Rulin Chen

Postdoctoral Fellow at SUTD

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Research Interest

Computer Graphics. In particular, geometric modeling, computational design, and computational fabrication. Currently focus on developing computational methods for designing sustainable assemblies in various forms and functionalities.

Education

2020.9 – 2024.7   **Ph.D. in Computer Graphics**   Singapore University of Technology and Design
Dissertation: *Computational Design of Assemblies with Discrete Equivalence Classes*
Advisor: Peng Song

2016.9 – 2020.7   **B.S. in Electronic Information Engineering**   Shantou University

Research Experience

2024.8 – now   **Postdoctoral Fellow**   Computer Graphics Laboratory, SUTD

Developing computational methods for modeling and designing sustainable assemblies from various input types, e.g., image, sketch, and text etc; advising junior Ph.D. students and research assistants; drafting grant proposals and being involved in managing existing funded projects.   Advised by Peng Song.

2020.9 – 2024.7   **Graduate Research Assistant**   Computer Graphics Laboratory, SUTD

Developed computational methods for modeling and design sustainable assemblies in various forms and functionalities with discrete equivalence classes and validated the feasibility of the propoosd methods with physical prototypes; collaborated with researchers at ETH, EPFL, CUHK, NTU and Cardiff University; published results in top graphics journals (TOG / TVCG) and presented findings at top graphics conference (SIGGRAPH); led instructions and contributed to the developments of various courses and workshops. Advised by Peng Song.

2019.9 – 2020.6   **Undergraduate Research Intern**   The Chinese University of Hong Kong

Participated in two research projects: 1) designing robots for loading and unloading luggage at Hong Kong Airport; 2) designing natural orifice surgical robots; assisted in applying 6 robot-related patents. Advised by Zhenglong Sun.

2017.9 – 2019.6   **Undergraduate Research Intern**   Shantou University

Developed a real-time FPGA system to reconstruct 3D shapes from a single defocus image input; published results at IEEE Access. Advised by Chuliang Wei.

Award

2022.8 SIGGRAPH 2022 Best Paper Honorable Mention Award

Awarded 5 Best Paper Awards and 10 Honorable Mention Awards (out of $\sim$ 1000 submitted papers) at SIGGRAPH each year, a premier venue in the graphics community.

2020.9 – 2024.7 SUTD PhD Fellowship

Funding for full tuition fee ($\sim$ 40,000 USD each academic year) and tax-free living stipend throughout the entire duration of Ph.D study ($\sim$ 28,000 USD each academic year); awarded by Singapore Ministry of Education (MOE).

2016 – 2018 Shantou University Sports-meeting Champion Scholarship (500 RMB/year)

Awarded to students who won the champions at Shantou University Sports-meeting; I won the first prize at Men's Long Jump Matches three times from 2016 to 2018.

2018 Shantou University Outstanding Undergraduate Student Scholarship (500 RMB/year)

Publication

(all the publications, including the two papers under review, are attached in the supporting documents)

2023 SIGGRAPH **Rulin Chen**, Pengyun Qiu, Peng Song, Bailin Deng, Ziqi Wang, and Ying He
Masonry Shell Structures with Discrete Equivalence Classes
ACM Transactions on Graphics (SIGGRAPH 2022 Journal-track), 42(4), 2023

2022 SIGGRAPH **Rulin Chen**, Ziqi Wang, Peng Song, and **Bernd Bickel**
Computational Design of High-level Interlocking Puzzles
ACM Transactions on Graphics (SIGGRAPH 2023 Journal-track), 41(4), 2022
Best Paper Honorable Mention Award

2019 ACCESS Chuliang Wei, **Rulin Chen**, Qin Xin
FPGA Design of Real-time MDFD System using High-level Sysnthesis
IEEE Access, vol. 7, pp. 83664-83672, 2019

Submitted and Under Peer Review

2024 TOG **Rulin Chen**, Peng Song, and Chi-Wing Fu
Inverse Tiling of Finite Domains
ACM Transactions on Graphics, 2024

2024 TVCG Pengyun Qiu⋆, **Rulin Chen**⋆ (co-first author), Peng Song, and Ying He
Modeling Wireframe Meshes with Discrete Equivalence Classes
IEEE Transactions on Visualization and Computer Graphics, 2024

Open-source Software

HighLevel-Puzzle   Author

A C++ based computational tool for desiging high-level interlocking puzzles with user-specified level-of-difficulties.

TileableShell   Author

A C++ based computational tool for modeling masonry shell structures with discrete equivalence classes with user-specified topology.

Patent

2021.3   Jiahao Fang, Qian Gao, Yanwei Huang, Wei Xiao, **Rulin Chen**, and Zhenglong Sun
Aircraft Luggage Loading and Unloading Robot, CN212710041 (U)

2021.1   Qian Gao, Jiahao Fang, Yanwei Huang, **Rulin Chen**, Wei Xiao, and Zhenglong Sun
Natural Cavity Surgical Mechanical Arm, CN212326570 (U)

2020.7   Qian Gao, Jiahao Fang, Yanwei Huang, **Rulin Chen**, Wei Xiao, and Zhenglong Sun
Natural Orifice Operation Mechanical Arm, CN111419404 (A)

2020.7   Qian Gao, Wei Xiao, **Rulin Chen**, Jiahao Fang, Yanwei Huang, and Zhenglong Sun
End Effector for Natural Orifice Surgery, CN111407412 (A)

2020.7   Jiahao Fang, Qian Gao, Yanwei Huang, Wei Xiao, **Rulin Chen**, and Zhenglong Sun
Aircraft Luggage Loading and Unloading Robot and Control Method Thereof,
CN111392060 (A)

2020.7   Qian Gao, **Rulin Chen**, Jiahao Fang, Yanwei Huang, Wei Xiao, and Zhenglong Sun
Power Battery with Positive and Negative Electrodes of Battery Cell Welded on the Same
Side, CN111403639 (A)

Mentoring

2023.11 – 2024.8   Yuhang Wang   RA at SUTD -> Ph.D. at University of South Florida
Modeling assemblies from pure textual inputs

2022.10 – 2024.3   Pengyun Qiu   RA at SUTD -> Ph.D. at Simon Fraser University
Computational design of assemblies with discrete equivalence classes

2022.6 – now   Zebin Chen   RA at SUTD
Urban planning and optimization

Teaching

2024.8   MIT Summer Geometry Initiative 2024   Remote
Research Mentor: 2 students without computer graphics background
Project: Modeling K-set Surfaces with Various Patterns
Planned, prepared, and mentored a bi-week-long research project for two undergraduate
students for bridging geometry optimization and sustainable architectural applications.

2021 – 2023   Graphics and Visualisation (50.017)   SUTD, Singapore
Teaching Assistant ($\sim$ 30 students per year)
Led weekly office hours and monitored student final projects; developed C++ code framework
for student assignments; guest lecture on the use of OpenGL framework.

2022.8   FACT Undergraduate Exchange Programme   SUTD, Singapore
Student Facilitator ($\sim$ 40 students)
Designed, organized, and prepared lecture and project materials. Students used the code
framework I developed on single-chip microcomputer to design smart IoT in-house systems.

Professional Service

Journal Reviewer

ACM Transactions on Graphics 2024
Computers & Graphics 2024
The Visual Computer 2023

Conference Reviewer

ACM SIGGRAPH Asia 2024
Pacific Graphics 2024
Computer Graphics International 2023

Research Activity Organizer

Co-organizer of Computational Fabrication Seminar 2021, 2022 (with **Prof. Bickel**)

Invited Talks

2024.6	PhD Oral Defense Public Seminar	SUTD
2024.5	Huawei Singapore Harmony Software Technology Workshop	Huawei Singapore
2023.8	Technical Paper Presentation	SIGGRAPH 2023
2022.8	Technical Paper Presentation	SIGGRAPH 2022
2022.8	Lab Demo	SIGGRAPH 2022

Reference

Ph.D. Advisor	Dr. Peng Song, Assistant Professor at SUTD *Email:* peng_song@sutd.edu.sg
Collaborator	Dr. Bernd Bickel, Full Professor at ETH Zurich *Email:* bernd.bickel@gmail.com
Collaborator	Dr. Ying He, Associate Professor at NTU *Email:* yhe@ntu.edu.sg
Collaborator	Dr. Ziqi Wang, Postdoctoral Fellow at EPFL Zurich, Incoming Assistant Professor at HKUST *Email:* ziqi.wang@epfl.ch