

# Mohammad Sarraf Joshaghani

## Education

- August 2015 **Ph.D., Civil Engineering**, University of Houston, Houston, TX, United States.  
–August 2019 With concurrent degree program in **High Performance Computing**.  
Thesis title: *Multi-scale and interface mechanics for porous media: mathematical models and computational frameworks*. (click here to view)  
Supervisor: Dr. K. B. Nakshatrala
- 2012–2014 **M.Sc., Civil Engineering**, University of Houston, Houston, TX, United States.  
Thesis title: *Full-scale testing and numerical Modeling of subsea pipe soil interaction*.  
Supervisors: Dr. C. Vipulanandan
- 2008–2012 **B.Sc., Civil Engineering**, Azad University of Mashhad, Mashhad, Iran.

## Awards & Honors

- 2019 **Runner-up Best Dissertation Award**.  
Department of Civil and Environmental Engineering, University of Houston
- 2019 **SIAM CSE19 Travel Award**.  
Society for Industrial and Applied Mathematics (SIAM)
- 2018 **Winner of computational mechanics student competition**.  
Engineering Mechanics Institute (EMI), Massachusetts Institute of Technology [UH eNews Coverage]
- 2017-2018 **Future Faculty Program Fellowship**.  
Cullen college of engineering, University of Houston
- 2018-2019 **Center for Advanced Computing and Data Science Fellow**.  
University of Houston
- 2015-2019 **UH Doctoral Student Tuition Fellowship**.  
University of Houston
- 2012-2013 **Houston Endowment and Presidential Fellowship**.  
2015-2017 Cullen college of engineering
- 2003 **Awarded best K-12 student paper**.  
Iranian national competition for K-12 students, Organization for Development of Exceptional Talents

## Professional Experience

- September 2019 **Postdoctoral Research Associate**, Rice University, Houston, TX.  
–present Department of Computational and Applied Mathematics  
Computational Optimization and Modeling of Porous Media (COMP-M) group
- Proposed a computational framework for vertex upwinding scheme in two-phase flow.
  - Developed a fully-implicit discontinuous Galerkin formulation for compressible two-phase flow that respects maximum-principle.
  - Contributed to the dead-oil reservoir module of PORODG code developed by TOTAL E&P Research and Technology.

- August 2015 **Graduate Research Assistant**, University of Houston, Houston, TX.
- August 2019 Department of Civil and Environmental Engineering  
Computational and Applied Mechanics Laboratory (CAML) group
- Developed a theoretical/computational framework for modeling flow in porous media with coupled double pore-networks.
  - Proposed a composable block solvers and performance spectrum analysis for double porosity/permeability model.
  - Developed a theoretical/mechanistic framework for obtaining the interface condition for porous-fluid domains, employing dissipation theorem and calculus of variations.
  - Developed an optimized-based nonnegative framework for coupling plasticity with species diffusion.
  - Mathematical modeling of the hemodynamic forces and vascular morphology of the cerebral aneurysm.
- November 2014 **Civil Engineer**, Odebrecht Group, Houston, TX.
- July 2015
- Reviewed designs and drafts of structural components of 1.1 miles of Grand parkway-SH99 bridges, and performed structural analysis for pre-stressed concrete beams.
  - Provided an interface with design group and resolve non-conformity-reports for superstructures.
- September 2014 **Intern**, EDI Building Consultants Co., Houston, TX.
- November 2014
- Analysis and design of steel connections for Williams Tower penthouse roof.
  - Structural and damage assessments for Houston Club implosion on Esperson building.
- August 2012 **Research Assistant**, University of Houston, Houston, TX.
- August 2014
- Developed a numerical model based on ALE formulation to predict subsea pipe-soil interaction.
  - Performed full scale laboratory modeling of HPHT subsea pipelines, susceptible to thermal buckling; and proposed mitigation solutions.
  - Developed a model for characterizing rheological and mechanical behavior of ultra-soft clayey soil

## Publications

- PEER-REVIEWED
- 1 **M. S. Joshaghani**, J. Chang, K. B. Nakshatrala, and M. G. Knepley [On composable block solvers and performance spectrum analysis for double porosity/permeability model](#) *Journal of Computational Physics* 386: 428-466, 2019. [Journal link]
  - 2 K. B. Nakshatrala and **M. S. Joshaghani** [On interface conditions for flows in coupled free-porous media](#) *Transport in Porous Media* 130: 577-609, 2019. [Journal link]
  - 3 **M. S. Joshaghani**, S. H. Joodat, and K. B. Nakshatrala [A stabilized mixed discontinuous Galerkin formulation for double porosity/permeability model](#) *Computer Methods in Applied Mechanics and Engineering Journal* 352: 508-560, 2019. [Journal link]
  - 4 A. M. Raheem, C. Vipulanandan, and **M. S. Joshaghani** [Non-destructive experimental testing and modeling of electrical impedance behavior of untreated and treated ultra-soft clayey soils](#) *Journal of Rock Mechanics and Geotechnical Engineering* 9(3): 543-550, 2017. [Journal link]
  - 5 M. M. R. Mousavi, M. D. Champiri, **M. S. Joshaghani**, and S. Sajjadi [A kinematic measurement for ductile and brittle failure of materials using digital image correlation](#) *AIMS Materials Science* 3(4): 1759-1772, 2016. [Journal link]
  - 6 A. M. Raheem, and **M. S. Joshaghani** [Modeling of shears strength-water content relationship of ultra-soft clayey soil](#). *International Journal of Advanced Research* 4(4): 537-545, 2016. [Journal link]
  - 7 **M. S. Joshaghani**, A. M. Raheem, and M. M. R. Mousavi [Analytical modeling of large-scale testing of axial pipe-soil interaction in ultra-soft soil](#) *American Journal of Civil Engineering and Architecture* 4(3): 98-105, 2016. [Journal link]

- 8 C. Vipulanandan, J. A. Yahouide, and **M. S. Joshaghani** [Deepwater axial and lateral sliding pipe-soil interaction model study](#) *Pipelines 2013: Pipelines and Trenchless Construction and Renewals—A Global Perspective*: 1583–1592, 2013. [Journal link]

- IN-PREPARATION
- 1 **M. S. Joshaghani**, and B. Riviere [A computational framework for vertex upwinding scheme in two-phase flow](#).
  - 2 **M. S. Joshaghani**, B. Riviere, and M. Sekachev [Maximum-principle-satisfying discontinuous galerkin methods for compressible two-phase immiscible flow](#).
  - 3 **M. S. Joshaghani**, and K. B. Nakshatrala [A modeling framework for coupling plasticity with species diffusion](#).
  - 4 **M. S. Joshaghani**, B. Riviere [Maximum-principle preserving DG schemes for convection-dominated PDEs: a brief survey](#).
  - 5 K. B. Nakshatrala, **M. S. Joshaghani**, and M. Shabouei [A posteriori criterion based on Noether’s theorem to assess accuracy of numerical solutions for diffusion equations](#).
  - 6 **M. S. Joshaghani**, A. M. Raheem, and C. Vipulanandan [Large-Scale Testing and Numerical Modeling of Axial Pipe-Soil-Interaction in Ultra-Soft Wyoming Bentonite](#).

## Conference Presentations and Talks

- 1 **M. S. Joshaghani**, and K. B. Nakshatrala. [A modeling framework for coupled plasticity and species diffusion with applications to degradation](#) *Engineering Mechanics Institute (EMI) Conference*, Pasadena, CA, June 2019. [poster presentation]
- 2 **M. S. Joshaghani**, and K. B. Nakshatrala. [A scalable parallel implementation of double porosity/permeability model](#) *Society of Industrial and Applied Mathematics (SIAM) Conference on Mathematical and Computational Issues in the Geosciences*, Houston, TX, March 2019. [oral presentation]
- 3 **M. S. Joshaghani**, J. Chang, K. B. Nakshatrala, and M. G. Knepley. [On composable block solvers and performance spectrum model for the four-field double porosity/permeability model](#) *Society of Industrial and Applied Mathematics (SIAM) Conference on Computer Science and Engineering*, Spokane, WA, February 2019. [poster presentation]
- 4 **M. S. Joshaghani**. [Stabilized discontinuous Galerkin formulation for modeling flow in highly heterogeneous media with complex porous structures](#) *Center for Thermo-Fluid Mechanics (CTFM) Seminar*, Houston, TX, October 2018. [invited talk]
- 5 **M. S. Joshaghani**, S. H. Joodat, and K. B. Nakshatrala. [A stabilized mixed DG formulation for flow in porous media with double pore-networks](#) *Engineering Mechanics Institute (EMI) Conference*, Boston, MA, May 2018. [oral and poster presentation]
- 6 **M. S. Joshaghani**, and A. M. Raheem. [Finite element simulation of deep-water pipe walking phenomenon on ultra soft soil](#) *American Geophysical Union (AGU) Fall Meeting*, San Francisco, CA, December 2014. [poster presentation]
- 7 **M. S. Joshaghani**, and C. Vipulanandan. [Testing and modeling of fixed and rolling buoyancy sections](#) *Center for Innovative Grouting Material and Technology (CIGMAT) Conference*, Houston, TX, March 2014. [poster presentation]
- 8 **M. S. Joshaghani**, M. R. Gharib, and S. Khatibmasjedi [Modeling and control of an offshore steel jacket platforms using robust controller](#) *ASCE Centennial Conference*, Dallas, TX, September 2013. [oral presentation]

- 9 **M. S. Joshaghani**, and C. Vipulanandan. [Finite element simulation of deep-water pipe walking phenomenon on ultra soft soil](#) *Texas Hurricane Center for Innovative Technology Conference*, Houston, TX, August 2013. [poster presentation]

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## Teaching Experience

### [Workshop instructor](#) at **University of Houston**

- “*Solving PDEs in Python: A FEniCS tutorial*”, UH Center for Advanced Computing and Data Science (CACDS), Houston, TX, June 2018.
- “*CFD Code Development Frameworks*”, UH Center for Thermo-Fluid Mechanics (CTFM), Houston, TX, September 2018.

### [Teaching assistant](#) at **University of Houston**

Statics (Spring 2017-2019), solid mechanics (Fall 2016), matrix analysis (Fall 2017)

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## Computer skills

Programming Languages	C/C++, FORTRAN, LATEX, MATLAB, PYTHON, Shell scripting, version control
Scientific libraries	FEniCS/Firedrakes, PORODG, MPI, NumPy, SciPy, OpenFOAM, OpenMP, Palablos, Deal II, PETSc
Commercial softwares	ABAQUS, COMSOL, PLAXIS, SAP
Visualization Packages	AUTOCAD, GNUPLOT, GRACE, GMSH, PARAVIEW, VisIt

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## References

- [Professor Beatrice Riviere](#)  
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- [Professor Kalyana Babu Nakshatrala](#)  
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University of Houston, Houston, Texas 77204-4003  
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- [Professor Kumaraswamy Vipulanandan](#)  
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*(Additional references available upon request.)*

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