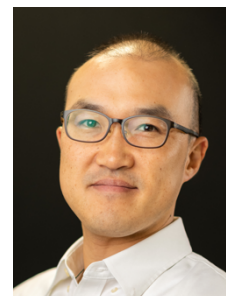


# SANGYOON J. HAN, Ph.D.

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Assistant Professor  
Michigan Technological University  
Department of Biomedical Engineering  
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Houghton, MI 49931  
Phone: (906) 487 2897  
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## EXECUTIVE SUMMARY

Sangyoon J. Han is an engineer and a biologist who believes that an accurate measurement brings new discovery. His group develops image remodeling/analysis software, such as traction force microscopy (TFM) and focal adhesion tracking package, to find the fundamental mechanisms underlying force transduction that occurs during cells' environmental sensing and migration, largely recognized as *mechanobiology*. He is also a passionate teacher who keeps innovating the student learning experience by transforming the class into human-centered learning environment.

### Research Interests (Biological):

Mechanobiology, Cancer Mechanobiology, Ehlers-Danlos Syndrome, Cell Mechanics, Computational Cell Biology, and Cell Migration

### Research Interests (Technical):

Traction Force Microscopy, Live-Cell Microscopy, Computer Vision, Machine/Deep Learning, Inverse Problem, Nonlinear Mechanics Characterization of Extracellular Matrix

## EDUCATION

**2007 - 2012 Ph.D., Mechanical Engineering, University of Washington, Seattle, WA**

Dissertation title: *Experimental and computational analysis of cell mechanics during spreading and migration*

Advisor: Dr. Nathan J. Sniadecki, Professor in Mech. Engineering at University of Washington.

Research experience: BioMEMS, Microfluidics, Micropatterning, Mammalian Cell Culture, Mathematical Modeling, Fluorescence Microscopy and Electron Microscopy

**2002 - 2004 M.S., Mechanical Engineering, Seoul National University, Seoul, Korea (Advisor: Kunwoo Lee)**

Thesis: *Biomechanical study of artificial disc replacement in lumbar spine using finite element analysis*

**1998 - 2002 B.S., Mechanical Engineering, Seoul National University, Seoul, Korea**

Senior project: *Development of Smart 2D Sketcher Using Dimensional Constraint Manager for Computer-Aided Design (CAD) Program*

## CURRENT AND PAST EMPLOYMENT HISTORY

**2017 - present Michigan Technological University, Assistant Professor, Biomedical Engineering**

- Established Mechanobiology Lab with fully functional BSL-2 laboratory in BME department
- Established a live-cell, confocal/TIRF microscopy facility at Great Lake Research Center
- Trained/training 2 Ph.D. students, 4 Master students, and 15 undergraduate students
- Established TFM protocol in the lab and applied it to matrix stiffness sensing, endothelial flow sensing, collagen subtype sensing and silicone non-linear mechanics.
- Published software, 'Focal Adhesion Package', in Han Lab Website and GitHub
- Published an upgrade in the software, 'TFM Package' with a particle re-tracking method: >500 accumulated downloads
- Introduced a new technical elective course titled "Computer Vision for Microscopic Images"

- Introduced a new technical elective course titled “Tissue Mechanics”
  - Innovated another graduate level course “Cell Biomechanics and Mechanotransduction” with introduction of numerical models
  - Started a new, BME-focused undergraduate course, ‘Bio-fluid Mechanics and Heat Transfer’ and kept innovating it with computational challenges such as CFD and PIV algorithm implementation
  - Serving as primary senator in MTU Senate
- 2014 - 2017** **University of Texas Southwestern Medical Center, Postdoctoral Scientist, Bioinformatics**  
 Postdoc Advisor: *Dr. Gaudenz Danuser*, Chair of Bioinformatics Department, UT Southwestern  
 Research experience: Mechanobiology, Computer Vision, Inverse Problem, Light Microscopy, Single Particle Tracking, Convolutional Neural Networks, Time-series Analysis.
- Developed high-resolution traction force microscopy (TFM) software package.
  - Developed single-particle-tracking program for nascent and focal adhesions.
  - Developed Machine-Learning-based classification of dynamic nascent adhesions.
  - Identified differential recruitment of talin, vinculin and paxillin in force-transmitting adhesions.
- 2012 - 2013** **Harvard Medical School, Postdoctoral Scientist, Cell Biology**  
 P.I.: Gaudenz Danuser, Professor, Department of Cell Biology
- Developed high-performance particle image velocimetry (PIV) specifically designed for TFM.
  - Identified role of myosin II activity in actin’s inward flow using quantitative fluorescence speckle microscopy (qFSM).
- 2007 - 2012** **University of Washington, Research Assistant, Mechanical Engineering**
- Established PDMS-based micro-post assays in the Sniadecki Lab as the first Ph.D. student and used them to reveal relationships between substrate stiffness, cell spread area and the traction force
  - Developed a Bio-Chemo-Mechanical model, both in Matlab and COMSOL, that predicts traction modulation during stiffness sensing and cell migration.
  - Developed micro-contact printing-based patterning techniques on micro-posts to study 1-D fibroblast migration and endothelial traction modulation
  - Developed streamlined Matlab program to analyze time-lapse images of microposts
- 2006 - 2007** **Korea Institute of Industrial Technology (KITECH), Project Manager, Applied Robotics, Ansan, Korea**
- Managed a government-supported project, developing an integrated interface for healthcare robots.
- 2004 - 2006** **Daewoo Electronics Corp, Research Engineer, Digital Multimedia R&D Center, Gunpo, Korea**
- Designed and followed through a manufacturing/quality-control process for TV cabinet.

## GRANTS, CURRENT

- 2023-2028 NIH R01 (R01EY035305, \$1,775,724). Bioengineered corneal endothelial graft using photodegradable device to induce graft-host integration, Role: Co-Investigator
- 2023-2026 NIH R15 (2R15GM135806-02, \$450K). Informational flow from mechanosensing to signaling for extracellular matrix stiffness sensing, Role: Principal Investigator
- 2024-2025 NIH R15 (3R15GM135806-02, \$100K). Supplement: Upgrade of Spinning-disk and TIRF microscopy with modern laser and LED illuminations. Role: Principal Investigator
- 2023 Wallas Research Foundation (\$270K). Elucidation of mechanobiological pathway in classical type of Ehlers-Danlos Syndrome , Role: Principal Investigator
- 2022-2023 MTU Research Excellence Fund – Research Seed Grant (\$26K). Mechanics and Dynamics of Filopodia in Cancer Cells for Directed Migration, Role: Principal Investigator

## GRANTS, PAST

- 2019-2023 NIH R15 (GM135806-01, \$410K). Nascent Adhesion-Based Mechano-transmission for Extracellular Matrix Stiffness Sensing, Role: Principal Investigator

- 2020-2021 MTU Research Excellence Fund – Research Seed Grant (\$71K). Building Big Data Computing Capabilities Toward Advancing Research and Education, Role: Co-Principal Investigator
- 2018 Michigan Tech C2E2 (\$5K). Building Mechanical Testing Infrastructure toward Enhancement, Role: Co-Investigator
- 2017 NIH R01 (GM071868) Mechanochemical regulation of actin-mediated cell protrusion – Assisted with figures.
- 2016 NIH K99/R00 Career Development Grant: Science score: 3 in average (out of 6).
- 2015 Burroughs Wellcome Fund, Career Award in Scientific Interface: Finalist
- 2014 American Heart Association Postdoctoral Fellowship: Review score 2.12
- 2009 NIH R21 (HL097284) Subcellular Platelet Forces and Adhesions - Assisted with preliminary analysis
- 2008 NSF CAREER (#0846780) Mechanics of Smooth Muscle Cell Contraction - Assisted with analysis

### PEER REVIEWED PUBLICATIONS (in reverse chronological order)

- Chandurkar, M. K., Mittal, N., Royer-Weeken, S. P., Lehmann, S. D., Michels, E. B., Haarman, S. E., Severance, S. A., Rho, Y., **Han, S. J.** (2024). Transient Low Shear Stress Preconditioning Influences Long-term Endothelial Traction and Alignment under High Shear Flow. *American Journal of Physiology-Heart and Circulatory Physiology* 326(5), H1180-H1192.
- McGowan, S.E., Gilfanov, N., Chandurkar, M. K., Stiber, J. A., **Han, S. J.** (2024). Drebrin is Required for Myosin-facilitated Actin Cytoskeletal Remodeling during Pulmonary Alveolar Development. *American Journal of Respiratory Cell and Molecular Biology* 70(4)
- Mittal, N., Michels, E. B., Massey, A. E., Qiu, Y., Royer-Weeden, S. P., Smith, B.R., Cartagena-Rivera, A. X., **Han, S. J.** (2024). Myosin-independent stiffness sensing by fibroblasts is regulated by the viscoelasticity of flowing actin. **Communications Materials** 5(1), 6
- Carney, K. R., Khan, A. M., Samson, S. C., Mittal, N., **Han, S. J.**, Mendoza, M. C., & Bidone, T. C. (2023). Nascent adhesions shorten the period of lamellipodium protrusion through the Brownian ratchet mechanism. *Mol Biol Cell* 34(12), ar115.
- Haarman, S., Kim, S. Y., Isogai, T., Dean, K. M., **Han, S. J.**, (2022). Particle Retracking Algorithm Capable of Quantifying Large, Local Matrix Deformation for Traction Force Microscopy, *PLoS ONE*, 17(6): e0268614. DOI: 10.1371/journal.pone.0268614
- Royer S. P., **Han S. J.**, (2022). Mechanobiology in the Comorbidities of Ehlers Danlos Syndrome. *Frontiers in Cell and Developmental Biology*, 10, 2296-634X, doi: 10.3389/fcell.2022.874840
- Wang, J., Wren, J. D., Ding, Y., Chen, J., Mittal, N., Xu, C., **Han, S. J.** & Zhang, X. A. (2022). EW12 promotes endolysosome-mediated turnover of growth factor receptors and integrins to suppress lung cancer. **Cancer letters**, 215641.
- Beussman, K. M., Mollica, M. Y., Leonard, A., Miles, J., Hocter, J., Song, Z., ..., **Han, S.J.**, ..., Wendy, E. T., & Sniadecki, N. J. (2021). Black Dots: High-Yield Traction Force Microscopy Reveals Structural Factors Contributing to Platelet Forces. *Acta biomaterialia*.
- Mittal, N., **Han, S. J.** (2021). High-resolution, highly-integrated traction force microscopy software. *Current Protocols*, 1, e233. doi: 10.1002/cpz1.233
- Han, S.J.**, Arazova, E., Whitewood, A.J., Bachir, A., Guttierrez, E., Groisman, A., Horwitz, A.R., Goult B.T., Dean, K.M. and Danuser, G. (2021) Pre-complexation of talin and vinculin without tension is required for efficient nascent adhesion maturation, **eLife**, 10, e66151.
- Schäfer, C., Ju, Y., Tak, Y., **Han, S.J.**, Tan, E., Shay, J.W., Danuser, G., Holmqvist, M., Bubley, G. (2020) TRA-1-60-positive cells found in the peripheral blood of prostate cancer patients correlate with metastatic disease. *Heliyon* 6(1), e03263.
- Mohan, A.S., Dean, K.M., Isogai, T., Kasitnon, S.Y., Murali, V.S., Roudot, P., Groisman, A., Reed, D.K., Welf, E.S., **Han, S.J.**, Noh, J., and Danuser, G. (2019). Enhanced Dendritic Actin Network Formation in Extended Lamellipodia Drives Proliferation in Growth-Challenged Rac1P29S Melanoma Cells. **Developmental Cell**, 49(3), pp.444-460.

13. Manificier I., Milan, J., Beussman, K., **Han, S.J.**, Sniadecki, N.J., About, I (2019) The consequence of large-scale rigidity on actin network tension. *In press. Comp Meth Biomech Biomed Eng*, 2019 Oct;22(13):1073-1082.
14. Mohan A., Dean K., **Han S.J.**, Welf E.S., Danuser G. (2017) LB993 Focal adhesions mediate Rac1P29S-dependent drug resistance to MAPK inhibitors in melanoma. *J Investigative Dermatology*. 137 (10), B11
15. Costigliola N., Ding, L., Burckhardt, C.J., **Han, S.J.**, Gutierrez, E., Mota, A., Groisman, A., Mitchison, T.J., and Danuser, G. (2017) Vimentin directs traction stress. *PNAS*. 2017 114 (20) 5195-5200.
16. **Han, S.J.**, Rodriguez M.L., Al-Rekabi, Z., Sniadecki, N.J. (2016) Spatial and Temporal Coordination of Traction Forces in One-Dimensional Cell Migration, *Cell Adhesion & Migration*. 10(5): 529-539.
17. Oudin, M.J., Barbier, L., Schäfer, C., Kosciuk, T., Miller, M.A., **Han, S.J.**, Jonas, O., Lauffenburger, D.A., Gertler, F.B. (2016) Mena confers resistance to Paclitaxel in triple-negative breast cancer. *Mol Cancer Ther*. DOI: 10.1158/1535-7163. MCT-16-0413.
18. Milan, J., Manificier, I., Beussman, K.M., **Han, S.J.**, Sniadecki, N.J., About, I., Chabrand, P. (2016) In silico CDM model sheds light on force transmission in cell from focal adhesions to nucleus. *J Biomechanics*. 49(13):2625-2634.
19. Lomakin. A.J., Lee, K.C., **Han, S.J.**, Bui, A., Davidson, M., Mogilner, A., Danuser G. (2015) Competition for molecular resources among two structurally distinct actin networks defines a bistable switch for cell polarization, *Nature Cell Biology*. 17, 1435–1445
20. **Han, S.J.**, Oak, Y., Groisman, A., Danuser, G. (2015) Traction Microscopy to Identify Force Modulation in Sub-resolution Adhesions, *Nature Methods*. 12(7): 653–656
21. Rodriguez, M.L., Graham, B.T., Pabon, L.M., **Han, S.J.**, Murry, C.E., Sniadecki, N.J. (2014) Measuring the Contractile Forces of Human Induced Pluripotent Stem Cell-Derived Cardiomyocytes with Arrays of Microposts. *J Biomechanical Engineering*. 136(5), 051005
22. Sniadecki, N.J., **Han, S.J.**, Ting, L.H., Feghhi, S. (2013) Micropatterning on Micropost Arrays, *Methods in Cell Biology*. 121:61-73
23. Rodriguez, A.G., Rodriguez, M.L., **Han, S.J.**, Sniadecki, N.J., Regnier, M. (2013) Enhanced Contractility with 2-deoxy-ATP and EMD 57033 is Correlated with Reduced Myofibril Structure and Twitch Power in Neonatal Cardiomyocytes. *Integr Biol*. 5(11):1366-73
24. **Han, S.J.**, Bielowski, K., Rodriguez, M., Ting, L., Sniadecki, N.J. (2012) Decoupling Spread Area, Substrate Stiffness, and Micropost Density: A Close Spatial Relationship Between Traction Forces and Focal Adhesions. *Biophys J*. 103(4):640-648
25. Ting, L., Jahn, J., Jung, J., Shuman, B., Feghhi, S., **Han, S.J.**, Sniadecki, N.J. (2012) Flow Mechanotransduction Regulates Traction Forces, Intercellular Forces, and Adherens Junctions. *Am J Physiol Heart and Cir Physiol*. 302(11):H2220-H2229
26. Ting, L.H., Feghhi, S., **Han, S.J.**, Rodriguez, M.L., Sniadecki, N.J. (2011) Effect of Silanization Film Thickness in Soft Lithography of Nanoscale Features. *ASME J Nano Engr Medicine*. 2(4):041006
27. Rodriguez, A.G., **Han, S.J.**, Regnier, M., Sniadecki, N.J. (2011) Substrate Stiffness Increases Twitch Power of Neonatal Cardiomyocytes in Correlation with Changes in Myofibril Structure and Intracellular Calcium. *Biophys J*. 101(10):2455-2464.
28. **Han, S.J.**, Sniadecki, N.J. (2011) Simulations of the Contractile Cycle in Cell Migration Using a Bio-Chemical-Mechanical Model. *Comp Meth Biomech Biomed Eng*. 14(5):459-468
29. Tooley, W.W., Feghhi, S., **Han, S.J.**, Wang, J., Sniadecki, N.J. (2011) Thermal Fracture of Oxidized Polydimethylsiloxane during Soft Lithography of Nanopost Arrays. *J Microeng Micromech*. 21(5):054013

30. Liang, X.M, **Han, S.J.**, Reems, J.A., Gao, D., Sniadecki, N.J. (2010) Platelet Retraction Force Measurements Using Flexible Post Force Sensors. *Lab on a Chip*. 10(8):991-998

## PREPRINTS

1. Isogai, T., Dean, K.M., Roudot, P., Shao, Q., Cillay, J.D., Welf, E.S., Driscoll, M.K., Royer, S.P., Mittal, N., Chang, B., **Han, S.J.**, Fiolka, R., Danuser, G., (2019) Direct Arp2/3-vinculin binding is essential for cell spreading, but only on compliant substrates and in 3D, *bioRxiv*

## BOOK CHAPTERS

1. Chandurkar, M. K., & **Han, S. J.** (2022). Subcellular Force Quantification of Endothelial Cells Using Silicone Pillar Arrays. In *Vascular Tissue Engineering* (pp. 229-245). Humana, New York, NY.
2. **Han, S.J.**, Sniadecki, N.J. (2021) Subcellular Force Quantification of Endothelial Cells Using Silicone Pillar Arrays. *Methods Molecular Biology, Vol. 2375: Vascular Tissue Engineering, 978-1-0716-1707-6, 485275\_1\_En*, (Chapter 19, ed. F. Zhao and K. W. Leong).
3. **Han, S.J.**, Sniadecki, N.J. (2011) Nanotechnology Usages for Cellular Adhesion and Traction Forces. *Cellular and Biomolecular Mechanics and Mechanobiology*. (ed. A. Gefen). Springer: New York. 7:177-200.

## SOFTWARE

1. Han, S.J., **TFM software**, written in Matlab and released in 2015, <https://hanlab.biomed.mtu.edu/software>
2. Han, S.J., **Focal Adhesion Package**, written in Matlab and released in 2021, <https://github.com/HanLab-BME-MTU/focalAdhesionPackage>

## PATENTS

1. Sangyoon Han, Korea Patent 10-0643886-0000, *Remote Controlled Television by User's Motion Using Image Processing and the Method Thereof*. June, 2004
2. Sangyoon Han, Korea Patent 10-2004-0109944 Screen Angle Alternation Apparatus Through Viewer-position Detection And Method Thereof. December, 2004
3. Sangyoon Han, Korea Patent 10-0635144-0000, A Button Door Structure of Electronic Goods, June, 2004

## AWARDS

2019 Best Poster Award, The 6<sup>th</sup> Zoo Meeting on Cell Adhesion and Migration in Inflammation and Cancer, 2019  
2017 Best Poster Award, US-Korea Conference 2017  
2016 Best Poster Award, US-Korea Conference 2016  
2015 American Society of Cell Biology Conference, Postdoctoral Scholar Travel Award  
2011 University of Washington Travel Award  
2011 NSF Student Travel Grants for the ASME IMECE 2011 Micro/Nano Forum  
2009 Kobayashi Fellowship for outstanding graduate students

## SERVICE

### Service to the University

- 2021-Current: Senator for BME at MTU Senate
- 2021-Current: Information Technology Committee in MTU Senate
- 2017-2021: Graduate Committee for BME, MTU
- 2021-Current: Faculty Advisor for Korean Student Association at MTU
- Judge MTU Graduate Student Government symposium, 2018, 2019, 2022
- Judge MTU HRI Graduate symposium, 2023

### Services to Professional Community

- 2021 October BMES Session Chair: Cancer Systems Biology
- 2020 October BMES Session Chair: Molecular Imaging
- 2020 February NIH NCSD Study Section Reviewer
- 2020 January NSF Reviewer
- 2019 October BMES Session Chair: Human Biomechanics

#### **Journal Editor**

- Since 2021: Reviewing Editor for *Frontiers in Cell and Developmental Biology*, *Cell Adhesion and Migration*
- Since 2021: Editorial Topic Board Member for *Bioengineering Journal*

#### **Paper Referee**

- ACS Biomaterials
- Acta Biomaterialia
- Annals of Biomedical Engineering
- Biochemistry
- Bioinformatics
- Biomicrofluidics
- Biophysical Journal (5)
- Biomechanics and Modeling in Mechanobiology (2)
- Computer Methods in Biomechanics and Biomedical Engineering
- Communications Biology
- Current Biology
- eLife
- Frontiers in Cell and Developmental Biology, Cell Adhesion and Migration (2)
- Heliyon (2)
- International Journal for Numerical Methods in Biomedical Engineering
- Journal of Cell Science
- Journal of Biomechanical Engineering
- Journal of Visualized Experiments
- Molecular Biosystems
- Physical Chemistry Chemical Physics
- PLOS ONE
- Biochemistry
- RSC Advances
- Scientific Reports
- STAR Protocol

#### **Poster & Podium Judge:**

- 2015 ASCB Conference undergraduate poster judge
- 2018 Feb 28 Graduate Research Colloquium judge

#### **Services to Local Community**

- 2017 October Engineering Discovery Day
- 2018 October Engineering Discovery Day
- 2019 November Engineering Discovery Day
- 2021 November Engineering Explorations

### **TEACHING AND MENTORING EXPERIENCE**

#### **Teaching Innovation**

- 2023** Participation in a summer workshop series to support the integration of computing across engineering curricula, July 11-13, 2023, hosted by University of Illinois College of Engineering
- This workshop was followed by 5-week follow-up mentoring, through which I was able to finish developing a complete lesson plan to involve practical Matlab-based, Fully-autograded, Mastery-learning assignments in my course that I will teach in Fall 2023.

## **Teaching**

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>2024 Spring</b>  | Bio-Fluid Mechanics and Heat Transfer (BE3550), Michigan Tech University                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>2023 Fall</b>    | Cell Biomechanics and Mechanotransduction (BE4350/5350), Michigan Tech University                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>2023-2024</b>    | Senior Design Project Mentoring (BE4901), Michigan Tech University <ul style="list-style-type: none"><li>Minimally Invasive Surgical Wire Passer for Traumatic Surgery, sponsored by Resolve Surgical Technologies, Marquette, MI: <u>Awarded with 1<sup>st</sup> Place in Senior Design Award, 2<sup>nd</sup> Place Innovation Award, and Audience's Choice Award</u></li><li>Quantification of Head and Neck Movement for Development of Blood-pressure-regulating baroreflex system, sponsored by Barologics, Bloomington, MN</li></ul> |
| <b>2023 Spring</b>  | Bio-Fluid Mechanics and Heat Transfer (BE3550), Michigan Tech University                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>2022 Fall</b>    | Computer Vision for Microscopic Images (BE4870/5870), Michigan Tech University                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>2022-2023</b>    | Senior Design Project Mentoring (BE4901), Michigan Tech University <ul style="list-style-type: none"><li>Instrument Laser Weld Characterization and Testing, sponsored by Resolve Surgical Technologies, Marquette, MI</li><li>Device to measure mechanical properties of cell monolayer, sponsored by Muhammad Rizwan, MTU BME</li></ul>                                                                                                                                                                                                  |
| <b>2022 Spring</b>  | Bio-Fluid Mechanics (BE3550), Michigan Tech University                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>2021 Fall</b>    | Cell Biomechanics and Mechanotransduction (BE4350/5350), Michigan Tech University                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>2021-2022</b>    | Senior Design Project Mentoring (BE4901), Michigan Tech University <ul style="list-style-type: none"><li>Hospital Washer AutoSampler Phase III, sponsored by Stryker</li><li>Custom Designed Mechanical Grips- Project Plan II, sponsored by Boston Scientific</li></ul>                                                                                                                                                                                                                                                                   |
| <b>2021 Spring</b>  | Bio-Fluid Mechanics (BE3550), Michigan Tech University                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>2020 Fall</b>    | Computer Vision for Microscopic Images (BE4870/5870), Michigan Tech University                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>2020-2021</b>    | Senior Design Project Mentoring (BE4901), Michigan Tech University <ul style="list-style-type: none"><li>Hospital Washer AutoSampler Phase II, sponsored by Stryker</li><li>Advanced Filtration for Flyte Personal Protection System to protect against Covid-19 and other viruses, sponsored by Stryker</li></ul>                                                                                                                                                                                                                         |
| <b>2020 Spring</b>  | Bio-Fluid Mechanics (BE3550), Michigan Tech University                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>2019 Fall</b>    | Computer Vision for Microscopic Images (BE4870/5870), Michigan Tech University                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>2019-2020</b>    | Senior Design Project Mentoring (BE4901), Michigan Tech University <ul style="list-style-type: none"><li>Hospital Washer AutoSampler Phase I, sponsored by Stryker: <u>2<sup>nd</sup> Place in Design Expo</u></li><li>Mission Trip High-Speed Drill System, sponsored by Stryker</li></ul>                                                                                                                                                                                                                                                |
| <b>2019 Spring</b>  | Bio-Fluid Mechanics (BE3550), Michigan Tech University                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>2018 Fall</b>    | Tissue Mechanics (BE4930/5930), Michigan Tech University                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>2018-2019</b>    | Senior Design Project Mentoring (BE4901), Michigan Tech University <ul style="list-style-type: none"><li>Data Analysis of Real-world Pain Patients, sponsored by Medtronic Inc.</li><li>Universal Driver Geartrain, sponsored by Stryker: <u>2<sup>nd</sup> Place in Design Expo</u></li></ul>                                                                                                                                                                                                                                             |
| <b>2018 Spring</b>  | Bio-Fluid Mechanics (BE4930), Michigan Tech University                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>2017-2018</b>    | Senior Design Project Mentoring (BE4901), Michigan Tech University <ul style="list-style-type: none"><li>Nerve Stimulation through Powered Surgical Instruments: Cerebral Ultrasonic Aspiration, sponsored by Stryker</li></ul>                                                                                                                                                                                                                                                                                                            |
| <b>2016 October</b> | Teaching Assistant for Computational Image Analysis in Marine Biology Laboratory, Woods Hole, MA                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>2015 Summer</b>  | Teaching Assistant for Matlab Boot Camp at UT Southwestern                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>2010 Spring</b>  | Guest lectures for Biological Framework for Engineers (ME599) at University of Washington                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>2008 Spring</b>  | Teaching Assistant for Mechanical Design and Analysis (ME356) at University of Washington                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## **Mentoring**

### **Current Doctoral Students**

|                     |                                                                   |
|---------------------|-------------------------------------------------------------------|
| Nikhil Mittal       | Nascent Adhesion Mechano-sensing (2018-2024)                      |
| Mohanish Chandurkar | Shear Flow Mechanotransduction (2020-2024)                        |
| Erican Santiago     | Microfluidics Development for NK-tumor Interaction (2023-Present) |

### **Current Master Students**

|              |                                                                                      |
|--------------|--------------------------------------------------------------------------------------|
| Shaina Rover | Mechanotransductive Role of Collagen V in Cell Adhesion and Migration (2021-Present) |
| Sam Haarman  | Nonlinear Mechanics-based Traction Force Microscopy Development (2022-Present)       |

### **Current Undergraduate Students**

|                  |                                                           |
|------------------|-----------------------------------------------------------|
| Sara Goheen      | Rheological Characterization of Collagen V (2022-Present) |
| Justina Pennala  | Mechanobiology of Rhabdomyosarcoma (2023-Present)         |
| Zachary Peterson | Traction Force Quantification (2023-Present)              |
| Delaney Fritz    | Atomic Force Microscopy of Collagen V (2023-Present)      |
| Scott Severance  | Optical Tweezers Establishment (2023-Present)             |
| Alex Engholm     | Flow Channel Development (2023-Present)                   |
| Kat Davidson     | Electron Microscopy of Collagen V (2023-Present)          |

### **Former Students at Michigan Tech**

Dongwoo Han (Master student)  
Rajat Onkar (Master student)  
Saumyaveer Chauna (Master student)  
Chris Norton (Undergrad)  
Etienne Michels (Undergrad)  
Shaina Rover (Undergrad)  
Sam Haarman (Undergrad)  
Katie Heusser (Undergrad)  
Sue Kim (Undergrad)  
Elizabeth Kaechele (Undergrad)  
Lucia Salinas (Undergrad):

### **Former Students at Former Institution**

Ning Zhang (Ph.D. student, UT Southwestern):  
Ariel Medina (Undergrad, Univ. of Washington)  
Sean Chang (Undergrad, Univ. of Washington)  
Max Walner (Undergrad, Univ. of Washington)

## **INVITED TALKS**

2024 Invited talk at Mechanical Engineering and Engineering Mechanics, MTU, Invited by Dr. SeongYeong Lee  
2024 Invited talk at Midwest Regional Conference, Chicago, Invited by Dr. Seung Hwan Jeong  
2022 Invited talk at Materials Science and Engineering, Seoul National University, Seoul, Korea, Invited by Dr. Doh Joon Hwan  
2020 Chemistry Department, Michigan Technological University, Houghton, MI  
2019 Chemical Engineering, Hongik University, Seoul, Korea  
2019 Mechanical Engineering, Myoungji University, Yongin, Korea  
2019 Department of Biomedical Science,, Inha University College of Medicine, Korea  
2019 School of Dentistry, Yonsei University, Seoul, Korea  
2019 Mechanical Engineering, KAIST, Daejeon, Korea  
2018 Materials Science and Engineering Department, Michigan Technological University, Houghton, MI  
2017 Chemistry Department, Michigan Technological University, Houghton, MI  
2017 Chicago Cytoskeleton Meeting, Northwestern University, Chicago, IL

- 2016 Mechanical Engineering Graduate Student Seminar at University of North Texas, Denton, TX
- 2016 Mechanical Engineering Graduate Student Seminar at University of Texas Arlington, Arlington, TX
- 2015 Keynote speech at Korean Scientists and Engineers Association (KSEA) North Texas Meeting, Dallas, TX
- 2014 IEEE EMBC 2014, Cancer Nanotechnology Minisymposium, Chicago, IL
- 2013 Condensed Matter Seminar, Physics and Astronomy, Tufts University, Medford, MA
- 2012 World Class University seminar, Mechanical Engineering, Seoul National University, Seoul, Korea
- 2012 Undergraduate Seminar course, Mechanical Engineering, Myung-Ji University, Yongin, Korea
- 2012 Kristin Swanson Lab, Pathology, University of Washington Medical Center, Seattle, WA
- 2012 Tom Daniel Lab Seminar, Biology, University of Washington, Seattle, WA
- 2010 Graduate Student Seminar Series, Mechanical Engineering, University of Washington, Seattle, WA

## PROFESSIONAL AFFILIATIONS

- 2009 - American Society of Mechanical Engineers (ASME)
- 2013 - American Society for Cell Biology (ASCB)
- 2013 - Biophysical Society (BPS)
- 2014 - American Heart Association (AHA)
- 2014 - IEEE Engineering in Medicine and Biology Society (EMBS)
- 2017 - Biomedical Engineering Society (BMES)

## CONFERENCE PROCEEDINGS

- 33. Summer Biomechanics Bioengineering Biotransport Conference, Lake Geneva, WI, 2024 (Podium)
- 32. American Society of Matrix Biology Biennial Meeting, 2023, (Podium and Poster)
- 31. Gordon Research Conference, Biomechanics in Vascular Biology and Disease, 2023 (Poster)
- 30. Michigan State University - Michigan Tech Joint Symposium, Grand Rapids, 2023 (*Podium*)
- 29. Gordon Research Conference, Fibronectin, Integrin and Related Molecules, 2023 (Poster)
- 28. US-Korea Conference, Washington D.C., 2022 (Poster)
- 27. SIAM Conference on the Life Sciences (LS22), Pittsburg, PA, 2022 (*Podium* by Invitation)
- 26. Biomedical Engineering Society (BMES) Meeting, San Antonio, TX 2022 (Poster)
- 25. Cellular and Molecular Bioengineering (CMBE) Meeting, Palm Springs, 2022 (*Podium* by Nik)
- 24. Summer Biomechanics Bioengineering Biotransport Conference, Virtual, 2021 (Posters)
- 23. US-Korea Conference, Virtual, 2020 (Poster)
- 22. Cellular and Molecular Bioengineering (CMBE) Meeting, Puerto Rico, 2020 (Poster)
- 21. Biomedical Engineering Society (BMES) Meeting, Philadelphia, PA 2019 (Poster)
- 20. The 6<sup>th</sup> Zoo Meeting, Cell Adhesion and Migration in Inflammation and Cancer, Rotterdam, Netherlands 2019 (Poster) – won 1<sup>st</sup> place award
- 19. Gordon Research Conference, Fibronectin, Integrin and Related Molecules, 2019 (Poster, *Podium*)
- 18. Biomedical Engineering Society (BMES) Meeting, Atlanta, GA 2018 (*Podium*)
- 17. Gordon Research Conference, Signaling by Adhesion Receptors 2018 (Poster)
- 16. ASME International Mechanical Engineering Conference and Exposition 2017 (*Podium*)
- 15. Biomedical Engineering Society (BMES) Meeting, Phoenix, AZ 2017 (Poster)
- 14. US-Korea Conference 2017 (Poster)– Best Poster Award
- 13. EMBO, Mechanical Forces in Biology, Heidelberg, Germany 2017 (Poster)
- 12. Biophysics Society Meeting, Single Cell Biophysics, Taipei, Taiwan 2017 (*Podium* and Poster)
- 11. US-Korea Conference 2016 (Poster)– Best Poster Award
- 10. Gordon Research Conference, Signaling by Adhesion Receptor 2016 (Poster)
- 9. ASCB Annual Meeting 2015 (Podium and Poster)
- 8. Biophysical Society Meeting 2015 (Poster)

7. Annual International IEEE EMBS Conference 2014 (Podium)
6. American Society of Cell Biology (ASCB) Annual Meeting 2013 (Poster)
5. Gordon Research Conference Motile & Contractile Systems 2013 (Poster)
4. Multiscale Methods and Validation in Medicine and Biology 2012 (Podium)
3. ASME International Mechanical Engineering Congress & Exposition 2011 (Podium and Poster)
2. Miniaturized Systems for Chemistry and Life Sciences (MicroTAS) 2009 (Poster)
1. ASME 2009 Summer Bioengineering Conference, 2009 (Poster)

*Last updated: April 26, 2024*