

# Maryam Hakimzadeh

✉ maryamhakimzadeh1994@gmail.com 🏠 Pittsburgh, PA, US ☎ +1(323)616-8053

🌐 maryhzd.github.io 🔄 maryhzd 🐦 @MaryamHakimzadeh 🌐 MaryamHakimzadeh 🎓 Maryam Hakimzadeh

## SUMMARY

I am an **FEA Engineering Researcher** with a **PhD** in **Computational Mechanics** from **Carnegie Mellon University (CMU)**. My work primarily focuses on developing **mathematical models, finite element analysis (FEA), numerical methods, machine learning, computer vision, data analysis, and data science** for solving **structural, thermal, fracture, fatigue, CFD, and other engineering problems**. I am proficient in **ANSYS, Abaqus, and the FEniCS library of Python**. During my PhD, I have conducted research in **material modeling and fracture mechanics for nonlinear and soft materials**. Additionally, I have strong skills in **Python and Matlab** scripting, and experience in **statistical analysis**.

## EDUCATION

<b>Carnegie Mellon University</b>	Pittsburgh, PA
Ph.D. in Computational Mechanics (Civil Engineering), GPA: 4.0/4.0	2020 - Sep 2024 (Expected)
· Thesis Title (tentative): Improving Phase-Field Modeling of Fracture Mechanics using Finite Element Analysis	
Advisors: Kaushik Dayal, David Rounce	
Collaborators: Noel Walkington, Carlos Mora-Corral, Vaibhav Agrawal	
M.Sc. in Civil and Environmental Engineering , GPA: 4.0/4.0	2020 - 2022
<b>Sharif University of Technology</b>	Tehran, Iran
M.Sc. in Civil and Environmental Engineering , GPA: 4.0/4.0	2016 - 2019
B.Sc. in Civil and Environmental Engineering , GPA: 3.81/4.0	2012 - 2016

## TECHNICAL SKILLS

<b>FEA Simulation and Design</b>	FEniCS, Ansys (Mechanical, Fluent, LS-DYNA), Abaqus, COMSOL
<b>Design and Processing Softwares</b>	CIVIL 3D, SolidWorks, Ansys Discovery, CAD, Gmsh, ParaView
<b>Programming</b>	Python, C/C++, MATLAB, Wolfram Mathematica , MPI
<b>Machine Learning &amp; Data Science</b>	NumPy, Pandas, PyTorch, scikit-learn, R, SPSS, SQL

## EXPERIENCE

<b>Carnegie Mellon University</b> , Graduate Research Assistant	Aug 2020 - Present, Pittsburgh, PA
Ph.D. Projects:	
· <b>Fracture Mechanics</b> with an Effective Energy using <b>Phase-Field Modeling (Contact Mechanics, Nonlinear FEA, Hyper-elastic Nonlinear Material, Fracture in Brittle and Soft Material, FEniCS simulations)</b> 🔄	
· <b>Anisotropic Fracture</b> Model under Compression and Confinement (Fracture Propagation in Anisotropic Material, High Performance Computing (HPC)) 🔄	
· <b>Crack Nucleation</b> and Propagation Using a Modified Fracture Mechanics Model and it's Application in Glaciers ( <b>Dynamic FEA, Explicit and Implicit FEA, Numerical Methods, Environmental Engineering</b> )	
Additional Projects:	
· <b>Thermal Optimization of CPU Performance (Transient Analysis, Fluid Flow Simulation with Ansys Fluent)</b> 🔄	
· Steady State and Transient <b>Thermal Analysis</b> of an Elbow Pipe with <b>Ansys Mechanical</b> . 🔄	
· FEA Analysis for <b>Elasto-Plastic</b> Material under <b>Contact</b> using Ansys 🔄	
· <b>Fatigue and Failure</b> Assessment and Optimization under Diverse Loading Conditions 🔄	
· <b>Structural Design and Optimization</b> of a Beam-Based Tower for Optimal Load Distribution and Safety 🔄	
· Structural <b>Dynamics</b> Analysis Subject to Pressure Wave Impacts: <b>Vibration, Modal, and Harmonic Assessments</b> 🔄	
· <b>Structural Topology Optimization</b> of a Bracket: Minimizing Mass with <b>Fatigue and Deformation</b> Constraints 🔄	
· Employing <b>Transformers Deep Learning</b> for Predicting the Dynamics of the <b>Burgers' Equation</b> 🔄	
· <b>SimCLR Model Supervised Model</b> for Image Classification: From Training to Fine-Tuning 🔄	
· Airfoil <b>Generation</b> via <b>Variational Auto-Encoders (VAEs)</b> and <b>Generative Adversarial Networks (GANs)</b> 🔄	
· CIFAR-10 <b>Classification</b> via <b>Convolutional Neural Networks (CNNs)</b> 🔄	
· Development and Analysis of a <b>Diffusion Model</b> for Image <b>Generation</b> Using the MNIST Dataset 🔄	
· Implementing a <b>Graph Neural Network</b> for <b>Predicting</b> Aqueous Solubility 🔄	

**University of Southern California**, Graduate Research Assistant Aug 2019 - Aug 2020, Los Angeles, CA  
· **Data-Driven Analysis** of Biomass Burning Impact on Public Health in Metropolitan Area of Milan (**Statistical Data Analysis** and Data **Visualization**, Machine Learning)

**Sharif University of Technology**, Graduate Research Assistant Sep 2016 - March 2019, Tehran, Iran  
· Quantifying and Modifying Emission Sources Using **Inverse Modeling**: A Case Study in Tehran (**M.Sc Thesis**)  
· Comprehensive **Data Analysis** of Greenhouse Gas Emissions and **Environmental Impact** in Iran  
· Pollution Attenuation in Flume Outlets and Estuary Tidal Dispersion Study

**PUBLICATIONS**

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Hakimzadeh, Maryam, Ehsan Soleimanian, Amirhosein Mousavi, Alessandro Borgini, Cinzia De Marco, Ario A. Ruprecht, and Constantinos Sioutas. "The impact of biomass burning on the oxidative potential of PM2. 5 in the metropolitan area of Milan." Atmospheric Environment 224 (2020): 117328.

Hakimzadeh, Maryam, Vaibhav Agrawal, Kaushik Dayal, and Carlos Mora-Corral. "Phase-field finite deformation fracture with an effective energy for regularized crack face contact." Journal of the Mechanics and Physics of Solids 167 (2022): 104994.

Hakimzadeh, Maryam, Carlos Mora-Corral, Noel Walkington, Giuseppe Buscarnera, and Kaushik Dayal. "Phase-Field Modeling of Fracture under Compression and Confinement in Anisotropic Geomaterials." Submitted

Hakimzadeh, Maryam, Carlos Mora-Corral, Noel Walkington, and Kaushik Dayal. "Phase-Field Modeling of Fracture with Realistic Nucleation." In Preparation

**HONORS AND AWARDS**

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Finalist for ASTM MR Mitchell Student Presentation Forum on Fatigue and Fracture Mechanics.	2023
Awarded Fenves Travel Grants, CMU CEE Department.	2023
Steinbrenner Institute Doctoral Fellowship for Environmental Education and Research.	2022
Invited participant at CMU Rising Stars Workshop.	2022
CMU CEE Department Fellowship.	2020

**RELATED GRADUATE COURSES**

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• Finite Element Methods	• Environmental Hydrodynamics
• Numerical Methods	• Machine Learning
• Math Techniques (Solving PDEs)	• Deep Learning
• Continuum Mechanics	• Applied FEA
• Elasticity	• Continuum Mechanics & Multiscale Modeling

**SELECTED CONFERENCE PRESENTATIONS**

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A Phase-Field Fracture Model for Anisotropic Materials Under Compressive Loading	
M. Hakimzadeh, K. Dayal, and C. Mora-Corral,	Society for Industrial and Applied Mathematics ( <b>SIAM MS24</b> )
Simulating Crevasse Nucleation and Propagation Using a Modified Fracture Mechanics Model	
M. Hakimzadeh, D. Rounce, and K. Dayal,	American Geophysical Union ( <b>AGU23</b> )
A Phase-Field Fracture Model for Complex Loadings in Space	
M. Hakimzadeh, V.Agrawal, C. Mora-Corral, G. Gazonas, N. Walkington and K. Dayal,	<b>ASTM 21st International Symposium on Fatigue and Fracture Mechanics</b>
A Phase-Field Fracture Model for Complex Loading Across the Crack Face	
M. Hakimzadeh, V.Agrawal, C. Mora-Corral, and K. Dayal,	Society of Engineering Science ( <b>SES2022</b> )

**LICENSES & CERTIFICATIONS**

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Supervised Machine Learning: Regression and Classification	🔗 July 2023, DeepLearning.AI
Advanced Learning Algorithms	🔗 July 2023, DeepLearning.AI
Unsupervised Learning, Recommenders, Reinforcement Learning	🔗 Jan 2024, DeepLearning.AI
What is Data Science?	🔗 Jun 2023, IBM