

Ata Mesgarnejad

4801 Avia Cir. Apt. 104, Henrico, VA 23233

☎ (+1) 225-620-6369 | ✉ a.mesgarnejad@gmail.com | 📱 mesgarnejad | 📧 mesgarnejad

Education

Louisiana State University

PH.D. IN MECHANICAL ENGINEERING

LA, USA

Jan. 2008 - Dec. 2014

“Applications of the variational approach to fracture mechanics.” Advisor: [Prof. B. Bourdin](#), Co-advisor: [Prof. M.M. Khonsari](#).

Louisiana State University

M.Sc. IN APPLIED MATHEMATICS

LA, USA

Jan. 2008 - Dec. 2014

“Development of a Work-controlled Algorithm for the Variational Approach to Fracture Mechanics and Its Application to Sandstone Burst Experiments.” Advisor: [Prof. B. Bourdin](#).

Amirkabir University of Technology

M.Sc. IN MECHANICAL ENGINEERING

Tehran, Iran

Aug. 2005 - Oct. 2007

“Development of Constitutive Equations for the High Temperature Plasticity.” Advisor: [Prof. M.R. Eslami](#).

Islamic Azad University, Central Tehran Branch

B.Sc. IN MECHANICAL ENGINEERING

Tehran, Iran

Aug. 2001 - Aug. 2005

Skills

Numerical Algorithms	Nonlinear Optimization, Numerical Optimization, Numerical Linear Algebra Mesh Generation
Programming	C/C++, Modern Fortran, Cuda
Scripting	Python, Jupyter, Matlab
Software Development	Git, Design Patterns, Agile, TFS
HPC	MPI, Cuda, PETSc, libMesh, deal.ii
Scientific Visualization	VisIt (including python scripting), Paraview
Computational Cluster Administration	OS (CentOS, Redhat), Job Scheduler (Torque, Slurm) Tool Chain (GNU, Intel, OpenMpi)
Misc	Bash, LaTeX

Publications (Google Scholar)

“On the tribological behavior of MoS₂ coated thrust ball bearings operating under oscillating motion”, [A. Mesgarnejad](#), [M.M. Khonsari](#), *Wear*, 2010, Volume 269, Issues 7–8, pp. 547–556, <https://doi.org/10.1016/j.wear.2010.05.010>.

“A variational approach to the fracture of brittle thin films subject to out-of-plane loading”, [A. Mesgarnejad](#), [B. Bourdin](#), [M. Khonsari](#), *Journal of Mechanics and Physics of Solids*, 2013, Volume 61, Issue 11, pp. 2360-2379, <https://doi.org/10.1016/j.jmps.2013.05.001>.

“Validation simulations for the variational approach to fracture mechanics”, [A. Mesgarnejad](#), [B. Bourdin](#), [M. Khonsari](#), *Journal of Computer Methods in Applied Mechanics and Engineering*, 2015, Volume 290, pp. 420-437, <https://doi.org/10.1016/j.cma.2014.10.052>.

“Phase-Field Models for Fatigue Crack Growth”, [A. Mesgarnejad](#), [A. Imanian](#), [A. Karma](#), *Journal of Theoretical and Applied Fracture Mechanics*, 2019, pp. 102282, <https://doi.org/10.1016/j.tafmec.2019.102282>.

“Phase Field Modeling of Chemomechanical Fracture of Intercalation Electrodes: Role of Charging Rate and Dimensionality”, [A. Mesgarnejad](#), [A. Karma](#), *Journal of Mechanics and Physics of Solids*, 2019, Volume 132, pp. 103696, doi.org/10.1016/j.jmps.2019.103696.

“Vulnerable Window of Yield Strength for Swelling-Driven Fracture of Phase-Transforming Battery Materials”, [A. Mesgarnejad](#), [A. Karma](#), *NPJ Computational Materials*, Volume 6, 58, doi.org/10.1038/s41524-020-0315-8.

“Crack Path Selection in Orientationally Ordered Composites”, [A. Mesgarnejad](#), [C. Pan](#), [R.M. Erb](#), [S.J. Shefelbine](#), [A. Karma](#), *Physical Review E*, 2020, Volume 102, pp. 013004, doi.org/10.1103/PhysRevE.102.013004.

“Enhanced toughness in ceramic-reinforced polymer composites with herringbone architectures”, [R. Zando](#), [A. Mesgarnejad](#)¹, [C. Pan](#), [S.J. Shefelbine](#), [A. Karma](#), [R.M. Erb](#), *Composite Science and Technology*, 2021, Volume 204, pp. 108513, doi.org/10.1016/j.compscitech.2020.108513.

“Fracture Toughness of Bone at the Microscale”, [N. Aldegaither](#), [G. Sernicola](#), [A. Mesgarnejad](#), [A. Karma](#), [D. Balint](#), [J. Wang](#), [E. Saiz](#), [S.J. Shefelbine](#), [A.E. Porter](#), [F. Giuliani](#), *Acta Biomaterialia*, 2021, Volume 121, pp. 475-483, doi.org/10.1016/j.actbio.2020.12.007.

“Phase-field modeling of continuous fatigue via toughness degradation”, [B.E. Grossman-Ponemon](#), [A. Mesgarnejad](#), [A. Karma](#), *Engineering Fracture Mechanics*, 2022, Volume 264, pp. 108255, <https://doi.org/10.1016/j.engfracmech.2022.108255>.

“Spatiotemporal Organization of Electromechanical Phase Singularities During Focal and Re-entrant Cardiac Arrhythmias”, [A. Molavi Tabrizi](#), [A. Mesgarnejad](#), [M. Bazzi](#), [S. Luther](#), [J. Christoph](#), [A. Karma](#), *Physical Review X*, Volume 12, pp. 021052, <https://doi.org/10.1103/PhysRevX.12.021052>.

¹Co-first author

“Topology-enhanced mechanical stability of swelling nanoporous electrodes”, *B.E. Grossman-Ponemon, A. Mesgarnejad, A. Karma*, Accepted for publication in NPJ Computational Materials.

Patents

“Ceramic-Reinforced Polymer Composites With Herringbone Architecture”, R. Erb, R. Zando, A. Karma, **A. Mesgarnejad**, <https://patents.google.com/patent/US20210276253A1/en>.

Conference Proceedings

“Constitutive relation for high temperature cyclic plasticity”, **A. Mesgarnejad**, *M. Sabbaghian, M.R. Eslami*, Proceedings of 7th International Congress on Thermal Stresses, 2007, Taipei, Taiwan.

“Online coated ball bearing health monitoring using degree of randomness and Hidden Markov Model”, *Bo Ling, M.M. Khonsari, A. Mesgarnejad, R. Hathaway*, Proceedings of IEEE Aerospace Conference, 2009, Big Sky, Montana.

“Crack paths in anisotropic biomimetic composites”

A. Mesgarnejad, *C. Pan, R.M. Erb, S.J. Shefelbine, A. Karma*, Proceedings of 14th International Conference on Fracture, 2017, Rhodes, Greece (Vol.1 Part. A).

“Phase-field models of brittle and fatigue crack growth”, **A. Mesgarnejad**, *A. Karma*, Proceedings of 14th International Conference on Fracture, 2017, Rhodes, Greece (Vol.1 Part. A).

Professional Experience

Bentley Systems

RESEARCH ENGINEER II, SACS

- Developed and implemented curved shell meshing and SCF extraction in SACS JointMesher.
- Enhanced the JointMesher internal algorithm gaining 10x speed up.
- Enhanced time integration and sort algorithms for SACS fluid-structure interaction module (WaveResponse) gaining 5x speed up.
- Enhanced preprocessor and sort algorithms for SACS preprocessor module.

Remote

April. 2022 - Present

SOFTWARE ENGINEER, SACS

- Implemented a series of Krylov-subspace solvers with automatic null-space detection and removal for the main FEM solution engine of SACS.
- Implemented and validated degenerate continuum shell elements for the main FEM solution engine of SACS.
- Implemented automatic meshing and SCF extraction to the JointMesher component of SACS for ring stiffened joints and explicit stiffeners.

June. 2020 - April. 2022

Northeastern University

POSTDOCTORAL RESEARCH ASSOCIATE

- Theoretical development and numerical implementation of a phase-field model for fracture in Li-ion batteries (DOE, BSE). Also participated in preparation and writing of the grant proposals in 2016 and 2019.
- Theoretical development and numerical implementation of an anisotropic fracture of biomimetic composites (NSF, MOMS) in collaboration with Prof. R. Erb (MIE, NEU) and Prof. S.J. Shefelbine (MIE & BIOE, NEU). This model was further used for the development a new tough composite architecture in conjunction with Prof. R. Erb (MIE, NEU). This model was also used for interpretation of experiments on micro DCB samples of bone in collaboration with Prof. G. Finn. at Imperial College London
- Theoretical development and numerical implementation of a novel class of phase-field models for fatigue crack propagation (STTR grant with *TDA Inc.* funded by US Navy Office of Small Business Programs). Also contributed to preparation and writing of grant proposals in 2016, 2017, and 2018.
- Supervised and participated in development of a electro-mechanical simulation framework to explain the origin of mechanical phase singularities during heart fibrillation.

Boston, MA

July. 2015 - April. 2020

Louisiana State University

POSTDOCTORAL RESEARCH ASSOCIATE

- Implemented a natural numbering for unstructured meshes in PETSc.

Baton Rouge, LA

Jan. 2015 - Exp. Jun. 2015

Louisiana State University

RESEARCH ASSISTANT

- Theoretical development and numerical implementation of a phase-field model for the fracture of thin films (plates) under out-of-plane loading.
- Numerical validation of phase-field models of fracture against well-documented experimental observations.
- Theoretical development and numerical implementation of a work-controlled phase-field model for fracture.
- Performed numerical experiments to enhance the functionality of double-torsion experiments in collaboration with *Corning Inc.*

Baton Rouge, LA

Jan. 2008 - Exp. Dec. 2014

Teaching & Mentoring Experience

Louisiana State University

TEACHING ASSISTANT

- Taught machine design lab, dynamics, and thermodynamics.

Baton Rouge, LA

Jan. 2008 - Exp. Dec. 2014

Northeastern University

POSTDOCTORAL RESEARCH ASSOCIATE

- Managed and helped mentor Maher Bazzi, an M.Sc. degree student in Bioengineering and Physics.
- Managed and helped mentor Davoud Hejazi, a Ph.D. degree student in Physics.

Boston, MA

July. 2016 - May. 2017

Awards

- | | | |
|------|--|--------------------------|
| 2016 | XSEDE MSS160013 allocation , Obtained 1.43 MSUs (\approx \$77000) from XSEDE | <i>SuperMIC, LSU</i> |
| 2016 | Travel award , Obtained \$1200 for NYU-Oxford PIRE workshop | <i>New York City, NY</i> |
| 2018 | Travel award , Obtained \$555 for USACM, Nonlocal methods in fracture | <i>Austin, TX</i> |
| 2020 | Travel award , Obtained \$ 650 for USACM, Workshop on Experimental and Computational Fracture Mechanics | <i>Baton Rouge, LA</i> |
| 2020 | XSEDE MSS200005 allocation , Obtained 21,617 SUs (\approx \$5612) from XSEDE | <i>Stampede2, TACC</i> |