CV of Yi ZHU

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KEY RESEARCH INTERESTS

Reconfigurable and Adaptive Structures, Computational Mechanics, Origami Engineering, Soft Robots, Machine Learning

APPOINTMENT

Assistant Professor, (August 2024 – Now)

- Department of Civil, Environmental and Geospatial Engineering
- Michigan Technological University, Houghton, MI

Research Fellow, (June 2022 – August 2024)

- Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI

Adjunct Lecturer, (Jan 2023 – May 2023)

- Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor, MI
- CEE 515: Advanced Design of Reinforced Concrete Structures

EDUCATION BACKGROUND

University of Michigan, Ann Arbor, MI, (Aug 2018 – June 2022)

- PhD in Civil Engineering and Scientific Computing & Rackham DEI Certificate

University of California at Berkeley, Berkeley, CA, (Aug 2017 – May 2018)

- Master of Science in Civil Engineering

Tongji University, Shanghai, China, (Sept 2013 – Jun 2017)

- Bachelor of Engineering in Civil Engineering

SELECTED AWARD

Mar 2023	ProQuest Distinguished Dissertation Awards (Honorable Mention), University of Michigan
Dec 2021	Richard and Eleanor Towner Prize Winner for Outstanding PhD Research, University of Michigan
Sept 2020	Michigan Institute of Computational Discovery & Engineering Fellowship
Sept 2018	College of Engineering Dean's Fellowship, University of Michigan
Jun 2017	Excellent Bachelor Graduates of Shanghai
Nov 2015	National Scholarship, Ministry of Education of China
Nov 2014	National Scholarship, Ministry of Education of China

JOURNAL PAPER

[1] **Yi Zhu,** Evugeni T. Filipov, **2024**, Large-Scale Modular and Uniformly Thick Origami-Inspired Structures for Adaptable and Load-Carrying Structures, *Nature Communications,* 15 (1) 2353. (doi: 10.1038/s41467-024-46667-0) for details and media coverage of the work.

[2] **Yi Zhu**, Anan Ghrayeb, Joonyoung Yu, Evgueni T. Filipov, Kenn R. Oldham, **2024**, Mixed-Transducer Micro-Origami for Efficient Motion and Decoupled Sensing, *Small.* (doi: 10.1002/smll.202400059)

[3] **Yi Zhu**, Evgueni T. Filipov, **2022**, Harnessing interpretable machine learning for holistic inverse design of origami.

Scientific Reports. 12, 19277. (doi: 10.1038/s41598-022-23875-6)

[4] **Yi Zhu,** Mark Schenk, Evgueni T. Filipov, **2022,** A Review on Origami Simulation Methods: From Kinematic, To Mechanics, and Towards Multi-Physics. *Applied Mechanics Review.* 74(3): 030801. (doi: 10.1115/1.4055031)

[5] **Yi Zhu**, Evgueni T. Filipov, **2021**, Rapid Multi-Physics Simulation for Electro-Thermal Origami Systems, *International Journal of Mechanical Sciences*, 202-203, 106537. (doi: 10.1016/j.ijmecsci.2021.106537)

[6] **Yi Zhu**, Mayur Birla, Kenn Oldham, Evgueni T. Filipov. **2020**. Elastically and Plastically Foldable Electro-Thermal Micro-Origami for Controllable and Rapid Shape Morphing. *Advanced Functional Material.* 202003741 (10 pages). (doi: 10.1002/adfm.202003741) for details and media coverage of the work.

[7] **Yi Zhu**, Evgueni T. Filipov. **2020**. A Bar and Hinge Model for Simulating Bistability in Origami Structures with Compliant Creases. *Journal of Mechanisms and Robotics*. 12(2): 021110 (10 pages). (doi: 10.1115/1.4045955)

[8] **Yi Zhu**, Evgueni T. Filipov. **2019**. An Efficient Numerical Approach for Simulating Contact in Origami Assemblages. *Proceedings of the Royal Society A*. 475: 20190366. (doi: 10.1098/rspa.2019.0366)

[9] Ying Zhou, Tian-yao Ping, Shun-ming Gong, **Yi Zhu**, **2018**, An improved defining parameter for long-period ground motions with application of a super-tall building, *Soil Dynamics and Earthquake Engineering* 113, 462-472. (doi: 10.1016/j.soildyn.2018.06.018)

CONFERENCE PAPER

[1] **Yi Zhu**, Evgueni T. Filipov, **2021**, Sequentially Working Origami Multi-Physics Simulator (SWOMPS): A Versatile Implementation, *ASME IDETC-CIE Conference,* DETC2021-68042. August 17–19, Virtual Event. (doi: 10.1115/DETC2021-68042)

[2] **Yi Zhu**, Evgueni T. Filipov, **2019**, Simulating Compliant Creases Origami with a Bar and Hinge Model. *ASME IDETC-CIE Conference*, DETC2019-97119. Aug 18 – 21, Anaheim, USA. (doi: 10.1115/DETC2019-97119)

CONFERENCE REPORT (Presenting authors marked in bold)

[1] **Yi Zhu**, Evgueni T. Filipov, Design considerations for thick origami with application in adaptable infrastructure, **2024**, *Engineering Mechanics Institute Conference*, Chicago, IL, May 27 - May 30.

[2] **Yi Zhu**, Anan Ghrayeb, Joonyoung Yu, Evgueni T. Filipov, Kenn R. Oldham, Using Multiple Transducers in Micro-Origami Systems to Enhance Functionality, **2023**, *Society of Engineering Science*, Minneapolis, MN, Oct 8 – Oct 11.

[3] **Yi Zhu**, Anan Ghrayeb, Joonyoung Yu, Evgueni T. Filipov, Kenn R. Oldham, Mixed-Transducer Micro-Origami Robots, **2023**, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Detroit, MI, Oct 1 – Oct 5.

[4] **Yi Zhu**, Evgueni T. Filipov, **2023**, Modular Thick Origami for Large Deployable Infrastructure, *ASME IDETC-CIE Conference*, Boston, MA, Aug 13 – Aug 16.

[5] **Yi Zhu**, Evgueni T. Filipov, **2023**, Design of Thick Origami for Reusable and Deployable Load Carrying Structures and Infrastructure, *Engineering Mechanics Institute Conference*, Atlanta, GA, June 6 – June 10.

[6] **Yi Zhu**, Joonyoung Yu, Kenn R. Oldham, Evgueni T. Filipov, **2022**, Folding 3D thin-film PZT MEMS with Electro-Thermal Micro-Origami, *ASME IMECE Conferecne*, Columbus, OH, Oct 30 - Nov 2.

[7] **Yi Zhu**, Evgueni T. Filipov, **2022**, Origami Inverse Design with Machine Learning, *ASME IMECE Conferecne*, Columbus, OH, Oct 30 - Nov 2.

[8] **Yi Zhu**, Evgueni T. Filipov, **2022**, Harnessing Interpretable Machine Learning for Origami Inverse Design, *Society of Engineering Science Conference*, Texas A&M University, College Station, Texas, Oct 16 - 19.

[9] **Yi Zhu**, Evgueni T. Filipov, **2022**, Simulation of Thermo-Mechanical Coupling in Origami Assemblages, *Engineering Mechanics Institute Conference*, Johns Hopkins University, Baltimore, Maryland, May 31-June 3.

[10] **Yi Zhu**, Mayur Birla, Kenn R. Oldham, Evgueni T. Filipov, **2022**, Fabrication and Simulation of Functional Electro-

Thermal Micro-Origami, *APS March Meeting*, Chicago, IL, USA, March 14-17.

[11] **Evgueni T. Filipov,** and Yi Zhu, **2021**, Simulating Compliant Creases, Contact, and Thickness in Origami, *International Congress on Theoretical and Applied Mechanics 2020+1*, Virtual Event, August 22 – 27.

[12] **Yi Zhu**, Evgueni T. Filipov, **2021**, Modeling Origami Self-Contact, *Engineering Mechanics Institute Conference*, Virtual Event, May 25 – 28.

[13] **Yi Zhu**, Mayur Birla, Kenn R. Oldham, Evgueni T. Filipov, **2020**, Design and Fabrication of Functional Electro-Thermal Micro-Origami, *ASME IMECE*, Virtual Event, Nov 16 – 19.

[14] **Evgueni T. Filipov**, Yi Zhu, Mayur Birla, Kenn R. Oldham, **2020**, A Simulation Framework for the Design and Fabrication of Functional Micro-Origami, *ASME IMECE*, Virtual Event, Nov 16 – 19.

[15] **Yi Zhu**, Evgueni T. Filipov, **2020**, Modelling Origami Self-Contact for Functional Micro-Origami, *Society of Engineering Science 2020 Virtual Technical Meeting*, Sept 29 – Oct 1.

[16] Yi Zhu, **Evgueni T. Filipov**, **2019**, Simulating Contact in Deformable Origami Structures*, Society of Engineering Science Conference*, Oct 13 – 15 2019, Washington University, St. Louis, USA. (KEYNOTE LECTURE)

[17] **Yi Zhu**, Evgueni T. Filipov, **2019**, An Efficient Numerical Approach for Simulating Panel Contact in Origami Structures, *MICDE 2019 Symposium*, Apr 10, University of Michigan, Ann Arbor, MI, USA.

ACADEMIC SERVICE

- Reviewer of Journals:
  - Nature Communications
  - Mechanics Research Communications
  - Journal of Non-Linear Mechanics
  - Frontiers in Robotics and AI
  - Research, a Science Partner Journal
  - Journal of Engineering Mechanics
  - IEEE Robotics & Automation Letters
  - Structural and Multidisciplinary Optimization
  - Engineering Applications of Artificial Intelligence
  - Journal of Advanced Simulation in Science and Engineering
  - International Journal of Mechanical Sciences

TEACHING & CLASS DEVELOPMENT

Adjunct Lecturer - CEE 515 Advanced Design of Reinforced Concrete (2023 Winter)

- Design new class material and teach the class.
- Integrate nonlinear simulations into traditional course materials on reinforced concrete.

Graduate Student Instructor - CEE 415 Reinforced Concrete, (2021 Winter, 2022 Winter)

- Prepare and lecture the design lab session for the class.
- Prepare and grade design assignment associated with the lab.
- Help designing exams, give office hours, etc.

Graduate Student Instructor - CEE 212 Structural Mechanics, (2021 Winter)

- Give office hour, help designing exams, etc.

MENTORING EXPERIENCE

Anan Ghrayeb – PhD Student, University of Michigan

- Scalable fabrication of micro-origami systems (Aug 2022 – August 2024)

Martin Yitao Zhou – Undergraduate Summer Research, University of Michigan

- Deployable Thick Origami for Space Habitats. (May 2023 – Aug 2023)

Fekadu Woltejji – African Undergraduate Research Adventure (AURA) program, University of Michigan

- Zero-stiffness linkages and origami structures (May 2022 – July 2022)

- https://aura.engin.umich.edu/home/aura-2022-projects.

Biniyam P. Chamiso – African Undergraduate Research Adventure (AURA) program, University of Michigan

- Cm-scale reconfigurable robots that can swim and walk using PZT and SMP. (May 2019 – Aug 2019)
- https://cse.engin.umich.edu/stories/aura-students-celebrate-experiences-projects-at-program-reception.

SOFTWARE PROGRAM

Simulator For Active Structures (Sim-FAST)

- GitHub: https://github.com/zzhuyii/Sim-FAST
- The package provides a rapid simulator for various active structures, including origami, tensegrity, kirigami, shape morphing mechanisms, and many others.

Sequentially Working Origami Multi-Physics Simulator (SWOMPS)

- GitHub: https://github.com/zzhuyii/OrigamiSimulator
- The package executes my three simulation models, including the panel contact model (2019 RSPA paper), the compliant crease model (2020 JMR paper), and the electro-thermal actuation model (2021 IJMS paper), and allows users to develop customized loading schemes with arbitrary number and sequence of loading steps.
- For more details about this work, please visit: https://drsl.engin.umich.edu/software/swomps-package/

IsoEstimate

- Course project for Seismic Resilient Design; **Advisor: J.P. MOEHLE.**
- This C# program estimates seismic responses of base isolated structures with a large number of ground motions (>50), so that users can learn about the impact of ground motion variability on structural responses.

TJ Seismo

- Software Program for Bachelor Thesis; **Advisor: Ying ZHOU.**
- This C# program can calculate different nonlinear response spectra and damage spectra, solve regional damage of an earthquake, and estimate performance of base isolated structures.
- Copyright Registration for Computer Program in China: 2017SR538363

OTHER ACTIVITY & SERVICE

Xplore Summer Camp – **Volunteer**	July 2022
Department Graduate Peer Mentor Program – **Volunteer Mentor**	Sept 2021 – May 2022
Department Prospective Student Visit – **Volunteer**	Mar 2022
University EMERGE Prospective Student Visit (Hybrid) – **Volunteer**	Oct 2021
Department Graduate Peer Mentor Program (Online) – **Volunteer Mentor**	Sept 2020 – Dec 2020
Department Prospective Student Visit (Online) – **Volunteer**	Mar 2020
Xplore Summer Camp – **Volunteer**	July 2019
Department Prospective Student Visit – **Volunteer**	Mar 2019
Girls in Science and Engineering (GISE) Summer Camp – **Volunteer**	July 2018
Institution of Civil Engineers, Tongji Student Chapter – **Vice President**	Sept 2015 – Jun 2017
Association of Future Architects (TJCAUP student union) – **VI Designer**	Sept 2013 – Jun 2017
Habitat for Humanity, Shanghai, China – **Volunteer**	Nov 2015 – Jun 2017