

# Rao FU | Ph.D. Student

✉ [rao\\_fu@brown.edu](mailto:rao_fu@brown.edu) ☎ +1 401-808-9798

Homepage: <https://freddierao.github.io>

Fourth floor, 115 Waterman Street, Providence, RI 02912

## Education

**Brown University | Dept. Computer Sciences**

*Computer Science Ph.D. Student*

Concentration: Vision, Graphics, AI and Robotics

GPA: **4.0/4.0**

**Providence, RI, USA**

*Sept. 2021 – Jun. 2026(expected)*

**University of Chinese Academy of Sciences | Dept. Computer Sciences**

*Bachelor of Computer Science*

Core GPA: **3.8/4.0** Overall GPA: **3.7/4.0**

*Outstanding Thesis Awards.*

**Beijing, China**

*Sept. 2017 – Jun. 2021*

**University of California, San Diego | Jacobs School of Engineering**

*Visiting Scholar*

Host: SU Lab

**San Diego, CA, USA**

*May. 2020 – Nov. 2020*

**University of Southern California | Viterbi School of Engineering**

*Visiting Student*

GPA: **4.0 / 4.0**

**Los Angeles, CA, USA**

*Jan. 2020 – May. 2020*

**Beijing National Day School**

*Student*

GPA: **3.9 / 4.0**

**Beijing, China**

*Sept. 2011 – Jul. 2017*

## Employment

**Autodesk Inc. | AI Research Group**

*Research Intern*

Manager: Hooman Shayani, Aditya Sanghi.

**Toronto, Canada.**

*May. 2022 – Nov. 2022*

**Microsoft Research, Asia | Vision Group & Speech Group**

*Research Intern*

Manager: JingDong Wang, Yuhui Yuan, Weihong Lin.

**Beijing, China.**

*Mar. 2021 – Jul. 2021*

## Publications

[1]: 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.(NeurIPS2022)(to appear) [paper link](#)*

[2]: 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.(NeurIPS2021) [paper link](#)*

## Manuscripts

[1]: Textcraft: 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

*In Submission*

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

*In Submission [CoRR](#) [paper link](#)*

[3]: RISA-Net: Rotation-Invariant Structure-Aware Network for Fine-Grained 3D Shape Retrieval. **Rao Fu**, Jie Yang, Jiawei Sun, Fanglue Zhang, Yu-Kun Lai, Lin Gao.

[CoRR](#) [paperlink](#)

## Professional Service

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**Conference Reviewer:** NeurIPS 2022, CVM 2021

**Google exploreCSR 2022:** Ph.D. mentor

## Awards and Honors

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**07.2021:** Outstanding Undergrad Thesis Awards(Advisor: Prof. Xilin Chen).

**09.2020:** Excellent Comprehensive Performance Scholarship.

**09.2019:** National Inspirational Scholarship.

**09.2019:** Excellent Comprehensive Performance Scholarship.

**09.2017:** National College Entrance Exam: Top 1‰

## Research Experience

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Language and 3D Shapes.....

### 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.
- Finished a technical paper as a co-author and the paper was submitted to CVPR2021.

Learning Based Graphics, Vision and Geometry Processing.....

### Research on Emotional Talking Head Generation. TAL Education; 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.
- Finished a technical paper as first author and the manuscript was submitted to CVPR2021.

### Research on Fine-grained 3D Shape Retrieval.

**Alibaba; 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.
- Contributed to Alibaba 3D Online Shopping system.
- Completed an academic paper as first author and the manuscript was submitted to IEEE TPAMI.

### Research on Single Image Reconstruction.

**Institute of Computing Technology, CAS**

*Guide: Prof. Lin Gao.*

*Jul. 2019 – Sept. 2020*

- Combined parameterized modelling methods in traditional graphics algorithms with neural networks to reconstruct outdoor scene from a single image.

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.
- Finished a math thesis.

### 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.
- Finished a math thesis.

## Skills

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**Programming:** C/C++, Python, Matlab, Latex, HTML, CSS, VHDL

**Tools:** PyTorch, TensorFlow, OpenGL, Sapien, Vim, Git, Docker, Kubernetes

**Software:** Autodesk Maya, Adobe Illustrator, Adobe Photoshop, Bugzilla, Vivado

### Course Related to My Research Interests .....

- **Computer Sciences:** Theory of Computation, Algorithm and Theory of Computing, Data Structure, Artificial Intelligence, Machine Learning, Computer Graphics, Web Publishing, 3D Modeling Animation and Visual Effect, Video Game Quality Assurance, Computer Vision, Reintegrated AI, Advanced Topics in Deep Learning, Advanced 3D Robot Perception.
- **Computer Engineer:** Practise of Metal Processing Technics, Digital Circuits, Computer Organization, Assembly Language, Programming and Experiments in C, Computer Architecture, Operating System, Computer Networks, Compiler.
- **Mathematics:** Lineal Algebra, Calculus, Equations of Mathematical Physics, Discrete Mathematics, Probability and Mathematical Statistics.
- **Physics:** Mechanics, Electromagnetism, Thermal, Optics, Atomic Physics.

### Course Projects Related to My Research Interests .....

- **Text-conditioned 3D Object Detection:** Using text description and SPOT to detect a 3D object in the scene.
- **Text-to-Shape Retrieval:** Retrieve 3D texture shapes using text descriptions.
- **OCR-based Information Extraction:** Extracted information from noisy Certificate images.
- **Semantic Triplet Matching:** Extracted all semantic entities in a natural language sentence.
- **OpenGL:** Implemented Bezier surface, Phong Lighting Model and Ray-Tracing with OpenGL.
- **Operating System:** Implemented a MIPS System (Booter, Shell, Kernel, Interactive Process, Driver, FS).
- **Computer Architecture:** Implemented a MIPS32 and a RISC-V CPU (Instruction pipeline, Mem, Cache, Bus).
- **Go-Bang Game:** Designed a Go-Bang game agent and optimized its chess playing strategy via  $\alpha$ - $\beta$  pruning.
- **Algorithm Paper:** Finished a survey of Marching Cube and its potential applications in the industry.

## Other Service

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### Starry Sky Program 2019.

- Organizer of popularizing STEM knowledge to left-behind female students in Mianyang, Sichuan Province.

### Starry Sky Program 2018.

- Organizer and teacher of popularizing STEM knowledge to left-behind female students in Huaihua, Hunan Province.

### UCAS Dreamer Theater Clubs 2018-2021

- Writer and actor.

### UCAS Swimming Club 2018-2019.

- President of the club. The club was awarded Excellent Students' Club.

### The 38th Beijing Open Half Marathon Park Run 2019.

- The 93rd place.