

TIAN (TIM) CHEN

tianchen@uh.edu | google scholar | aim.me.uh.edu

EDUCATION

Doctor of Science (*ETH Medal*), Mechanical Eng., ETH Zurich, Switzerland Dec. 2018
Master of Science (*Cum Laude*), Civil Eng., TU Delft, the Netherlands June 2014
Bachelor of Applied Science, Engineering Science, University of Toronto, Canada June 2010

PROFESSIONAL EXPERIENCE

Kamel Salama assistant professor University of Houston Houston, TX
Architected Intelligent Matter Laboratory From Sept. 2021
Postdoctoral scientist EPFL Lausanne, Switzerland
Flexible Structures Laboratory & Geometric Computing Laboratory Jan. 2019 - July 2021
Visiting researcher California Institute of Technology Pasadena, CA
Daraio Research Group June - Sept. 2017
Doctoral researcher ETH Zurich Zurich, Switzerland
Engineering Design and Computing Laboratory Sept. 2014 - Dec. 2018
Junior structural engineer Amsterdam, Netherlands
Arup B.V. June 2013 - June 2014

ACADEMIC ACTIVITIES

Academic services

Associate Editor: 3D Printing and Additive Manufacturing From 2022
Mini-symposium organizer: IDETC/MR 2023, USNCCM17 2023, SES 2023
Session chair: USNCTAM 2022, APS March Meeting 2022, ICTAM 2021

Grants and funding

Stochastic excitation in the fabrication and charact. of thin elastic shells using acoustics,
UH, Grants to Enhance and Advance Research (\$39,775) 2023
Computational Design of Knitted Wearable Haptic Devices,
NSF, IIS: Human-Centered Computing (\$58,000) 2023
Materials for Sustainability in Energy and Manufacturing,
NSF, Research Experiences for Undergraduates (\$12,000) 2022
Developing Demonstration Kits for During-lecture Experimentation in Mechanics,
UH, Teaching Innovation Program Grant (\$10,000) 2022
Summer Undergraduate Research Fellowship, University of Houston (\$12,000) 2022
Provost's Undergraduate Research Scholarship, University of Houston (\$3,000) 2022
Additive Manufacturing of NdFeB Magnets and Inline Metrology Development,
UH, Advanced Manufacturing Institute (\$50,000) 2022
Swiss National Science Foundation Post-Doc mobility fellowship (~\$100,000) 2018

Selected awards and honours

ETH Medal for outstanding doctoral thesis (top < 8%, \$2,000), ETH Zurich 2018
Cum Laude (top 5%), Delft University of Technology 2014
Gordon Cressy Student Leadership Award, University of Toronto 2010
Spirit of Engsci Award, Engineering Science, University of Toronto 2010
Engineering Society Award, Engineering Society, University of Toronto 2010

Patents

Additive manufacturing of a flat textile product, EP2020/059812, ON Clouds Gmbh 2018

Keynote and invited talks

Spring seminar series, Rice University, TX, USA 2023
Physics of Morphing Matter workshop, Princeton University, NJ, USA 2022
Texas Soft Matter Meeting, UT Austin, TX, USA 2022
Computational Fabrication Seminar, Austria 2022
Seminar, University of Cambridge, UK 2022
Mechanical Engineering Seminar, University of Houston, TX, USA 2022
livMatS Colloquium, University of Freiburg, Germany 2022
Swiss.mech, ETH Zurich, Switzerland 2021
Brown university, Providence, RI, USA 2021
South China University of Technology, China 2021
Tel Aviv university, Israel 2021
Rocky Mountain Mechanics Seminar, CU Boulder, CO, USA 2021
Mechanics Gathering Seminar, EPFL, Switzerland 2021
MechSE Seminar, UIUC, IL, USA 2021
Mechanical Seminar, Georgia Tech, GA, USA 2021
Seminar, University of British Columbia, Canada 2021
Green Tech Innovators Club, TU Graz, Austria 2019
Global Young Scientists Summit, NTU, Singapore 2019
SIGCHI Computational Fabrication and Smart Matter, MIT, USA 2017

External projects

[The Canopy Pavilion](#) as a permanent installation at EPFL. 2022
The CircaDiem Caustic Pavilion in Seoul Biennale. 2021
Winner of the [IASS Barcelona 2019 Expo](#). 2019
World Economic Forum, Rethinking design: 4D Printing. 2019
ON AG, Design and fabrication of 3D printed athletic shoes. 2018
World Economic Forum, Design and fabrication of a brain for augmented reality. 2018

Professional membership

American Physical Society (APS), Association for Computing Machinery (ACM), Society of Engineering Science. (SES), The American Society of Mechanical Engineers (ASME)

Journal and conference reviewing

Nature, Nature Communications, Science Advances, Extreme Mechanics Letters, International Journal of Solids and Structures, Journal of Applied Mechanics, Computers & Structures, Proc. Natl. Acad. Sci., 3DP+, Scientific Reports, Materials & Design, Soft Robotics, Journal of the Mechanics and Physics of Solids

TEACHING & SUPERVISION

PhD theses

Wang, Y., (2026), “Design and fabrication of deployable metasurfaces”.
Adab, N., (2026), “Mechanics of continuously programmable microstructures”.

Master theses

Schnaubelt, M, (2020), “Deployable surfaces using bistable auxetics”.

Koh, M., (2018), “Designing Activated Buckling Structures Using FDM 3D Printing”.
 Du Pasquier, C., (2017), “Modular Pneumatic Toolkit: an Application of 4D-Printing”.
 Wagner, M., (2016), “3D Printed Active Structures Using Shape Memory Polymers”.
 Liu, J., (2016), “Properties of Multi-Material Structures Printed with the Polyjet”.
 Zimmermann, L., (2015), “Generative Design with 3D Shape Grammar & Simulation”.

Bachelor projects and theses

Shariff, A., (2022), “Functionalization of micr-bistable surfaces”, *SURF*.
 Betancourt, N., (2022), “Renewable fluidic devices”, *SURF, REU*.
 Nguyen, T., (2022), “Programmable Friction through mechanical bistability”, *PURS*.
 Tran, T., (2022), “Fabrication of bistable surfaces on a micro-meter scale”, *PURS*.
 Benitez, C., (2022), “Effective continuum models bistable surfaces”, *PURS, REU*.
 Gautier, A., (2020), “Experimental testing of non-linear periodic microstructures”.
 Volk, C., (2018), “Magnetically Controlled Reversible Appendage”.
 Ulrich, L., (2018), “Effect of Poisson’s Ratio on Energy trapping Meta-material”.
 Fritzsche, D., (2017), “Studying the Activation and Instability of FDM Sheets”.
 Gustaf, W., (2017), “Biomimetic Buckling Mechanisms”.
 Freitag, J., (2017), “Synthesizing 3D Printing Resin with Reversible Shape Memory Effect”.
 Sesseg, J., (2017), “Light-activated Synthetic Resin Using Azobenzene”.
 Felber, R., (2017), “Design of 4D light Activated Joints”.
 Koh, M., (2016), “Design and Analysis of 3D Printed Bistable Structures”.

Courses

Computational Design of Structures and Materials (<i>Graduate</i>)	2022-present
Solid Mechanics (<i>Undergraduate</i>)	2021-present

PUBLICATIONS

Journal Articles

- [1] **Chen, T.**, “Programming material logic using magnetically controlled bistability”, Proc. Natl. Acad. Sci., 120(17), e2304391120.
- [2] Poincloux, S., Vallet, C., **Chen, T.**, Sano, T.G., & Reis, P. M., (2023), “Indentation and stable states of weaved domes”, Extreme Mechanics Letters, 101968.
- [3] Roshdy, M., **Chen, T.**, Nakhmanson, S., & Bilal, R. O., (2023), “Tunable ferroelectric auxetic metamaterials for guiding elastic waves in three-dimensions”, Extreme Mechanics Letters, 101966.
- [4] Wirth, M., Shea, K., & **Chen, T.**, (2022), “3D-printing textiles: multi-stage characterization of tensile properties of additively manufactured biaxial weaves”, Materials & Design, 111449.
- [5] Wang, Y., Ren, Y., & **Chen, T.**, (2022), “Deployable surfaces with conformal mapping”, Journal of Applied Mechanics, 90(4), 044801.
- [6] Ren, Y., Kusupati, U., Panetta, J., Isvoranu, F., Pellis, D., **Chen, T.**, & Pauly, M., (2022), “Umbrella Meshes: Elastic Mechanisms for Freeform Shape Deployment”, ACM Transactions on Graphics (TOG), 41(4), Art. 152, *Best Paper Award Honorable Mention*.
- [7] Baek, C., Martin, A., Poincloux, S., **Chen, T.**, & Reis, M. P., (2021), “Smooth triaxial weaving with naturally curved ribbons”, Phys. Rev. Lett., 127(10), 104301, *Editors’ suggestion, Cover article, Physics Synopsis*.
- [8] **Chen, T.**, Panetta, J., Schaubelt, M., & Pauly, M., (2021), “Bistable Auxetic Surface Structures”, ACM Transactions on Graphics (TOG), 40(4), Art. 39.

- [9] Ren, Y., Panetta, J., **Chen, T.**, Isvoranu, F., Poincloux, S., Brandt, C., Martin, A., & Pauly, M., (2021), “3D Weaving with Curved Ribbons”, *ACM Transactions on Graphics (TOG)*, 40(4), Art. 127.
- [10] Panetta, J., Isvoranu, F., **Chen, T.**, Siefert, E., Roman, B., & Pauly, M., (2021), “Computational Inverse Design of Surface-based Inflatables”, *ACM Transactions on Graphics (TOG)*, 40(4), Art. 40.
- [11] **Chen, T.**, & Shea, K., (2021), “Computational design of multi-stable, reconfigurable surfaces”, *Materials & Design*, 205, 109688.
- [12] **Chen, T.**, Pauly, M., & Reis, M. P., (2021), “A reprogrammable mechanical metamaterial with stable memory”, *Nature*, 589(7842), 386-390.
- [13] Poincloux, S., **Chen, T.**, Audoly, B., & Reis, M. P., (2021), “Bending response of a book with internal friction”, *Phys. Rev. Lett.*, 126(21), 218004, *Editors’ suggestion*.
- [14] **Chen, T.**, Bilal, R. O., Lang, R., Daraio, C., & Shea, K., (2019), “Autonomous Deployment of a Solar Panel Using an Elastic Origami and Distributed Shape Memory Polymer Actuators”, *Phys. Rev. Applied*, 11(6), 064069, *Editor’s suggestion, Featured in Physics*.
- [15] Du Pasquier, C., **Chen, T.**, Tibbits, S., & Shea, K., (2019), “Design and Computational Modeling of a 3D Printed Pneumatic Toolkit for Soft Robotics”, *Soft Robotics*, 6(5), 657-663.
- [16] Wagner, M., Lumpe, T., **Chen, T.**, & Shea, K., (2019), “Programmable, Active Lattice Structures: Unifying Stretch-Dominated and Bending-Dominated Topologies”, *Extreme Mechanics Letters*, 29, 100461.
- [17] **Chen, T.**, Bilal, R. O., Shea, K., & Daraio, C., (2018), “Harnessing Bistability for Directional Propulsion of Untethered, Soft Robots”, *Proc. Natl. Acad. Sci.*, 115(22), 5698-5702.
- [18] **Chen, T.**, & Shea, K., (2018), “An Autonomous Programmable Actuator and Shape Reconfigurable Structures Using Bistability and Shape Memory Polymers”, *3D Printing and Additive Manufacturing*, 5(2), 91-101.
- [19] Schwarz, J., **Chen, T.**, Stankovic, T., & Shea, K., (2018), “An Efficient Size and Shape Optimization of Large Scale Truss Structures Subject to Stress and Buckling Constraints”, *Structural and Multidisciplinary Optimization*, 58(1), 171-184.
- [20] **Chen, T.**, Mueller, J., & Shea, K., (2017), “Integrated Design and Simulation of Tunable, Multi-State Structures Fabricated Monolithically with Multi-Material 3D Printing”, *Scientific Reports*, 7, 45671.
- [21] Wagner, M., **Chen, T.**, & Shea, K., (2017), “Large Shape Transforming 4D Auxetic Structures Using a 3D Printed Shape Memory Polymer”, *3D Printing and Additive Manufacturing*, 4(3), 133-142.
- [22] Zimmermann, L., **Chen, T.**, & Shea, K., (2017), “Generalizing the Link between 3D Spatial Grammars and Finite Element Analysis for Structural Engineering Design Automation”, *AIEDAM*, 32(2), 189-199.

Conference Proceedings

- [1] Isvoranu, F., **Chen, T.**, Bouleau, E., Blanc, A., Dietz, D., & Pauly, M., (2020), “The Canopy Pavilion: A lightweight shading structure based on a deployable auxetic linkage membrane”, *Advances in Architectural Geometry*, 2021.
- [2] Isvoranu, F., Panetta, J., **Chen, T.**, Bouleau, E., & Pauly, M., (2019), “X-Shell Pavilion: A Deployable Elastic Rod Structure”, *Proceedings of IASS Annual Symposia*, (5), 1-8.
- [3] **Chen, T.**, Mueller, J., & Shea, K., (2016), “Design and Fabrication of a Bistable Unit Actuator with Multi-Material Additive Manufacturing”, *Solid Freeform Fabrication Symposium*, Austin, Texas.

- [4] **Chen, T.**, & Shea, K., (2016), “ Design and Fabrication of Hierarchical Multi-Stable Structures through Multi-Material Additive Manufacturing”, In International Design Engineering Technical Conferences, pp. V02AT03A032, Charlotte, NC.
- [5] Zimmermann, L., **Chen, T.**, & Shea, K., (2016), “Generative Shape Design Using 3D Spatial Grammars, Simulation and Optimization”. Design Computing and Cognition, pp. 279–297.
- [6] **Chen, T.**, & Shea, K., (2015), “Computational Design-To-Fabrication Using Spatial Grammars : Automatically Generating Printable Car Wheel Design Variants”, International Conference on Engineering Design 2015, pp. 1–10, Design Society.
- [7] **Chen, T.**, Stoeckli, F., & Shea, K., (2015), “Design for Mass Customization Using Additive Manufacture : Case-Study of a Balloon-Powered Car”, International Conference on Engineering Design 2015, pp. 245–254, Design Society.
- [8] **Chen, T.**, Egan, P., Stoeckli, F., & Shea, K., (2015), “Studying the Impact of Incorporating an Additive Manufacturing Based Design Exercise in a Large, First Year Technical Drawing and CAD Course”, IDETC 2015, pp. V003T04A015. *Best paper nominee.*

Theses

- [1] **Chen, T.**, (2018), “Materials-based design of autonomous machines using 4D printing”, ETH Zurich, *awarded the ETH Medal.*
- [2] **Chen, T.**, (2014), “On introducing imperfection in the non-linear analysis of buckling of thin shell structures”, TU Delft, *awarded Cum Laude.*

SELECTED PRESS

Physics magazine The Geometry of Basket Weaving	Aug., 2021
Nature Review Physics Weaving smooth 3D shapes with curved ribbons	Aug., 2021
EPFL Modeling the friction between pages in a book	Jun., 2021
The Register Boffins’ 3cm ‘m-bit’ cubes demonstrate programmable wunderstuff	Jan., 2021
Nature News & Views Mechanical memory written and read remotely	Jan., 2021
EPFL New metamaterial offers reprogrammable properties	Jan., 2021
NZZ Auf Knopfdruck wird Weiches fest und Festes weich	Jan., 2021
TechCrunch This solar array expands itself at the right temperature	July, 2019
Physics magazine Focus: Folded Solar Panel Opens Without Power Source	June, 2019
CBS News Researchers developing self-powered robots	Oct., 2018
ETH Zurich Swimming without an engine	June, 2018
Caltech No Motor, No Battery, No Problem	May, 2018
World Economic Forum ETH Zurich, Rethinking Intelligence	Nov., 2017
ETH Globe 3D printing unlimited: From tooth enamel to 4D printing	Issue 4, 2017
Mary Ann Liebert 4D Printing of Programmable Shape-Changing Structures	Nov., 2017
ETH Zurich Fabrication technology in the fourth dimension	2017