Rao FU | Ph.D. Candidate

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Research Interest

My research is on capturing, analyzing, generating, and high-fiving with static and dynamic 3D from intuitive language instructions!

Education

Brown University | Computer Sciences — **Providence, RI, USA**
Computer Science Ph.D. Candidate — *Sept. 2021 – Present.*
Advisor: Srinath Sridhar. Committee: Daniel Ritchie, Stefanie Tellex, and George Konidaris.

Max Planck Institute for Informatics — **Saarbrücken, German**
Visiting Scholar — *May. 2025 – Sept. 2025*
Host: Christian Theobalt & Rishabh Dabral.

Brown University | Computer Sciences — **Providence, RI, USA**
Master of Science in Computer Science — *Sept. 2021 – May. 2024*

University of Chinese Academy of Sciences | Computer Sciences and Engineering — **Beijing, China**
Bachelor of Computer Engineering — *Sept. 2017 – Jun. 2021*
National Inspirational Scholarship & Outstanding Thesis Awards.

University of California, San Diego | Jacobs School of Engineering — **San Diego, CA, USA**
Visiting Scholar — *May. 2020 – Nov. 2020*
Host: Hao Su.

University of Southern California | Viterbi School of Engineering — **Los Angeles, CA, USA**
Visiting Student — *Jan. 2020 – May. 2020*

Beijing National Day School — **Beijing, China**
Student — *Sept. 2011 – Jul.. 2017*

Employment

Meta Inc. | GenAI, Llama Team — **Menlo Park, CA, US.**
Research Scientist Intern — *June. 2023 – Oct. 2023*
Manager: Wenhan Xiong.

Autodesk Inc. | AI Lab — **San Francisco, CA, USA.**
Research Scientist Intern — *May. 2022 – Dec. 2022*
Manager: Aditya Sanghi.

Microsoft Research, Asia | Vision Group & Speech Group — **Beijing, China.**
Research Intern — *Mar. 2021 – Jul. 2021*
Manager: JingDong Wang, Yuhui Yuan, Weihong Lin.

Invited Talk

MIT, Multisensory Intelligence Group: Title: Capturing Dexterity *Host: Prof. Paul Liang (April 2025)*
University of California, Berkeley, Computer Vision Group : Title: Capturing Dexterity *(March 2025)*
Columbia University, RoboPIL: Title: Capturing Dexterity *Host: Prof. Yunzhu Li (March 2025)*
New York University, Immersive Computing Lab: Title: Capturing Dexterity *Host: Prof. Qi Sun (March 2025)*
NYC Vision Day 2025: GigaHands: A Massive Annotated Dataset of Bimanual Hand Activities.
New England Computer Vision Workshop, 2023: AnyHome: Open-Vocabulary Generation of Structured and Textured 3D Homes.

New England Computer Vision Workshop, 2022: ShapeCrafter: A Recursive Text-Conditioned 3D Shape Generation Model.
ICT Turing Seminar, 2022 : Text-conditioned 3D Shape Generation.

Publications

[1]: GigaHands: A Massive Annotated Dataset of Bimanual Hand Activities. ***Rao Fu****, *D. Zhang**, *A. Jiang, W. Fu, A. Funk, D. Ritchie, S. Sridhar*
The IEEE/CVF Conference on Computer Vision and Pattern Recognition 2025 **(CVPR 2025, highlight)** paper link

[2]: Scene-LLM: Extending Language Model for 3D Visual Understanding and Reasoning. ***Rao Fu****, Jingyu Liu, Yixin Nie, Xilun Chen, Wenhan Xiong*
The Winter Conference on Applications of Computer Vision **(WACV 2025)** paper link

[3]: AnyHome: Open-Vocabulary Generation of Structured and Textured 3D Homes. ***Rao Fu****, *Zehao Wen**, *Zichen Liu**, *Srinath Sridhar.*
*The European Conference on Computer Vision 2024***(ECCV 2024)** paper link

[4]: CharacterMixer: Rig-Aware Interpolation of 3D Characters. *X. Zhan, **Rao Fu**, D. Ritchie*
*Annual Conference of the European Association for Computer Graphics 2024***(Eurographics 2024)** paper link

[5]: CLIPSculptor: Zero-shot Generation of High Fidelity and Diversity Shapes from Text. *A. Sanghi, **Rao Fu**, V. Liu, K. Willis, H. Shayani, A. H. Khasahmadi, S. Sridhar, D. Ritchie*
*Conference on Computer Vision and Pattern Recognition.***(CVPR 2023)** paper link

[6]: ShapeCrafter: A Recursive Text-Conditioned 3D Shape Generation Model. ***Rao Fu****, X. Zhan, Y.W. Chen, D. Ritchie, S. Sridhar.*
*Conference on Neural Information Processing Systems.***(NeurIPS 2022)** paper link

[7]: HRformer: High-resolution vision transformer for dense predict. *Yuhui Yuan, **Rao Fu**, Lang Huang, Weihong Lin, Xilin Chen, Jingdong Wang.*
*Conference on Neural Information Processing Systems.***(NeurIPS 2021)** paper link

[8]: ROSA-Net: Rotation-Robust Structure-Aware Network for Fine-Grained 3D Shape Retrieval. ***Rao Fu****, Jie Yang, Jiawei Sun, Fanglue Zhang, Yu-Kun Lai, Lin Gao.*
*Computational Visual Media Conference.***(CVM 2024)** paperlink

Manuscripts

[1]: DynaCon: Dynamic Contact Capture in Bimanual Hand-Object Manipulation. *X.Y. Cong, A. Xing, C. Pokhariya, **Rao Fu**, S. Sridhar*
In Submission to appear

[2]: NeuralODF: Learning Omnidirectional Distance Fields for 3D Shape Representation. *T. Houchens, C.Y. Lu, S. Duggal, **Rao Fu**, S. Sridhar*
Technical Report paper link

Workshops

ICCV 2025 HANDS: (To be announced)

Teaching Experience

CSCI 2952-K: Topics in 3D Computer Vision and Machine Learning:
Role: GTA and Co-Instructor

Grants

08.2024 - 08.2025: OpenAI Research Program Access Grant($5,000).

Awards and Honors

07.2021: UCAS Outstanding Undergrad Thesis Awards(Advisor: Prof. Xilin Chen).
09.2019: National Inspirational Scholarship.
09.2017: National College Entrance Exam: Top 1‰

Professional Service

Conference/Journel Reviewer: Siggraph 2025(2), Siggraph Asia 2024(2)/2023(1), ICML 2025(5)/2024(6), ICLR 2024(3)/2023(4), NeurIPS 2025/2023(3)/2022(2), ICCV 2025(4)/2023(2), ECCV 2024(4), CVPR 2025(4)/ 2024(5)/ 2023(4), IJCV(1), RSS 2023(2), TVCJ(2)
Google explore CSR: Ph.D. mentor 2022, 2023
Department PhD Admissions Committee Member: 2024, 2023

Reseach Mentoring

Xiao (Sean) Zhan **Brown CS Undergrad 2023**
Next position: PhD Student, MIT

Yiwen Chen **Brown CS Master 2023**
Next position: PhD Student, NEU

Dingxi Zhang **UCAS CS Undergrad 2024**
Next position: CS Master, ETH Zurich

Zehao Wen **Shenzhen International School**
Next position: CS undergrad, JHU

Zichen Liu **Shenzhen International School**
Next position: Robotics undergrad, UCL

Melvin He **Brown CS Undergrad 2025**
Next position: Software, Meta

Alex Jiang **Brown CS Undergrad 2028**
Current

Fiona Fan **Brown CS Undergrad 2028**
Current

Wanjia (Juia) Fu **Brown CS Undergrad 2026**
Current

Jiayi Shen **Brown CS Master 2026**
Current

Research Lead Experience

3D Hand Object Manipulation

Research on 3D Hand Object Motion Synthesis. **MPI, Informatics; Brown University**
Research Group: 3D Visual Intelligence, MPI Informatics *May. 2025 – Now.*
- Generating hand-object deformation during interaction.

Research on Force and Haptic Capturing during HOI. **Brown University**
Research Group: Brown IVL, Columbia RoboPIL, NYU ICL, MIT MMLab *March. 2025 – Now.*
- Capture force information during HOI.

Research on In-Hand Manipulation Taxonomy. **Yale Grab; Brown University**
Research Group: Brown IVL, Yale Grab *Feb. 2025 – Now.*
- Building taxonomy for uni-manual in-hand dexterous manipulation.

Research on 3D Hand Motion Dataset Construction. **Brown University**
Research Group: Brown IVL *Jan. 2023 – April. 2025*
- Constructing Large-Scale 3D Hand Motion Dataset with Marker-less Motion Capturing System.
- Showcasing diverse applications including 3D hand motion generation, hand motion captioning for both 3D sequences and videos, motion retargeting to robotic grippers, dynamic semantic scene reconstruction, and multitasking capabilities.

3D Scene Understanding and Generation

Research on 3D-Visual-Language Model. **Meta Research**
Research Group: GenAI *May. 2023 – Nov. 2023*
- Extending Llama-2 for a 3D-Visual-Language Model for interactive 3D scene understanding and reasoning.

Research on Text-to-Scene Generation. **Brown University**
Research Lead *May. 2023 – Nov. 2023*

- Propose a text-to house-scale scene generation method.
- The generation is structured and textured. Featuring control-ability with text and user inputs.

Language and 3D Shapes

Research on Zero-shot Text-conditioned 3D Shape Generation. **Brown University**
Guide: Prof. Aditya Sanghi *May. 2023 – Dec. 2023*

- Develop zero-shot text-conditioned shape generation method using 3D diffuison-based model.
- The generated shape set if of high diversity and quality.

Research on Text-conditioned 3D Shape Generation. **Brown University**
Guide: Prof. Srinath Sridhar *Sept. 2022 – Present.*

- Proposed a NLP-based method that augment one-to-one text-shape pairs to many-to-many correspondence.
- Propose a method that generates and edits high-quality 3D shapes with language.

Machine Perception

Research on High-Resolution Transformer. **Microsoft Research, Asia**
Research Group: Visual Computing *March. 2021 – July. 2021*

- Proposed a transformer-based neural network for dense prediction tasks.
- Achieved state-of-the-art performance on COCO human pose estimation benchmark.

Learning Based Robotics

Research on Articulation Grasping for Fast Exploration. **University of California, San Diego**
Guide: Prof. Hao Su *May. 2020 – Nov. 2020*

- Studied the problem of geometric based manipulation for efficient exploration.
- Proposed a novel neural network architecture that predicts grasp proposals efficiently and effectively.

Learning Based Graphics, Vision and Geometry Processing

Research on Emotional Talking Head Generation. **Institute of Computing Technology, CAS**
Guide: Prof. Dinesh Manocha; Prof. Yu-Kun Lai; Prof. Lin Gao *Sept. 2020 – Nov. 2020*

- Designed a pipeline that generates high-quality speech-driven talking head video with expressive emotion.
- Contributed to *TAL Education Group* Online School project.

Research on Fine-grained 3D Shape Retrieval. **Institute of Computing Technology, CAS**
Guide: Prof. Fanglue Zhang; Prof. Yu-Kun Lai; Prof. Lin Gao *Sept. 2019 – May. 2020*

- Proposed a deep architecture for rotation-invariant fine-grained 3D shape retrieval.
- Constructed and released a fine-grained 3D shape retrieval dataset.

Mathematics

A Geometric Solution to Multi-person Meeting Problem. **Beijing National Day School**
Guide: Tiehan Li *Jan. 2017 – Feb. 2017*

- Solved the multi-person meeting problem by formulating a dynamic programming problem into a high-dimensional geometric problem.

A Concise Discriminant of Cubic Real Coefficient Equations. **Beijing National Day School**
Guide: Tiehan Li *Sept. 2016 – Dec. 2016*

- Proposed a concise discriminant of cubic real coefficient equations. The method is applicable when the equation has one real root and two imaginary roots, more applicable than Cardano formula.

Reference

Dr. Srinath Sridhar **PhD Advisor, Assistant Prof. at Brown University**
srinath@brown.edu

Dr. Daniel Ritchie **Collaborator, Associate Prof. at Brown University**
daniel_ritchie@brown.edu

Dr. Hao Su **Collaborator, Associate Prof. at UCSD**
haosu@ucsd.edu