

# TIAN (TIM) CHEN

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## EDUCATION

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

## PROFESSIONAL EXPERIENCE

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

## ACADEMIC ACTIVITIES

### Academic services

<i>Associate Editor:</i> 3D Printing and Additive Manufacturing	From 2022
<i>Conference chair:</i> 11 <sup>th</sup> Texas Soft Matter Meeting	2023
<i>Mini-symposia organizer:</i> USNCCM17 2023, SES 2023/2024, ASME IMECE 2024	
<i>Organizing Committee:</i> 30th ICCES	

### Awards and honours

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

### Patents

Additive manufacturing of a flat textile product, EP2020/059812, ON Clouds GmbH	2018
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### Keynote and invited talks

Civil Engineering seminar series, UIUC, IL, USA	2024
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
ivMatS 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 on EPFL campus.	2022
The CircaDiem Caustic Pavilion in Seoul Biennale.	2021
Winner of the <a href="#">IASS Barcelona 2019 Expo</a> .	2019

### 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 Mechanics and Physics of Solids

## TEACHING & SUPERVISION

### PhD theses

- Krida, I., (2028), TBD.
- Liu, P., (2027), “the design and mechanics of 3D printed volumetric knits”.
- Wang, Y., (2026), “Design and fabrication of deployable surfaces”.

### Master theses

- Cline, B., (2026), TBD.
- Grelz, H., (2025), TBD.
- 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

- Ortiz, C., (2024), REU.
- Shum, K., (2024), REU.
- Tang, J., (2024), REU.
- Bai, C., (2024), REU.
- Moeller, W., (2023), REU .
- 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), “Biomemetic 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

Materials Science (Undergraduate)	2024-present
Computational Design of Structures and Materials (Graduate)	2022-present
Solid Mechanics (Undergraduate)	2021-present

## SELECTED JOURNAL PUBLICATIONS

### Peer-Reviewed Journal Articles

- [1] du Pasquier, C., Tessmer, L., Scholl, I., Tilton, L., **Chen, T.**, Tibbits, S., & Okamura, A., (2024), “Haptiknit: Distributed Stiffness Knitting for Wearable Haptics”, *Science Robotics*, *Under review*.
- [2] Abbasi, A., **Chen, T.**, Aymon, B., & Reis, P. M., (2024), “Leveraging the snap buckling of bistable magnetic shells to design a refreshable braille dot”, *Advanced Materials Technologies*, 9(3), 2301344.
- [3] Zhang, Z., Brandt, C., Jouve, J., Wang, Y., **Chen, T.**, Pauly, M., & Panetta J., (2023), “Computational Design of Flexible Planar Microstructures”, *ACM Transactions on Graphics (TOG)*, 42 (6), 1-16.
- [4] Xue, J., Baizhikova, Z., Ballarini, R.<sup>†</sup>, & **Chen, T.**<sup>†</sup>, (2023), “Creating Geometric Imperfections in Thin-Walled Structures using Acoustic Excitation”, *Journal of Applied Mechanics*, 90(12):121014.
- [5] Li, W.\* , Wang, Y.\* , **Chen, T.**<sup>†</sup>, & Zhang, X.J.<sup>†</sup>, (2023), “Algorithmic encoding of adaptive responses in temperature-sensing multi-material architectures”, *Science Advances*, 9 (47), eadk0620, *Cover article*.
- [6] Koh, M.\* , Wang, Y.\* , Shea, K., & **Chen, T.**, (2023), “Shape reconfiguring bistable structures using heat activated fibers”, *Engineering Structures*, 295, 116792.
- [7] Grelz, H., & **Chen, T.**, (2023), “Intelligent matter that senses, calculates, and reacts: A story of electronics, computation, and mechanics”, *Matter* 6 (8), 2550-2552.
- [8] **Chen, T.**, (2023), “Programming material logic using magnetically controlled bistability”, *Proc. Natl. Acad. Sci.*, 120(17), e2304391120.
- [9] Wang, Y., Ren, Y., & **Chen, T.**, (2023), “From kirigami to hydrogels: a tutorial on designing conformally transformable surfaces”, *Journal of Applied Mechanics*, 90 (4), 044801.
- [10] Roshdy, M., **Chen, T.**, Nakhmanson, S., & Bilal, R. O., (2023), “Tunable ferroelectric auxetic metamaterials for guiding elastic waves in three-dimensions”, *Extreme Mechanics Letters*, 59, 101966.
- [11] Poincloux, S., Vallet, C., **Chen, T.**, Sano, T.G., & Reis, P. M., (2022), “Indentation and stable states of weaved domes”, *Extreme Mechanics Letters*, 59, 101968.
- [12] Pathak, O., Majkic, G., Erickson, T., **Chen, T.**, & Selvamaniackam, V., (2023), “Two-Dimensional X-Ray Diffraction (2D-XRD) and Micro-Computed Tomography (micro-CT) Characterization of Additively Manufactured 316L Stainless Steel”, *SSRN*, 4529173-1.
- [13] Wirth, M., Shea, K., & **Chen, T.**, (2022), “3D-printing textiles: multi-stage characterization of tensile properties of additively manufactured biaxial weaves”, *Materials and Design*, 225, 111449.
- [14] 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*.
- [15] 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*.
- [16] **Chen, T.**, Panetta, J., Schaubelt, M., & Pauly, M., (2021), “Bistable Auxetic Surface Structures”, *ACM Transactions on Graphics (TOG)*, 40(4), Art. 39.
- [17] 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.
- [18] 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.
- [19] **Chen, T.**, & Shea, K., (2021), “Computational design of multi-stable, reconfigurable surfaces”, *Materials & Design*, 205, 109688.
- [20] **Chen, T.**, Pauly, M., & Reis, M. P., (2021), “A reprogrammable mechanical metamaterial with stable memory”, *Nature*, 589(7842), 386-390.

- [21] 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*.
- [22] **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*.
- [23] Du Pasquier, C., **Chen, T.**, Tibbitts, S., & Shea, K., (2019), “Design and Computational Modeling of a 3D Printed Pneumatic Toolkit for Soft Robotics”, *Soft Robotics*, 6(5), 657-663.
- [24] 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.
- [25] **Chen, T.**, Bilal, R. O., Shea, K., & Daraio, C., (2018), “Harnessing Bistability for Directional Propulsion of Untethered, Soft Robots”, *Proceedings of the National Academy of Sciences*, 115(22), 5698-5702.
- [26] **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.
- [27] 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.
- [28] **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.
- [29] 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.
- [30] 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.**, Stockli, 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., Stockli, 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, ETH Medal*.
- [2] **Chen, T.**, (2014), “On introducing imperfection in the non-linear analysis of buckling of thin shell structures”, *TU Delft, Cum Laude*.

#### SELECTED PRESS

<b>UH news</b> Research By ME's Tian Chen Picked For Journal Cover	Jan., 2024
<b>Steve Mould</b> Youtube: Self-assembling material pops into 3D (5.4M views)	Oct., 2023
<b>UH news</b> Video Featuring Research Of ME's Chen Surpasses 1M Views	Oct., 2023
<b>Physics magazine</b> The Geometry of Basket Weaving	Aug., 2021
<b>Nature Review Physics</b> Weaving smooth 3D shapes with curved ribbons	Aug., 2021
<b>EPFL</b> Modeling the friction between pages in a book	Jun., 2021
<b>The Register</b> Boffins' 3cm 'm-bit' cubes demonstrate programmable wunderstuff	Jan., 2021
<b>Nature News &amp; Views</b> Mechanical memory written and read remotely	Jan., 2021
<b>EPFL</b> New metamaterial offers reprogrammable properties	Jan., 2021
<b>NZZ</b> Auf Knopfdruck wird Weiches fest und Festes weich	Jan., 2021
<b>TechCrunch</b> This solar array expands itself at the right temperature	July, 2019
<b>Physics magazine</b> Focus: Folded Solar Panel Opens Without Power Source	June, 2019
<b>CBS News</b> Researchers developing self-powered robots	Oct., 2018
<b>ETH Zurich</b> Swimming without an engine	June, 2018
<b>Caltech</b> No Motor, No Battery, No Problem	May, 2018
<b>World Economic Forum</b> ETH Zurich, Rethinking Intelligence	Nov., 2017
<b>ETH Globe</b> 3D printing unlimited: From tooth enamel to 4D printing	Issue 4, 2017
<b>Mary Ann Liebert</b> 4D Printing of Programmable Shape-Changing Structures	Nov., 2017
<b>ETH Zurich</b> Fabrication technology in the fourth dimension	2017