

# Leila Ghaffari

Curriculum Vitae

March 2023

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Google Scholar : <https://scholar.google.com/citations?user=gW-Ve9sAAAAJ>

## EDUCATION

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- **University of Colorado Boulder** Boulder, CO  
*PhD in Computer Science* *Aug. 2019 – Present*
- **Sharif University of Technology** Tehran, Iran  
*M.Sc in Chemical Engineering* *Sep. 2013 – Jan. 2016*
- **University of Tehran** Tehran, Iran  
*B.Sc in Chemical Engineering* *Sep. 2006 – Jun. 2011*

## EXPERIENCE

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- **University of Colorado Boulder** Boulder, CO  
*Graduate Research Assistant* *Apr. 2020 - Present*
  - Contributing to fluids with [libCEED](#) and [PETSc](#).
  - Contributing to structures with [Ratel](#) and [Enzyme-AD](#), a high-performance automatic differentiation tool, for developing new material models.
  - Investigating generalizations of blocked Krylov methods for Kronecker-type systems.
  - Computational plasticity
- **The National Center for Atmospheric Research (NCAR)** Boulder, CO  
*SIParCS Intern* *May 2021 - Jul. 2021*

Ported the Shallow Water Model mini-app with DPC++, ran it on an Intel Xeon Skylake CPU and an Intel-Xe GPU with different problem sizes, and studied the performance of the ported code ([Performance Portability of Shallow Water Model with DPC++](#)).
- **University of Colorado Boulder** Boulder, CO  
*Collaborating Researcher* *Apr. 2019 - Apr. 2020*

Expanded a Navier-Stokes solver mini-app for compressible gas dynamics in a three-dimensional geometry in libCEED.
- **Universite d'Avignon et des Pays du Vaucluse** Avignon, France  
*Intern* *Jan. 2017 - Jun. 2017*

Developed environmental-friendly chemical processes.
- **Sharif University of Technology** Tehran, Iran  
*Graduate Research Assistant* *Feb. 2014 - Jan. 2016*

Designed a bioreactor for Sulfate reducing processes and studied the experimental consistency of the observations with theory.
- **Tehran Oil Refinery Company** Tehran, Iran  
*Intern* *Jun. 2009 - Sep. 2009*

Studied the Health, Safety and Environment (HSE) management of the Tehran Oil Refinery Company.

## TECHNICAL SKILLS

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- **Programming Languages:** C, Python, Julia, MATLAB, Scala, R
- **Software and Tools:** Git, Make, Snakemake, Travis CI, Linux Bash, Valgrind, GNU Debugger, L<sup>A</sup>T<sub>E</sub>X, Abaqus, AutoCAD, SOLIDWORKS, ChemCAD, Aspen HYSYS, Enzyme-AD, Zygote
- **High-Performance Computing:** Intel Advisor, DPC++, MPI, MPI I/O, OpenMP, Slurm

## PUBLICATIONS

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- Jed Brown, Valeria Barra, Natalie Beams, **Leila Ghaffari**, Matthew Knepley, William Moses, Rezgar Shakeri, Karen Stengel, Jeremy L. Thompson, and Junchao Zhang. 2022. *Performance Portable Solid Mechanics via Matrix-Free p-Multigrid*. doi:10.48550/arXiv.2204.01722
- Jed Brown, Ahmad Abdelfattah, Valeria Barra, Natalie Beams, Jean-Sylvain Camier, Veselin Dobrev, Yohann Dudouit, **Leila Ghaffari**, Tzanio Kolev, David Medina, Will Pazner, Thilina Rathnayake, Jeremy Thompson, Stan Tomov, *libCEED: Fast algebra for high-order element-based discretizations*, Journal of Open Source Software, 6(63), 2945, doi:10.21105/joss.02945
- Boublenza I, Lazouni HA, **Ghaffari L**, Ruiz K, Fabiano-Tixier AS, Chemat F, *Influence of roasting on sensory, antioxidant, aromas, and physicochemical properties of carob pod powder (Ceratonia siliqua L.)*, J Food Qual 2017:1-10. doi:10.1155/2017/4193672

## TECHNICAL REPORTS

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- Kolev, Tzanio, Fischer, Paul, Abdelfattah, Ahmad, Beams, Natalie, Brown, Jed, Camier, Jean-Sylvain, Carson, Robert, Chalmers, Noel, Dobrev, Veselin, Dudouit, Yohann, **Ghaffari, Leila**, Joshi, Aditya Y., Kerkemeier, Stefan, Lan, Yu-Hsiang, McDougall, Damon, Medina, David, Min, Misun, Mishra, Abhishek, Pazner, Will, Warburton, Tim. (2022). *CEED ECP Milestone Report: High-order algorithmic developments and optimizations for more robust exascale applications*. Zenodo. doi:10.5281/zenodo.6514857
- Kolev, Tzanio, Fischer, Paul, Austin, Anthony P., Barker, Andrew T., Beams, Natalie, Brown, Jed, Camier, Jean-Sylvain, Chalmers, Noel, Dobrev, Veselin, Dudouit, Yohann, **Ghaffari, Leila**, Kerkemeier, Stefan, Lan, Yu-Hsiang, Merzari, Elia, Min, Misun, Pazner, Will, Ratnayaka, Thilina, Shephard, Mark S., Siboni, Morteza H., Warburton, Tim. (2021). *CEED ECP Milestone Report: High-order algorithmic developments and optimizations for large-scale GPU-accelerated simulations*. Zenodo. doi:10.5281/zenodo.4672664
- Abdelfattah A., Barra V., Beams N., Brown J., Camier J. S., Dobrev V., Dudouit Y., **Ghaffari L.**, Kolev T., Medina D., Rathnayake T., Thompson J. L., Tomov S., *libCEED User Manual*, Version 0.7, Zenodo, September 2020. doi:10.5281/zenodo.4302737

## INVITED TALKS

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- **SIAM Conference on Parallel Processing for Scientific Computing** Baltimore, Maryland  
*SIAM-PP24* Mar. 2024  
*Solving under-constrained hyperelasticity without the null space*  
**Leila Ghaffari**, Toby Isaac, and Jed Brown
- **American Physical Society** Las Vegas, Nevada  
*APS March Meeting 2023* Mar. 2023  
*Scale-Resolving Simulations of Turbulence at Extreme/Exa Scale*  
Kenneth E Jansen, Jed Brown, John A Evans, Riccardo Balin, James R Wright, and **Leila Ghaffari**
- **SIAM Conference on Computational Science and Engineering** Amsterdam, The Netherlands  
*SIAM-CSE23* Feb. 2023  
*Forward-Mode Enzyme in Developing Constitutive Models with Ratel*  
**Leila Ghaffari**, William Moses, Jeremy L Thompson, Karen Stengel, Rezgar Shakeri, and Jed Brown

- **World and Asian Pacific Congresses on Computational Mechanics**  
*WCCM-APCOM 2022*

*On Performance portability of physical problems using libCEED*

**Leila Ghaffari**, Valeria Barra, Jeremy Thompson, James Wright, and Jed Brown

Online  
*Jul. 2022*
- **SIAM Conference on Parallel Processing for Scientific Computing**  
*SIAM-PP22*

*On Portability and Performance Versatility in Nonlinear Solid and Fluid Mechanics Using libCEED and PETSc*

**Leila Ghaffari**, Jeremy Thompson, Valeria Barra, Rezgar Shakeri, Karen Stengel, and Jed Brown

Online  
*Feb. 2022*
- **The National Center for Atmospheric Research (NCAR)**  
*SIParCS 2021*

*Performance Portability of Shallow Water Model with DPC++*

**Leila Ghanffari** and Zephaniah Connell

Online  
*Jul. 2021*
- **SIAM Conference on Computational Science and Engineering**  
*SIAM-CSE21*

*Advances in LibCEED with Applications to Fluid and Solid Mechanics*

**Leila Ghaffari**, Jeremy Thompson, Valeria Barra, and Jed Brown

Online  
*Mar. 2021*

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## CONTRIBUTED TALKS

- **Enzyme Conference 2023**  
*EnzymeCon 2023*

*Automatic Differentiation in Solid Mechanics: Interpretation and Composition*

**Leila Ghaffari**, William Moses, Jeremy L Thompson, Karen Stengel, Rezgar Shakeri, and Jed Brown

Boulder, CO  
*Feb. 2023*

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## POSTERS

- **The National Center for Atmospheric Research (NCAR)**  
*SIParCS 2021*

*Performance Portability of Shallow Water Model with DPC++*

**Leila Ghanffari** and Zephaniah Connell

Online  
*Jul. 2021*
- **Exascale Computing Project Annual Meeting**  
*2021 ECP Annual Meeting*

*LibCEED 0.8: Concepts and mini-apps*

Valeria Barra, Natalie Beams, Jed Brown, Yohann Dudouit, **Leila Ghaffari**, Arash Mehraban, Will Pazner, Rezgar Shakeri, and Jeremy Thompson

Online  
*Apr. 2021*
- **SIAM Conference on Computational Science and Engineering**  
*CSE21*

*LibCEED – The Finite Elements Library without Elements*

Valeria Barra, Jeremy Thompson, **Leila Ghaffari**, and Jed Brown

Online  
*Mar. 2021*
- **AGU Fall Meeting**  
*AGU2020*

*Efficient implementations for matrix-free solutions of PDEs with libCEED*

Valeria Barra, Jed Brown, Jeremy Thompson, **Leila Ghaffari**, Yohann Dudouit, and Natalie Beams

Online  
*Dec. 2020*

- **Women in High Performance Computing Summit** Vancouver, Canada  
*WHPC* *Apr. 2020*  
*An open-source library for high-performance computing on heterogeneous architectures: libCEED*  
 Valeria Barra, Jed Brown, Yohann Dudouit, **Leila Ghaffari**, and Jeremy Thompson

## HONORS AND AWARDS

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- **Student Travel Award (\$950)** *Jan. 2023*  
*SIAM*  
 Awarded from the Society for Industrial and Applied Mathematics (SIAM) to attend the 2023 SIAM Conference on Computational Science and Engineering (CSE23).
- **Clive Baillie Memorial Fellowship (\$1200)** *Oct. 2022*  
*Computer Science Department at CU Boulder*  
 Awarded from the Department of Computer Science at CU Boulder to attend the 2023 SIAM Conference on Computational Science and Engineering (CSE23).
- **Clive Baillie Memorial Fellowship (\$1000)** *Oct. 2020*  
*Computer Science Department at CU Boulder*  
 Awarded from the Department of Computer Science at CU Boulder to attend the 2021 SIAM Conference on Computational Science and Engineering (CSE21).

## TEACHING EXPERIENCE

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- **University of Tehran** Tehran, Iran  
*Process Design with HYSYS* *Jan. 2011 - May 2011*  
 Teaching assistant for **Computer Aided Process Design and Simulation with Aspen HYSYS**, a chemical process simulator used to mathematically model chemical processes, at the Chemical Engineering Department.

## MENTORING EXPERIENCE

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- **Summer Program for Undergraduate Research (SPUR)** Boulder, CO  
*University of Colorado Boulder* *May 2022 - Aug. 2022*  
 Kellen Davis Martin (B. Sc. in Aerospace Engineering, University of Colorado Boulder)
- **Summer Program for Undergraduate Research (SPUR)** Boulder, CO  
*University of Colorado Boulder* *Jun. 2021 - Aug. 2021*  
 David Reeder (B. Sc. in Mechanical Engineering, University of Colorado Boulder)