David S. Li, Ph.D.

Assistant Professor, Department of Biomechanics
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Professional Experience

Assistant Professor 2025 – present
Department of Biomechanics, University of Nebraska at Omaha *Omaha, NE*

Postdoctoral Associate 2021 – 2025
Department of Biomedical Engineering, Yale University *New Haven, CT*

Graduate Research Assistant 2015 – 2021
Department of Biomedical Engineering, The University of Texas at Austin (UT Austin) *Austin, TX*

Education

Ph.D., *Biomedical Engineering, UT Austin* 2021
Thesis: 3D characterization of ventricular myocardium in health, disease, and treatment
Advisor: Michael S. Sacks, Ph.D.

M.S.E., *Biomedical Engineering, UT Austin* 2017

B.S., *Bioengineering, Rice University* 2015

Awards & Honors

NIH Predoctoral Award (F31), *Principal Investigator* 2017 – 2020
National Heart, Lung, and Blood Institute
Amount: $118,644 for 3 years (summary)
Title: Investigation of the effect of injected hydrogel properties on post-myocardial infarction ventricular remodeling using an integrated experimental-numerical finite element modeling approach

Runner-up, *PhD Student Paper Competition* 2021
Summer Biomechanics, Bioengineering and Biotransport Conference 2021

NIH Fellowship and Portfolio Program (T32), *UT Austin* 2015 – 2019
Imaging Science and Informatics Fellowship (2015 – 2016)

Service & Outreach

Member, *Graduate Program Committee, University of Nebraska at Omaha* 2025 – present

Journal Peer Review 2023 – present
Acta Biomaterialia, Biomechanics and Modeling in Mechanobiology, Prosthesis

Member, *BME Diversity, Equity, Inclusion, and Belonging Committee, Yale University* 2023 – 2025

Chair, *Graduate-Undergraduate Research Union, UT Austin* 2015 – 2020
Member (2015 – 2020), Chair (2018 – 2020)

Member, *Biomedical Optics Graduate Organization, UT Austin* 2015 – 2017

Research Interests & Expertise

- Growth and remodeling of thoracic aortic aneurysm and arterial calcification
- Cardiovascular biomechanics (mechanical testing, imaging, histology, constitutive modeling)
- Image-based finite element modeling (FEBio, ABAQUS, SimVascular, MATLAB)
- Machine learning with applications to biomechanical modeling

Trainees

Master's Students

- Romain Gayraud, *Co-supervisor* (University of Montpellier) 2023 – 2024

Undergraduate Students

- Colin Means, *Co-supervisor* (Yale University) 2022 – 2025
- Angela Pak, *Primary Supervisor* (UT Austin) 2019 – 2021
- Justine Le, *Primary Supervisor* (UT Austin) 2019 – 2020
- Jessica Kim, *Primary Supervisor* (UT Austin) 2018
- MaiQuyen Nguyen, *Primary Supervisor* (UT Austin) 2016 – 2018
- Elizabeth Shih, *Primary Supervisor* (UT Austin) 2016 – 2018
- Thomas Leahy, *Primary Supervisor* (UT Austin) 2016 – 2018
- Steven LaBelle, *Primary Supervisor* (UT Austin) 2016 – 2017

Teaching Experience

Guest Lecturer, *Biomechanics, University of Nebraska at Omaha* 2025
Selected lectures: BMCH 1000 (Introduction to Biomechanics)

Guest Lecturer, *Biomedical Engineering, UT Austin* 2019
Selected lectures in 2 courses: BME 383J (Mathematical Physiology), BME 384T (Cell/Tissue/Scaffold Biomechanics)

Seminars

Invited Speaker, *Centrum IntelliPhysics Group Seminar, Johns Hopkins University* 2024
Title: Neural operator learning of aortic aneurysm progression

Invited Speaker, *CRUNCH Group Seminar, Brown University* 2023
Title: Neural operator learning of mechanobiological contributors to aortic aneurysms

Invited Speaker, *Interviews with Engineers Seminar, Southwestern University* 2021

Invited Speaker, *Professional Development Seminar, UT Austin* 2020

Publications

1. Schwarz EL, **Li DS**, Means CW, Assi R, Humphrey JD. Mechanisms driving thoracic aortic aneurysm. Submitted to Biomech Model Mechanobiol. 2025.
2. **Li DS**, Goswami S, Cao Q, Oommen V, Assi R, Humphrey JD, Karniadakis GE. Importance of localized dilatation and distensibility in identifying determinants of thoracic aortic aneurysm with neural operators. *PLoS Comput Biol*. 2025;21(10):e1013550. DOI
3. Weiss D, Rego BV, Cavinato C, **Li DS**, Kawamura Y, Emuna N, Humphrey JD. Effects of Age, Sex, and Extracellular Matrix Integrity on Aortic Dilatation and Rupture in a Mouse Model of Marfan Syndrome. *Arterioscler Thromb Vasc Biol*. 2023;43(9):e358-e372. DOI
4. **Li DS**, Cavinato C, Latorre M, Humphrey JD. Computational modeling distinguishes diverse contributors to aneurysmal progression in the Marfan aorta. *Proc R Soc A*. 2023;479(2276): 20230116. DOI
5. **Li DS**, Mendiola EA, Avazmohammadi R, Sachse FB, Sacks MS. A multi-scale computational model for the passive mechanical behavior of right ventricular myocardium. *J Mech Behav Biomed Mater*. 2023;142:105788. DOI
6. Murtada SI, Kawamura Y, Cavinato C, Wang M, Ramachandra AB, Spronck B, **Li DS**, Tellides G, Humphrey JD. Biomechanical and transcriptional evidence that smooth muscle cell death drives an osteochondrogenic phenotype and severe proximal vascular disease in progeria. *Biomech Model Mechanobiol*. 2023;22(4):1333-1347. DOI

7. Chen M, Cavinato C, Hansen J, Tanaka K, Ren P, Hassab A, **Li DS**, Youshao E, Tellides G, Iyengar R, Humphrey JD, Schwartz MA. FN (Fibronectin)-integrin α5 signaling promotes thoracic aortic aneurysm in a mouse model of Marfan syndrome. *Arterioscler Thromb Vasc Biol*. 2023; 43(5):e132-e150. DOI
8. Murtada SI, Mikush N, Wang M, Ren P, Kawamura Y, Ramachandra AB, **Li DS**, Braddock DT, Tellides G, Gordon LB, Humphrey JD. Lonafarnib improves cardiovascular function and survival in a mouse model of Hutchinson-Gilford progeria syndrome. *Elife*. 2023;12:e82728. DOI
9. Goswami S, **Li DS**, Rego BV, Latorre M, Humphrey JD, Karniadakis GE. Neural operator learning of heterogeneous mechanobiological insults contributing to aortic aneurysms. *J R Soc Interface*. 2022;19(193):20220410. DOI
10. Zhang W, **Li DS**, Bui-Thanh T, Sacks MS. Simulation of the 3D hyperelastic behavior of ventricular myocardium using a finite-element based neural-network approach. *Comput Methods Appl Mech Eng*. 2022;394:114871. DOI
11. Goodbrake C, **Li DS**, Aghakhani H, Contreras A, Reece GP, Markey MK, Sacks MS. On the three-dimensional mechanical behavior of human breast tissue. *Ann Biomed Eng*. 2022;50(5):601-613. DOI
12. Liu H, Soares JS, Walmsley J, **Li DS**, Raut S, Avazmohammadi R, Iaizzo P, Palmer M, Gorman JH 3rd, Gorman RC, Sacks MS. The impact of myocardial compressibility on organ-level simulations of the normal and infarcted heart. *Sci Rep*. 2021;11(1):13466. DOI
13. **Li DS**, Avazmohammadi R, Rodell CB, Hsu EW, Burdick JA, Gorman JH 3rd, Gorman RC, Sacks MS. How hydrogel inclusions modulate the local mechanical response in early and fully formed post-infarcted myocardium. *Acta Biomater*. 2020;114:296-306. DOI
14. Avazmohammadi R, Soares JS, **Li DS**, Eperjesi T, Pilla J, Gorman RC, Sacks MS. On the in vivo systolic compressibility of left ventricular free wall myocardium in the normal and infarcted heart. *J Biomech*. 2020;107:109767. DOI
15. **Li DS**, Avazmohammadi R, Merchant SS, Kawamura T, Hsu EW, Gorman JH 3rd, Gorman RC, Sacks MS. Insights into the passive mechanical behavior of left ventricular myocardium using a robust constitutive model based on full 3D kinematics. *J Mech Behav Biomed Mater*. 2020; 103:103508. DOI
16. Avazmohammadi R, Mendiola EA, **Li DS**, Vanderslice P, Dixon RAF, Sacks MS. Interactions between structural remodeling and hypertrophy in the right ventricle in response to pulmonary arterial hypertension. *J Biomech Eng*. 2019;141(9):0910161-09101613. DOI
17. Avazmohammadi R, Soares JS, **Li DS**, Raut SS, Gorman RC, Sacks MS. A contemporary look at biomechanical models of myocardium. *Annu Rev Biomed Eng*. 2019;21:417-442. DOI
18. Avazmohammadi R, Mendiola EA, Soares JS, **Li DS**, Chen Z, Merchant S, Hsu EW, Vanderslice P, Dixon RAF, Sacks MS. A computational cardiac model for the adaptation to pulmonary arterial hypertension in the rat. *Ann Biomed Eng*. 2019;47(1):138-153. DOI
19. Avazmohammadi R, **Li DS**, Leahy T, Shih E, Soares JS, Gorman JH 3rd, Gorman RC, Sacks MS. An integrated inverse model-experimental approach to determine soft tissue three-dimensional constitutive parameters: application to post-infarcted myocardium. *Biomech Model Mechanobiol*. 2018;17(1):31-53. DOI
20. **Li DS**, Zimmermann J, Levine H. Modeling closure of circular wounds through coordinated collective motion. *Phys Biol*. 2016;13(1):016006. DOI
21. Guo F, Li S, Li H, Giacalone J, Jokipii JR, **Li DS**. On the amplification of magnetic field by a supernova blast shock wave in a turbulent medium. *Astrophys J*. 2012;747(2):98. DOI

Selected Conference Presentations

1. **Li DS**, Cavinato C, Dar Weiss, Latorre M, Humphrey JD. Identifying contributors to aneurysmal progression in the Marfan aorta using a constrained mixture model. *Biomedical Engineering Society Annual Meeting* (2024).
2. **Li DS**, Cavinato C, Latorre M, Humphrey JD. Identifying contributors to aneurysmal progression in the Marfan aorta using a constrained mixture model. *Summer Biomechanics, Bioengineering, and Biotransport Conference* (2023).
3. **Li DS**, Rego BR, Murtada SI, Li G, Tellides G, Humphrey JD. Toward a biomechanical model of aortic development. *Summer Biomechanics, Bioengineering, and Biotransport Conference* (2023).
4. **Li DS**, Latorre M, Humphrey JD. A constrained mixture model of thoracic aortic aneurysm growth. *Summer Biomechanics, Bioengineering, and Biotransport Conference* (2022).
5. **Li DS**, Mendiola EA, Avazmohammadi R, Sachse FB, Sacks MS. A high-fidelity 3D micromechanical model of ventricular myocardium. *Functional Imaging and Modeling of the Heart* (2021).
6. **Li DS**, Avazmohammadi R, Kawamura T, Rodell CB, Burdick JA, Gorman RC, Sacks MS. How hydrogel inclusions modulate the local 3D mechanical behavior of post-infarcted myocardium. *14th World Congress in Computational Mechanics & ECCOMAS Congress* (2021).
7. **Li DS**, Avazmohammadi R, Kawamura T, Rodell CB, Burdick JA, Gorman RC, Sacks MS. Hydrogel inclusions modulate local 3D mechanical behavior of post-infarcted myocardium. *Virtual Physiological Human Conference* (2020).
8. **Li DS**, Avazmohammadi R, Rodell CB, Burdick JA, Gorman RC, Sacks MS. How hydrogel inclusions modulate the local 3D mechanical behavior of post-infarcted myocardium. *Summer Biomechanics, Bioengineering, and Biotransport Conference* (2020).
9. **Li DS**, Aghakhani H, Reece GP, Markey MK, Sacks MS. A novel 3D constitutive model for human breast tissue. *Summer Biomechanics, Bioengineering, and Biotransport Conference* (2020).
10. **Li DS**, Avazmohammadi R, Merchant SS, Kawamura T, Hsu EW, Gorman JH 3rd, Gorman RC, Sacks MS. A new robust 3D constitutive model for the passive properties of left ventricular myocardium. *Computer Methods in Biomechanics and Biomedical Engineering* (2019).
11. **Li DS**, Avazmohammadi R, Rodell CB, Burdick JA, Gorman JH 3rd, Gorman RC, Sacks MS. How hydrogel injection affects local myocardium behavior under generalized 3D loading. *8th World Congress of Biomechanics* (2018).
12. **Li DS**, Avazmohammadi R, Soares JS, Gorman JH 3rd, Gorman RC, Sacks MS. An integrated simulation-experimental approach to determine three-dimensional strain energy density function parameters: application to viable myocardium. *Biomedical Engineering Society Annual Meeting* (2017).
13. **Li DS**, Avazmohammadi R, Soares JS, Burdick JA, Gorman JH 3rd, Gorman RC, Sacks MS. Characterizing the three-dimensional mechanical properties of passive myocardium injected with hydrogels using a novel numerical-experimental inverse modeling approach. *Summer Biomechanics, Bioengineering, and Biotransport Conference* (2017).
14. **Li DS**, Avazmohammadi R, Soares JS, Witschey WRT, Gorman JH 3rd, Gorman RC, Sacks MS. An integrated inverse model-experimental approach to determine soft tissue constitutive parameters: application to post-infarcted myocardium. *Euromech Colloquium 585* (2017).
15. **Li DS**, Avazmohammadi R, Soares JS, Gorman JH 3rd, Gorman RC, Sacks MS. A novel numerical-experimental inverse modeling approach to investigate the three-dimensional mechanical properties of infarcted myocardium. *Summer Biomechanics, Bioengineering, and Biotransport Conference* (2016).