Emma Lejeune

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Current Position

Tenure-Track Assistant Professor 1/2020 - Present
Department of Mechanical Engineering
Boston University

Research Experience

Research Assistant Professor 9/2019 - 12/2019
Department of Mechanical Engineering
Boston University

Peter O'Donnell, Jr. Postdoctoral Fellow 9/2018 - 8/2019
The Oden Institute for Computational Engineering and Sciences
The University of Texas at Austin
Advisor: Michael Sacks

Graduate Research Fellow 9/2013 - 8/2018
The Department of Civil and Environmental Engineering
Stanford University
Advisor: Christian Linder

Education

Stanford University 3/2015 - 9/2018
Ph.D. in Civil & Environmental Engineering,
Thesis: Numerical modeling of mechanically driven emergent behavior in biological systems
Advisor: Christian Linder
Additional Committee Members: Ronaldo Borja, Ellen Kuhl

Stanford University 9/2013 - 3/2015
M.S. in Civil & Environmental Engineering, Structural Engineering and Geomechanics
Advisor: Christian Linder

Cornell University 8/2009 - 5/2013
B.S. in Civil Engineering, *magna cum laude*

Journal Publications

J21. Mohammadzadeh, S., & **Lejeune, E.** (*under review*). Predicting Mechanically Driven Full-Field Quantities of Interest with Deep Learning-Based Metamodels. arXiv preprint arXiv: 2108.03995.

J20. Zhao, B., Zhang, K., Chen, C. S., & **Lejeune, E.** (*under review*). Sarc-Graph: Automated segmentation, tracking, and analysis of sarcomeres in hiPSC-derived cardiomyocytes. arXiv preprint arXiv:2102.02412.

J19. Khang, A., **Lejeune, E.**, Abbaspour, A., Howsmon, D. P., & Sacks, M. S. (2021). On the Three-Dimensional Correlation Between Myofibroblast Shape and Contraction. Journal of Biomechanical Engineering, 143(9), 094503.

J18. Das, S. L., Bose, P., **Lejeune, E.**, Reich, D. H., Chen, C., & Eyckmans, J. (2021). Extracellular Matrix Alignment Directs Provisional Matrix Assembly and Three Dimensional Fibrous Tissue Closure. Tissue Engineering Part A.

J17. Kakaletsis, S., Meador, W., Mathur, M., Sugerman, G. P., Jazwiec, T., Malinowski, M., **Lejeune, E.**, Timek, T.A. & Rausch, M. K. (2021). Right Ventricular Myocardial Mechanics: Multi-Modal Deformation, Microstructure, and Modeling. Acta Biomateriala, 123, 154-166.

J16. **Lejeune, E.**, & Zhao, B. (2021). Exploring the potential of transfer learning for metamodels of heterogeneous material deformation. Journal of the Mechanical Behavior of Biomedical Materials, 104276.

J15. **Lejeune, E.** (2021). Geometric Stability Classification: Datasets, Metamodels, and Adversarial Attacks. Computer-Aided Design, 131, 102948.

J14. **Lejeune, E.** (2020). Mechanical MNIST: A benchmark dataset for mechanical metamodels. Extreme Mechanics Letters, 100659.

J13. **Lejeune, E.**, Khang, A., Sansom, J., & Sacks, M. S. (2020). FM-Track: A fiducial marker tracking software for studying cell mechanics in a three-dimensional environment. SoftwareX, 11, 100417.

J12. **Lejeune, E.**, & Linder, C. (2020). Interpreting stochastic agent-based models of cell death. Computer Methods in Applied Mechanics and Engineering, 360, 112700.

J11. Khang, A., Rodriguez, A. G., Schroeder, M. E., Sansom, J., **Lejeune, E.**, Anseth, K. S., & Sacks, M. S. (2019). Quantifying heart valve interstitial cell contractile state using highly tunable poly (ethylene glycol) hydrogels. Acta biomaterialia, 96, 354-367.

J10. **Lejeune, E.**, & Sacks, M. S. (2019). Analyzing valve interstitial cell mechanics and geometry with spatial statistics. Journal of biomechanics, 93, 159-166.

J9. **Lejeune, E.**, Dortdivanlioglu, B., Kuhl, E., & Linder, C. (2019). Understanding the mechanical link between oriented cell division and cerebellar morphogenesis. Soft matter, 15(10), 2204-2215.

J8. **Lejeune, E.**, & Linder, C. (2018). Understanding the relationship between cell death and tissue shrinkage via a stochastic agent-based model. Journal of biomechanics, 73, 9-17.

J7. **Lejeune, E.**, & Linder, C. (2018). Modeling mechanical inhomogeneities in small populations of proliferating monolayers and spheroids. Biomechanics and modeling in mechanobiology, 17(3), 727-743.

J6. **Lejeune, E.**, & Linder, C. (2017) Quantifying the relationship between cell division angle and morphogenesis through computational modeling. Journal of Theoretical Biology, 418, 1-7.

J5. **Lejeune, E.**, & Linder, C. (2017) Modeling tumor growth with peridynamics. Biomechanics and Modeling in Mechanobiology, 16(4), 1141-1157.

J4. **Lejeune, E.**, Javili, A., Weickenmeier, J., Kuhl, E., & Linder, C. (2016). Tri-layer wrinkling as a mechanism for anchoring center initiation in the developing cerebellum. Soft Matter, 12(25), 5613-5620.

J3. **Lejeune, E.**, Javili, A., & Linder, C. (2016). An algorithmic approach to multi-layer wrinkling. Extreme Mechanics Letters, 7, 10-17.

J2. **Lejeune, E.**, Javili, A., & Linder, C. (2016). Understanding geometric instabilities in thin films via a multi-layer model. Soft Matter, 12(3), 806-816.

J1. Rivera, J. P., Josipovic, G., **Lejeune, E.**, Luna, B. N., & Whittaker, A. S. (2015). Automated detection and measurement of cracks in reinforced concrete components. ACI Structural Journal, 112(3), 397.

Software and Datasets

SD5. Sarc-Graph: Segmentation, Tracking, and Analysis of hiPSC-CMs (2021) `https://github.com/elejeune11/Sarc-Graph`

SD4. Right Ventricular Myocardial Mechanics Dataset · Collaboration with M.K. Rausch (2020) `https://dataverse.tdl.org/dataverse/RVMechanics`

SD3. Buckling Instability Classification Datasets (2020) `https://open.bu.edu/handle/2144/40085`

SD2. Mechanical MNIST Datasets (2020) `https://open.bu.edu/handle/2144/39371`

SD1. FM-Track: Fiducial Marker Tracking Software (2020) `https://github.com/elejeune11/FM-Track`

Book Chapters

C2. **Lejeune, E.**, & Linder, C. (2021). Modeling biological materials with peridynamics. In Peridynamic Modeling, Numerical Techniques, and Applications (pp. 249-273). Elsevier.

C1. Khang, A., Howsmon, D. P., **Lejeune, E.**, & Sacks, M. S. (2020). Multi-scale modeling of the heart valve interstitial cell. In Multi-scale Extracellular Matrix Mechanics and Mechanobiology (pp. 21-53). Springer, Cham.

Invited Talks

T6. **Lejeune, E.** Methods for computational modeling and computation based discovery of spatially heterogeneous biological materials. Pontificia Universidad Católica de Chile. June 2021.

T5. **Lejeune, E.** Modeling heterogeneous materials: benchmark datasets, metamodels, and experimental characterization. Michigan Institute for Computational Discovery & Engineering. University of Michigan. February 2021.

T4. **Lejeune, E.** Benchmark datasets for mechanical metamodels. Machine Learning in Science and Engineering (MLSE), Mechanical Engineering, Engineering Mechanics, and Civil Engineering Track. Columbia University Data Science Institute. December 2020.

T3. **Lejeune, E.**, Khang, A., & Sacks, M.S. Multiscale mechanical modeling of biological systems. Biophysical Society Meeting, Bioengineering Subgroup Saturday. February 2020.

T2. **Lejeune, E.** Multi-scale mechanical modeling of biological systems. Joint Solid Mechanics and Materials Seminar Series at Brown University. November 2019.

T1. **Lejeune, E.**, Khang, A., West, N., Sansom, J., & Sacks, M.S.. Keynote: Multiscale modeling of valve interstitial cells in a three-dimensional hydrogel environment. The Society of Engineering Sciences. St. Louis, MO. October 2019.

Honors and Awards

American Heart Association Career Development Award 2021

David R. Dalton Career Development Professorship 2020-2023

Haythornthwaite Foundation Research Initiation Grant 2020
ASME Applied Mechanics Division

Junior Faculty Fellow 2020
Rafik B. Hariri Institute for Computing and Computational Science & Engineering

Biophysical Society Bioengineering Subgroup Early Career Research Award 2020

The Oden Institute Peter O'Donnell, Jr. Postdoctoral Fellowship 2018-2019

NSF Graduate Research Fellowship 2014-2017

Stanford School of Engineering Graduate Fellowship 2013-2014

Cornell Merrill Presidential Scholar, Top 1% of Graduating Seniors 2013

Teaching Experience

Instructor of Record 2020-21
EK 301: Engineering Mechanics I *Boston University*

Fundamental statics of particles, rigid bodies, trusses, frames, virtual work, distributed forces, uni-axial stress and strain, shear and bending moment diagrams, application of vector analysis, and introduction to engineering design.

Academic Service

Lead Organizer 2021
A Closer Look: Open Journal Club in Biomechanics

Minisymposium Organizer 2021
U.S. National Congress on Computational Mechanics

NSF Panel Reviewer 2020-21

Abstract Reviewer and Student Presentation Competition Judge 2020-21
Summer Biomechanics, Bioengineering, and Biotransport Conference

Minisymposium Organizer 2019
Society of Engineering Sciences

Manuscript Reviewer: Acta Biomaterialia, Computer-Aided Design, Computer Methods in Applied Mechanics and Engineering, International Journal for Numerical Methods in Biomedical Engineering, International Journal of Solids and Structures, Journal of the Mechanical Behavior of Biomedical Materials, Journal of the Mechanics and Physics of Solids, Journal of the Royal Society Interface, Nature Computational Science, Nature Scientific Reports, Soft Matter, Theoretical and Applied Fracture Mechanics.

Outreach

High School Student Mentor Summer 2016
Raising Interest in Science and Engineering (RISE) program *Stanford University*

Provided research guidance and mentorship for a high school student participating in RISE, a program designed for bright low income students who will be the first in their family to attend college.

High School Teacher Mentor Summer 2016
Research Experience for Teachers (RET) program *Stanford University*

Provided research guidance and collaborated with a high school teacher participating in RET, a program designed to give teachers a research experience that they can transfer to their high school classroom.

Mechanics Simulation Tutorial Spring 2015
Eastside College Preparatory School *East Palo Alto, CA*

Taught an interactive lesson on simulating structural materials at a high school focused on providing opportunities to students traditionally underrepresented in higher education.

Professional Licensure and Memberships

American Heart Association 2019

Engineer in Training (EIT), New York State 2013

Chi Epsilon, National Civil Engineering Honor Society 2012

Tau Beta Pi, National Engineering Honor Society 2012