Postdoctoral Research Associate
Rice University 6100 Main St.
DH 2001, Houston, TX 77005
✆ *(281) 781-5331*
✉ *m.sarraf.j@rice.edu*

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 competion 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 –August 2019	**Graduate Research Assistant**, University of Houston, Houston, TX. 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 –July 2015	**Civil Engineer**, Odebrecht Group, Houston, TX. ○ *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 –November 2014	**Intern**, EDI Building Consultants Co., Houston, TX. ○ *Analysis and design of steel connections for Williams Tower penthouse roof.* ○ *Structural and damage assessments for Houston Club implosion on Esperson building.*
August 2012 –August 2014	**Research Assistant**, University of Houston, Houston, TX. ○ *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** and K. B. Nakshatrala A modeling framework for coupling plasticity with species diffusion *submitted to Computer Methods in Applied Mechanics and Engineering Journal*, 2020. [Available on arXiv]

2 **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]

3 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]

4 **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]

5 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]

6 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]

7 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]

8 **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]

9 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**, B. Riviere Maximum-principle preserving DG schemes for convection-dominated PDEs: a brief survey.

4 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.

Conference Presentations and Talks

1 **M. S. Joshaghani**. Mechanics at the interface of flow and highly heterogeneous domain with complex porous structures *Department of Computational & Applied Mathematics (CAAM) Colloquium*, Rice University, October 2020. [invited talk]

2 **M. S. Joshaghani**, and B. Riviere. Maximum-principle-preserving vertex-based method for two phase flows in porous media *3rd Annual Meeting of the Society of Industrial and Applied Mathematics (SIAM) Texas-Louisiana Section*, Texas A & M University, October 2020. [invited talk]

3 **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]

4 **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]

5 **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, Februeary 2019. [poster presentation]

6 **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]

7 **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]

8 **M. S. Joshaghani**, A. M. Raheem, and C. Vipulanandan. 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]

9 **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]

10 **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]

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)

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

References

- Professor Beatrice Riviere
  Computational and Applied Mathematics
  Duncan Hall 3019
  Rice University, Houston, TX 77005–1827
  Phone: 713-743-4418
  Email: riviere@rice.edu

- Professor Kalyana B. Nakshatrala
  Department of Civil & Environmental Engineering
  N124 EB1
  University of Houston, Houston, TX 77204–4003
  Phone: 713-743-4418
  Email: knakshatrala@uh.edu

- Professor Matthew G. Knepley
  Department of Computer Science & Engineering
  211A Capen Hall
  University at Buffalo, Buffalo, NY 14260-2500
  Phone: 716-645-0747
  Email: knepley@buffalo.edu

(Additional references available upon request.)

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