Marine Engineering (SNAME), 2020
- Brian Nerney Fellowship, Aerospace and Ocean engineering Department of Virginia Tech, 2020
- Excellent Student Award, Amirkabir University of Technology, 2013
- Ranked 2nd in graduate students of Naval Architect – Hydromechanics in Amirkabir University of Technology, 2013 (Among 36 students)
- Best Maritime Thesis Award of the Year, Iranian Association of Naval Architecture and Marine Engineering, 2013
- Best Thesis Award in Maritime Engineering of Amirkabir University of Technology, 2013

LEADERSHIP AND AFFILIATIONS

President, University of Michigan PostDoctoral Association (UMPDA), March 2025 - Present

Treasurer, University of Michigan PostDoctoral Association (UMPDA), July 2024 – March 2026

Member, Diversity Equity and Inclusion Committee in the Aerospace and Ocean Engineering (AOE) Department, Virginia Tech, March 2022–September 2022

Vice President, AOE Graduate Student Assembly (GSA), Virginia Tech, April 2021–November 2021

Board Member, AOE Graduate Student Assembly (GSA), Virginia Tech, August 2019–April 2021

Board Member, Create Student Assoc. (CSE), Virginia Tech, August 2018–September 2022

Event Coordinator, Ahlul-Bayt Student Assoc. (ABSA), Virginia Tech, September 2017–August 2021

Team Captain, The Big Event-Voluntary Community Engagement & Service, Virginia Tech, April 2019

Member, American Society of Mechanical Engineers (ASME), August 2018–Present

Member, American Society of Naval Engineers (ASNE), April 2018–Present

Member, American Physical Society (APS), October 2017–Present

SKILLS

Experimental Techniques:	High-Speed Digital Photography, Particle Image Velocimetry (PIV), Stereoscopic-Digital Image Correlation (S-DIC), Data Acquisition
Computer Software:	MATLAB, Image Processing, OpenFAST, WEC-Sim, FVCOM, OrcaFlex, STAR-CCM, Python, LabVIEW, LaTeX
Machine Shop:	Lathe, Milling Machine, Drill Press, Saw Machines