Mrudang Mathur, PhD

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Education

- **The University of Texas at Austin** — Austin, TX
  PhD in Mechanical Engineering — *Aug 2018 – May 2024*
- **Delhi Technological University** — New Delhi, India
  Bachelor of Technology in Mechanical Engineering — *Aug 2014 – Jun 2018*

Experience

- **Stanford Surgical Intelligence & Modeling Laboratory** — Advisor: Prof. William Hiesinger
  Postdoctoral Scholar — *Jul 2024 – Present*
  - Using physics-based simulations to train autonomous surgical robots; Developing medically-consistent deep learning models; Optimizing septal myectomy repairs using fluid-structure interaction simulations

- **Soft Tissue Biomechanics Lab, UT-Austin** — Advisor: Prof. Manuel K. Rausch
  Graduate Research Assistant, AHA Predoctoral Fellow — *Aug 2018 – May 2024*
  - Thesis: *Towards understanding tricuspid valve mechanics & function in health, disease, and repair*
  - Optimized transcatheter tricuspid valve repair using analytical mechanics, histo-mechanical studies, machine learning, and high-fidelity finite element simulations

- **Ng Research Group, NTU Singapore** — Advisor: Prof. EYK Ng
  Summer Research Fellow — *Jun 2017 – Aug 2017*
  - Developed non-invasive, thermal diagnostic tools to detect carotid artery stenosis. Modeled system sensitivity through conjugate heat transfer simulations

- **Fluid Mechanics Group, DTU India** — Advisor: Prof. Rajkumar Singh
  Undergraduate Researcher — *Aug 2016 – Jun 2018*
  - Designed low-cost, smartphone-based Particle Image Velocimetry system for undergraduate student training

- **Innovator Lab Consultants, India** — Advisor: Sujay Shad, MD
  Research Engineer — *Feb 2015 – Jun 2018*
  - Reduced thrombogenicity of novel, mechanical heart valve using fluid-structure interaction simulations

Teaching Experience

- **Instructor**, Stanford: Reimagining Scientific Visualization with AR — *Spring 2026 (upcoming)*
- **Teaching Assistant**, UT Austin: Statics — *Spring 2021*
- **Teaching Assistant**, UT Austin: Aerospace Materials Lab — *Spring 2020*
- **Teaching Assistant**, UT Austin: New Product Development — *Fall 2019 & Fall 2018*
- **Teaching Assistant**, UT Austin: Intro. to Numerical Methods in BME — *Spring 2019*

Awards & Honors

- SES Future Faculty Symposium Travel Award — *Oct 2025*
- USNCCM Travel Award — *July 2025 & 2023*
- **Dean's Prestigious Fellowship Supplement (UT Austin)** — ***Aug 2023 & 2022***
- Finalist, PhD Paper Competition, SB3C — *Jun 2023*
- SES Annual Meeting Travel Award — *Oct 2022*

- **American Heart Association Predoctoral Fellowship, $64K** — ***Jan 2022 – Dec 2023***
- **Warren A. & Alice L. Meyer Scholarship in Engineering (UT Austin)** — ***Aug 2021 & 2019***
- **Member, Living Heart Project (Dassault Systèmes)** — ***Nov 2020 – Present***
- **Summer Research Fellowship (NTU, Singapore)** — ***Jun - Aug 2017***
- Best Re-engineered 3D Printed Product (ASME) — *Sept 2016*
- Merit Scholarship (DTU, India) — *Dec 2014*
- **DST INSPIRE Scholarship – declined (Govt. of India)** — ***Aug 2014***

Outreach & Service

- **Member**: *Stanford Cardiovascular Institute (CVI) Early Career Committee* – Planning career development activities, outreach talks, and research seminars for Stanford CVI trainees
- **Organizer**: *Early Career Lunch & Learn, Bay Area Cardiovascular Research Symposium, 2025* – Organized working lunch for early-career trainees to informally discuss professional development plans with faculty members at Stanford, UC San Francisco, UC Davis, and SJSU
- **Penpal**: *Stanford Science Penpals* – Exchanging monthly letters with underserved middle school students in California to encourage them to pursue a career in STEM
- **Technical Workshop Host**:
  Building AR Visualizations for Computational Mechanics, USNCCM17, 2023
  Reimagining Scientific Visualization using Augmented Reality, SB3C, 2023
- **Volunteer**: *Girl Day 2023, UT Austin* – Helped students make blood clots, shared how they form and break, and discussed the health implications of different clotting diseases
- **Mentor**: *INVVIZ 2022* – Helping Indian high-school students design a low-cost, "smart" sanitary pad dispenser to improve menstrual health of teenagers
- **Leader's Forum Member**: *The Global Education & Leadership Foundation* – Organized conferences on ethical leadership for Indian high-school & university students
- **Ad-hoc Reviewer**: Frontiers in Physiology, Cardiovascular Engineering & Technology, Scientific Reports, Biomechanics & Modeling in Mechanobiology, Annals of Biomedical Engineering, Device, Journal of Biomechanical Engineering, International Journal of Solids & Structures, Acta Biomaterialia, Engineering with Computers, Stanford CVI Summer Research Program

Invited Talks

I6 **Mathur, M.**(2025). *Cardiothoracic Digital Twins for Robot-assisted Surgery.* Harrington Faculty Fellow Symposium, Department of Aerospace Engineering & Engineering Mechanics, UT Austin, TX.
Note: Only trainee invited to speak alongside fellows of the NAE.

I5 **Mathur, M.**(2024). *Coding, Stretching & (Deep) Learning: My Journey Through Cardiovascular Science.* Pathways Seminar, Department of Biomedical Engineering, San Jose State University, CA.

I4 **Mathur, M.**(2023). *Augmented Reality for Scientific Visualization.* Yang Lab Seminar, Department of Aerospace Engineering & Engineering Mechanics, UT Austin, TX.

I3 **Mathur, M.** and Rausch, M.K. (2021). *Uncovering the Effects of Structural Intervention on the Human Tricuspid Valve Using Predictive Models.* 7th International Symposium: Virtual Twin of Human & Living Heart, Virtual.

I2 **Mathur, M.**, Meador, W.D. and Rausch, M.K. (2021). *Animal and Computer Models Towards a Better Understanding of Tricuspid Valve (Dys-)Function.* Edwards Lifesciences, Irvine, CA

I1 **Mathur, M.** and Rausch, M.K. (2020). *Subject-Specific Computational Models Of The Human Tricuspid Valve.* 6th Annual Living Heart Symposium, Virtual.

Book Chapters

B1 Meador W.D., **Mathur M.**, Rausch M.K. (2020). *Tricuspid Valve Biomechanics: A Brief Review.* In: *Advances in Heart Valve Biomechanics*, Springer. **LINK**

Journal Articles

: * indicates equal contribution; undergraduate & graduate mentees are underlined

As (co-)first author –

J30 Cho, J.*, **Mathur, M.***, Kaur, D., Duda, M., Dahlan, A., Krishnan, A., Leipzig, M., Shad, R., Gonzales, A.K., Logan, J., Siedman, C., Fong, R., Kumar, A., Zakka, C., Langlotz, C.P., Jolley, M.A., and Hiesinger, W. *A Multi-Task Deep Learning Model for Pediatric Echocardiography Analysis.* Preprint: medRxiv 2025.10.27.25338912. **LINK**

J29 Cho, J.*, **Mathur, M.***, Zakka, C.*, Kaur, D., Leipzig, M., Dalal, A., Krishnan, A., Koo, E., Wai, K., Zhao, C.S., Shad, R., Fong, R., Wightman, R., Chaudhari, A., and Hiesinger, W. *MediSyn: A Generalist Text-Guided Latent Diffusion Model For Diverse Medical Image Synthesis.* Preprint: arXiv:2405.09806. **LINK**

J28 **Mathur, M.**, Malinowski, M., Jazwiec, T., Timek, T.A., and Rausch, M.K. (2024). *Leaflet Remodeling Reduces Tricuspid Valve Function in a Computational Model.* Journal of the Mechanical Behavior of Biomedical Materials, 152, p.106453. **LINK**

J27 **Mathur, M.**, Brozovich, J.M., and Rausch, M.K. (2023). *A brief note on building augmented reality models for scientific visualization.* Finite Elements in Analysis & Design, 213, p.103851. **LINK**

J26 Lin, C.-Y.*, **Mathur, M.***, Malinowski, M., Timek, T., and Rausch, M.K. (2022). *The impact of thickness heterogeneity on soft tissue biomechanics: A novel measurement technique and a demonstration on heart valve tissue.* Biomechanics and Modeling in Mechanobiology, pp.1-12. **LINK**

J25 **Mathur M.**, Meador W.D., Malinowski M., Jazwiec T., Timek T.A., and Rausch M.K. (2022). *Texas TriValve 1.0: a reverse-engineered, open model of the human tricuspid valve.* Engineering with Computers, 38(5), pp.3835-3848. **LINK**

J24 **Mathur, M.***, Meador, W. D.*, Jazwiec, T., Malinowski, M., Timek, T. A., and Rausch, M. K. (2020). *Tricuspid valve annuloplasty alters leaflet mechanics.* Annals of Biomedical Engineering, 48(12), pp.2911-2923. **LINK**

J23 **Mathur, M.**, Malinowski, M., Timek, T.A. and Rausch, M.K. (2020). *Tricuspid annuloplasty rings: A quantitative comparison of size, non-planar shape, and stiffness.* The Annals of Thoracic Surgery, 110(5), pp.1605-1614. **LINK**

J22 **Mathur, M.**, Meador, W.D., Jazwiec, T., Malinowski, M., Timek, T.A. and Rausch, M.K. (2020). *The effect of downsizing on the normal tricuspid annulus.* Annals of Biomedical Engineering, 48(2), pp.655-668. **LINK**

J21 **Mathur, M.**, Jazwiec, T., Meador, W.D., Malinowski, M., Goehler, M., Ferguson, H., Timek, T.A. and Rausch, M.K. (2019). *Tricuspid valve leaflet strains in the beating ovine heart.* Biomechanics and Modeling in Mechanobiology, 18(5), pp.1351-1361. **LINK**

As second author –

J20 Haese, C.E., **Mathur, M.**, Malinowski, M., Timek, T.A., and Rausch, M.K. (2023) *Geometric Data of Commercially Available Tricuspid Valve Annuloplasty Devices.* Data in Brief, 52, p.110051. **LINK**

J19 Haese, C.E., **Mathur, M.**, Lin, C-Y, Malinowski, M., Timek, T.A., and Rausch, M.K. (2023) *Impact of Tricuspid Annuloplasty Device Shape and Size on Valve Mechanics - A Computational Study.* JTCVS Open, 17, pp.111-120. **LINK**

J18 Meador, W.D., **Mathur, M.**, Kakaletsis, S., Lin, C.-Y., Bersi, M.R., and Rausch, M.K. (2022). *Biomechanical phenotyping of minuscule soft tissues: An example in the rodent tricuspid valve.* Extreme Mechanics Letters, 55, p.101799. **LINK**

J17 Meador W.D., **Mathur M.**, Sugerman G.P., Malinowski M., Jazwiec T., Wang X., Lacerda C., Timek T.A., and Rausch M.K. (2020). *The tricuspid valve also maladapts: A multiscale study in sheep with biventricular heart failure.* eLife, 9:e63855. **LINK**

J16 Smith, K.J., **Mathur, M.**, Meador, W.D., Phillips-Garcia, B., Sugerman, G.P., Menta, A.K., Jazwiec, T., Malinowski, M., Timek, T.A. and Rausch, M.K. (2021). *Tricuspid chordae tendineae mechanics: Insertion site, leaflet, and size-specific analysis and constitutive modelling.* Experimental Mechanics, 61, pp.19-29. **LINK**

J15 Meador, W.D., **Mathur, M.**, Sugerman, G.P., Jazwiec, T., Malinowski, M., Bersi, M.R., Timek, T.A. and Rausch, M.K. (2020). *A detailed mechanical and microstructural analysis of ovine tricuspid valve leaflets.* Acta Biomaterialia, 102, pp.100-113. **LINK**

J14 Rausch, M.K., **Mathur, M.** and Meador, W.D. (2019). *Biomechanics of the tricuspid annulus: A review of the annulus in vivo dynamics with emphasis on ovine data.* GAMM Mitteilungen, 42(3), p.e201900012. **LINK**

As coauthor –

J13 Haese, C.E., Dubey, V., **Mathur, M.**, Kreidel, F., Fuhg, J., Moussa, I., Timek, T.A., Rausch, M.K. *Understanding the Mechanisms Behind the Annuloplasty Effect in Tricuspid Valve TEER: A Computational Study.* Submitted. Preprint: biorxiv 2025.11.04.686540. **LINK**

J12 Shad R., Zakka C., Kaur, D., **Mathur, M.**, Fong, R., Cho, J., Filice, R., Mongan, J., Kallianos, K.G., Khandwala, N., Eng, D., Leipzig, M., Witschey, W., de Fiera, A., Ferrari, V., Ashley, E., Acker, M.A., Langlotz, C., Hiesinger, H. *A Generalizable Deep Learning System for Cardiac MRI.* Nature Biomedical Engineering (in press).

J11 Kaur, D., Shad, R., Kumar, A., **Mathur, M.**, Cho, J., Fong, R., Zakka, C., Phillips, C., and Hiesinger, W. *Sex Disparities in Deep Learning Estimation of Ejection Fraction from Cardiac Magnetic Resonance Imaging.* NPJ Digital Medicine (in press).

J10 Kostelnik, C.*, Meador, W.*, Lin, C-Y., **Mathur, M.**, Malinowski, M., Jazwiec, T., Malinowskwa, Z., Piekarska, M., Gaweda, B., Timek, T.A., and Rausch, M.K. (2025) *Tricuspid valve leaflet remodeling in sheep with biventricular heart failure: A comparison between leaflets.* Acta Biomaterialia, 198, pp. 234-244. **LINK**

J9 Haese, C.E., Dubey, V., **Mathur, M.**, Pouch, A.M., Timek, T.A., Rausch, M.K. (2024) *Valvular Edge-to-Edge Repair Simulations are Highly Sensitive to Annular Boundary Conditions.* Journal of the Mechanical Behavior of Biomedical Materials, 163, pp.106879. **LINK**

J8 Kakaletsis, K., Malinowski, M., Snider, C.J., **Mathur, M.**, Sugerman, E., Jazwiec, T., Bersi, M.R., Timek, T.A., and Rausch, M.K. (2023) *Untangling the mechanisms of pulmonary arterial hypertension-induced right ventricular stiffening in a large animal model.* Acta Biomaterialia, 171, pp.155-165. **LINK**

J7 Iwasieczko, A., Gaddam, M., Gaweda, B., Goodyke, A., **Mathur, M.**, Lin, C-Y, Zagorski, J., Solarewicz, M., Cohle, S., Rausch, M.K., Timek, T.A. (2023). *Valvular complex and tissue remodeling in ovine functional tricuspid regurgitation.* European Journal of Cardio-Thoracic Surgery, 63(5). **LINK**

J6 Kakaletsis S., Meador W.D., **Mathur M.**, Sugerman G.P., Jazwiec M., Lejeune E., Timek T.A., and Rausch M.K.(2021) *Right ventricular myocardial mechanics: Multi-modal deformation, microstructure, and modeling.* Acta Biomaterialia, 123, pp.154-166. **LINK**

J5 Jazwiec, T., Malinowski, M. J., Ferguson, H., Parker, J., **Mathur, M.**, Rausch, M. K., and Timek, T. A. (2021). *Tricuspid valve anterior leaflet strains in ovine functional tricuspid regurgitation.* Seminars in Thoracic and Cardiovascular Surgery, 33(2), pp.356-364. **LINK**

J4 Saxena A., Ng E.Y.K., **Mathur M.**, Manchanda C., and Jajal N.A. (2019) *Effect of carotid artery stenosis on neck skin tissue heat transfer*, International Journal of Thermal Sciences, 145, p.106010. **LINK**

In preparation –

J3 **Mathur, M.** Corpuz, A., Zhao, H., Saraein, M., Haese, C., Fong, R., Hsu., M-C, Hiesinger, W., and Rasuch, M.K. *An Open-source Framework For Immersogeometric Analysis of Atrioventricular Heart Valves.*

J2 **Mathur, M.***, Kumar, A.*, Duda, M., Eades, A.T., Cho, J., Fong, R., Peltier, G., Leon, M., Ruaengsri, C., Hiesinger, W. *Towards building real-time digital twins for robot-assisted cardiac surgery.*

J1 **Mathur, M.***, Haese, C.E.*, Dubey, V., Meador, W.D., Malinowski, M., Jazwiec, T., Simonian, N., Sacks, M., Timek, T.A., and Rausch, M.K. *No Strings Attached: Predicting Tricuspid Valve Coaptation Without In Vivo Chordal Geometry.*

Selected Conference Proceedings & Presentations

: * indicates presenting author

C9 **Mathur, M.*** Corpuz, A., Zhao, H., Saraein, M., Haese, C., Fong, R., Hsu., M-C, Rausch, M.K., and Hiesinger W. (2025). *An Open-source Framework For Immersogeometric Analysis of Atrioventricular Heart Valves.* 18th US National Congress on Computational Mechanics, Chicago, IL.

C8 **Mathur, M.***, Malinowski, M., Timek, T.A., and Rausch, M.K. (2023). *Suppressing leaflet thickening and stiffening may restore tricuspid valve function.* Proceedings of the Summer Biomechanics, Bioengineering, & Biotransport Conference, Vail, CO.

C7 **Mathur, M.***, Malinowski, M., Timek, T.A., and Rausch, M.K. (2023). *"Are Images Enough?" – Examining the sensitivity of imaging-based finite element models of the human tricuspid valve.* 17th U.S National Congress on Computational Mechanics, Albequerque, NM.

C6 **Mathur, M.***, Lin, C-Y, Shad, R., Fong, R., Hiesinger, W. and Rausch, M.K. (2022). *On the Sensitivity of Tricuspid Valve Models Built From Non-invasive Imaging Data.* 15th World Congress of Computational Mechanics, Virtual.

C5 **Mathur, M.***, Meador, W.D., Malinowski, M., Jazwiec, T., Timek, T.A. and Rausch, M.K. (2022). *Texas TriValve 1.0: A reverse engineered, open model of the human tricuspid valve.* Proceedings of the Summer Biomechanics, Bioengineering, & Biotransport Conference, Cambridge, MD, USA.

C4 **Mathur, M.***, Meador, W.D., Malinowski, M., Timek, T.A. and Rausch, M.K. (2021). *True Subject-Specific Computational Models Of The Human Tricuspid Valve.* Annual Meeting of the Heart Valve Society, Virtual.

C3 **Mathur, M.***, Meador, W.D., Malinowski, M., Timek, T.A. and Rausch, M.K. (2021). *Engineering a Structural Twin of the Human Tricuspid Valve.* 4th Carnegie Mellon Forum on Biomedical Engineering, Virtual.

C2 **Mathur, M.***, Meador, W.D., Malinowski, M., Timek, T.A. and Rausch, M.K. (2021). *Using Predictive Simulations to Uncover the Effects of Ring-based Annuloplasty on the Human Tricuspid Valve.* 16th U.S National Congress on Computational Mechanics, Virtual.

C1 **Mathur, M.***, Shen, C., Meador, W.D., Malinowski, M., Timek, T.A. and Rausch, M.K. (2019). *Imaging-based Reconstruction Methods for Patient-Specific Tricuspid Valve Models.* 15th U.S National Congress on Computational Mechanics, Austin TX, USA.