

# Mohammad Mohaghar

*Research Engineer II*  
*Georgia Institute of Technology*  
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## EDUCATION

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- Ph.D. Mechanical Engineering** 2014-2019  
*Georgia Institute of Technology*  
Ph.D. Thesis: [Effects of Initial Conditions and Mach Number on Turbulent Mixing Transition of Shock-driven Variable-density Flow](#)  
Thesis advisor: [Prof. Devesh Ranjan](#)
- MSc Mechanical Engineering** 2015-2017  
*Georgia Institute of Technology*
- MSc Energy for Sustainability** 2012-2014  
*University of Coimbra (MIT-Portugal program)*  
MSc Thesis: [Developing a Novel Method for Predicting Nearshore and Offshore Wave Energy of the Portuguese Coast](#)  
Thesis advisor: Prof. Almerindo Ferreira
- MSc Automotive Engineering** 2008-2010  
*Iran University of Science and Technology*  
MSc Thesis: Analysis and Improvement of Longitudinal and Lateral Stability of an Off-Road Vehicle Moving on a Slope Submitted to External Impact Loading  
Thesis advisor: Prof. Javad Marzbanrad
- BSc Mechanical Engineering** 2004-2008  
*University of Tehran*  
BSc Thesis: Modifications and Improvements of FSW Welding  
Thesis advisor: Prof. Mohammad Kazem Besharati Givi

# RESEARCH EXPERIENCE

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## Research Engineer II

2022-Present

*Georgia Institute of Technology*

*Environmental Fluid Mechanics Lab*

Research: Biofluids, Experimental Fluid Mechanics, Turbulence

- Analyzed volumetric flow field around bio-inspired magnetic-responsive materials using tomographic particle image velocimetry (PIV) measurement
- Analyzed kinematics & hydrodynamics of the adult *Euchaeta antarctica* using tomographic PIV measurement
- Investigated the development of double-diffusive convection instability using PLIF/PIV techniques

## Postdoctoral Research Fellow

2019-2022

*Georgia Institute of Technology*

*Environmental Fluid Mechanics Lab*

*Advisor: Prof. Donald Webster*

Research: Biofluids, Experimental Fluid Mechanics, Turbulence

- Analyzed kinematics & hydrodynamics of pteropod using tomographic PIV measurement
- Characterized nonlinear internal waves using combined PLIF/PIV techniques
- Analyzed swimming behavior of copepods around internal waves
- Investigated high-Schmidt number passive scalar fields in turbulent boundary layers

## Graduate Research Assistant

2014-2019

*Georgia Institute of Technology*

*Shock Tube and Advanced Mixing Laboratory*

Research: Experimental Fluid Mechanics, Turbulence, Richtmyer-Meshkov Instability, Simultaneous Particle Image Velocimetry, and Planar Laser Induced Fluorescence (PLIF) Measurements

- Addressed the influence of modal content of the initial condition on the Richtmyer-Meshkov instability transition to a turbulent state
- Investigated the influence of Mach number and Atwood number on turbulent mixing transition of a shock-driven variable density flow
- Analyzed the inclined RMI flow development using high-resolution three-dimensional simulations with the FLASH code

## Research Fellow

2012-2014

*University of Coimbra*

Research: Renewable Energy Systems Particularly Ocean Wave Energy

- Developed a novel numerical method for predicting nearshore wave energy using Delft3d and DelftDashboard
- Modeled and simulated a hospital building with different HVAC systems using Energy Plus in order to reduce energy consumption

**Research Fellow** 2008-2010

*Iran University of Science and Technology*

Research: Optimization of Automotive Suspension Systems

- Optimized the double-wishbone suspension system of an off-road vehicle in critical position by modified Genetic Algorithm

## **TEACHING EXPERIENCE**

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**Teaching Assistant** 2019-Present

*Georgia Institute of Technology*

- Dynamics

**Teaching Assistant** 2016

*Georgia Institute of Technology*

- Introduction to Fluid Mechanics

**Teaching Assistant** 2006-2010

*University of Tehran*

- Thermodynamics
- Engineering Economy

**Teaching** 2006-2009

*Payam Hedayat, Emam Hadi & Talash High Schools*

- Mathematics
- Physics

## **INDUSTRIAL WORK EXPERIENCE**

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**Heat Exchanger & Pressure Vessel Designer** 2011-2012

*GarmaGostar Co.*

**Product Engineer** 2010-2011

*Mapna Locomotive Co.*

## **AWARDS**

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- Received *CEE Postdoctoral Excellence Award* of the year at Georgia Tech, 2022
- Received *CEE Future Faculty Fellow Award* at Georgia Tech, 2022
- The article “Characteristics of swimming shelled Antarctic pteropods (*Limacina helicina antarctica*) at intermediate Reynolds number regime” was named an Editors’ Suggestion by *Physical Review Fluids* and selected as a Focus Feature in *Physics*, 2019
- Recorded a patent for Portable Hybrid Generator in Iran, 2011
- Received full scholarship from Iran University of Science and Technology for Masters in Automotive Engineering, 2008 - 2010
- Received full scholarship from University of Tehran for BSc in Mechanical Engineering, 2004 - 2008
- Passed the first level of the National Physics and Mathematics Olympiads with a distinction, 2003

## **PROFESSIONAL AFFILIATIONS**

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- Member of Association for the Sciences of Limnology and Oceanography (ASLO), 2019 – Present
- Member of American Physical Society (APS), 2014 – Present

## **TECHNICAL SKILLS**

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### **Experimental Techniques**

Particle Image Velocimetry (PIV) techniques, Planar Laser-Induced Florescence (PLIF) measurements and image processing, Flow visualization

### **Computer Programs**

Matlab, C++, Fortran, Python, Visual Basic, LabView, Tecplot, AutoCAD, SolidWorks, FLASH, TSI Insight, LaVision DaVis, Delft3D, SWAN, ADAMS, PDMS, Energy Plus

## **SERVICE**

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- Reviewer for various Archival Journals (PRL, PRF, JFM, PoF, Physica D Scripta, Shock Waves, etc.)

## PEER-REVIEWED JOURNAL PAPERS [\[Google Scholar\]](#)

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9. [M. Mohaghar, A. Connor, S. Wu, R. Zhao, D.R. Webster, “Effects of symmetry-breaking mechanisms on the flow field around magnetic-responsive material appendages that mimic swimming strokes”](#), *Physical Review Fluids* **9**, 023101 (2024).
8. [M. Mohaghar, D.R. Webster, “Experimental investigation of non-linear standing internal waves using combined density and velocity measurements”](#), *Experiments in Fluids* **64**, 77 (2023).
7. [M. Mohaghar, J. McFarland, D. Ranjan, “Three-dimensional simulations of reshocked inclined Richtmyer-Meshkov instability: Effects of initial perturbations”](#), *Physical Review Fluids* **7**, 093902 (2022).
6. [M. Mohaghar, L.P. Dasi, D.R. Webster, “Scalar power spectra and turbulent scalar length scales of high-Schmidt-number passive scalar fields in turbulent boundary layers”](#), *Physical Review Fluids* **5**, 084606 (2020).
5. [M. Mohaghar, S. Jung, K. A. Haas, D. R. Webster, “Copepod behavior responses around internal waves”](#), *Frontiers in Marine Science* **7**, 331 (2020).
4. [M. Mohaghar, D. Adhikari, D.R. Webster, “Characteristics of swimming shelled Antarctic pteropods \(\*Limacina helicina antarctica\*\) at intermediate Reynolds number regime”](#), *Physical Review Fluids* **4**, 111101 (2019).
3. [M. Mohaghar, J. Carter, G. Pathikonda, D. Ranjan, “The transition to turbulence in shock-driven mixing: effects of Mach number and initial conditions”](#), *Journal of Fluid Mechanics* **871**, 595-635 (2019).
2. [M. Mohaghar, J. Carter, B. Musci, D. Reilly, J. McFarland, D. Ranjan, “Evaluation of turbulent mixing transition in a shock-driven variable-density flow”](#), *Journal of Fluid Mechanics* **831**, 779-825 (2017).
1. [D. Reilly, J. McFarland, M. Mohaghar, D. Ranjan, “The effects of initial conditions and circulation deposition on the inclined-interface reshocked Richtmyer–Meshkov instability”](#), *Experiments in Fluids* **56**, 168 (2015).

## PEER-REVIEWED PROCEEDINGS

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8. [M. Mohaghar, A. Connor, S. Wu, R. Zhao, D.R. Webster, “Volumetric PIV measurements of bio-inspired magnetic-responsive materials that mimic swimming strokes”](#), *15th International Symposium on Particle Image Velocimetry*, San Diego (2023).
7. [M. Mohaghar, J. McFarland, and D. Ranjan, “A study of modal interaction between different scales of the turbulent Richtmyer-Meshkov instability using high-resolution three-dimensional FLASH simulations”](#), *17th International Workshop on the Physics of Compressible Turbulent Mixing*, Atlanta (2022).

6. M. Mohaghar, D.R. Webster, “[Characterization of Non-linear Internal Waves Using PIV/PLIF Techniques](#)”, *14th International Symposium on Particle Image Velocimetry* , Chicago (2021).
5. G. Pathikonda, J. Carter, M. Mohaghar, and D. Ranjan, “[Temporal Evolution of Richtmyer-Meshkov-Induced Mixing Using Simultaneous High-speed PIV-PLIF](#)”, *32nd International Symposium on Shock Waves* , Singapore (2019).
4. M. Mohaghar, J. Carter, G. Pathikonda and D. Ranjan, “[Turbulent mixing driven by Richtmyer-Meshkov Instability: Effect of Atwood Number](#)”, *16th International Workshop on the Physics of Compressible Turbulent Mixing* , Marseilles (2018).
3. J. Carter, M. Mohaghar, G. Pathikonda and D. Ranjan, “[Turbulent mixing driven by Richtmyer-Meshkov Instability: Effect of Mach Number](#)”, *16th International Workshop on the Physics of Compressible Turbulent Mixing* , Marseilles (2018).
2. V. Tsiklashvili, D. Reilly, M. Mohaghar, J. Carter and D. Ranjan, “[Effect of the initial conditions on the evolution of Richtmyer - Meshkov instability turbulent quantities](#)”, *15th International Workshop on the Physics of Compressible Turbulent Mixing* , Sydney (2016).
1. M. Mohaghar, Z. Mousavi Karimi and A. Ferreira, “[Developing a novel method for predicting nearshore wave energy of Matosinhos, Portugal](#)”, *Energy for Sustainability Multidisciplinary Conference* , Coimbra (2013).

## **CONFERENCE PRESENTATIONS**

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13. M. Mohaghar, D.R. Webster, “[Hydrodynamic characterization of the adult \*Euchaeta antarctica\* during straight swimming and turning](#)”, *Ocean Sciences Meeting 2024* , New Orleans (2024).
12. M. Mohaghar, D.R. Webster, “[Hydrodynamics of cruise locomotion in the adult \*Euchaeta antarctica\*](#)”, *Bulletin of the American Physical Society* , Washington (2023).
11. M. Mohaghar, A. Connor, R. Zhao, D.R. Webster, “[Analysis of flow field around magnetic-responsive soft materials using tomographic particle image velocimetry](#)”, *Bulletin of the American Physical Society* , Indianapolis (2022).
10. M. Mohaghar, D.R. Webster, “[Characterization of Non-linear Internal Waves Using PIV/PLIF Techniques](#)”, *Bulletin of the American Physical Society* , Phoenix (2021).
9. D.R. Webster, M. Mohaghar, S. Jung, K. Haas, “[Marine copepod behavior responses in and near internal waves](#)”, *Bulletin of the American Physical Society* , Phoenix (2021).
8. M. Mohaghar, S. Jung, K.A. Haas, D.R. Webster, “[Copepod Behavior Responses Around Internal Waves](#)”, *Ocean Sciences Meeting 2020* , San Diego (2020).

7. [M. Mohaghar, L.P. Dasi, D.R. Webster, “Scalar power spectra and turbulent length scales in high-Schmidt-number scalar fields”](#), *Bulletin of the American Physical Society*, Seattle (2019).
6. [M. Mohaghar, J. Carter, J.S. Rubio, G. Pathikonda and D. Ranjan, “Experimental Investigation of the effects of Mach number and initial condition on mixing transition in shock-driven flow”](#), *Bulletin of the American Physical Society*, Atlanta (2018).
5. [M. Mohaghar, J. Carter, G. Pathikonda and D. Ranjan, “Investigation of Atwood ratio influence on turbulent mixing transition of a shock-driven variable density flow after reshock”](#), *Bulletin of the American Physical Society*, Denver (2017).
4. [M. Mohaghar, J. Carter, B. Musci and D. Ranjan, “Experimental investigation of the effect of multimodal inclined interface on Richtmyer-Meshkov instability evolution”](#), *APS Meeting Abstracts*, Portland (2016).
3. [D. Reilly, M. Mohaghar, J. Carter, J. McFarland and D. Ranjan, “Progress on Simultaneous PLIF/PIV Measurements for a Turbulent Complex Fluid Interface”](#), *APS Meeting Abstracts*, Boston (2015).
2. [M. Mohaghar, D. Reilly, J. Carter, J. McFarland and D. Ranjan, “Simultaneous PLIF/PIV measurements for a single-mode inclined interface”](#), *APS Meeting Abstracts*, Boston (2015).
1. [D. Reilly, J. Carter, M. Mohaghar, D. Jarrahbashi, J. McFarland and D. Ranjan, “Observations of Variable-Density Turbulence From a Complex Fluid Interface”](#), *APS Shock Compression of Condensed Matter Meeting Abstracts*, Tampa (2015).