# Sirui Tao

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## Education

### University of California San Diego

2023 - 2025 M.S. Computer Science and Engineering - HCI & Graphics (Advised by Prof. Steven Dow and Prof. Tzu-Mao Li)
Key Courses: HCI, AI, Computer Vision & Graphics, Collective Intelligence, User-centered Design Theory, UbiComp

2019 - 2023 B.S. Data Science & B.S. Probability and Statistics - minor in Economics (Advised by Prof. Judith Fan)
Key Courses: 3D Machine Learning, Scalable Analytics, ML Systems, Probabilistic Reasoning, Robotics

## Publication Summary of Stats on Google Scholar (up to 11/26/2024): Citation = 76, h-index = 1, i10-index = 1

[4] **Sirui Tao**, Ivan Liang, Cindy Peng, Zhiqing Wang, Srishti Palani, and Steven Dow. DesignWeaver: Dimensional Scaffolding for Text-to-Image Product Design. Revise & Resubmit by ACM CHI 2025. [link]

[3] Zimo Wang, Cheng Wang, Taiki Yoshino, **Sirui Tao**, Ziyang Fu, and Tzu-Mao Li. HotSpot: Screened Poisson Equation for Sign Distance Function Optimization. Under Review by CVPR 2025. [link]

[2] Hsiao-Yu Tung, Mingyu Ding, Zhenfang Chen, **Sirui Tao**, Vedang Lad, Daniel Bear, Chuang Gan, Josh Tenenbaum, Daniel Yamins, Judith Fan, and Kevin Smith. Physion++: Evaluating Physical Scene Understanding with Objects Consisting of Different Physical Attributes in Humans and Machines. In Proceedings of the Annual Meeting of the Cognitive Science Society 2023. [link]

[1] Daniel Bear, Elias Wang, Damian Mrowca, Felix Binder, Hsiao-Yu Tung, Pramod RT, Cameron Holdaway, **Sirui Tao**, Kevin Smith, Fan-Yun Sun, Fei-Fei Li, Nancy Kanwisher, Josh Tenenbaum, Dan Yamins, and Judith Fan. Physion: Evaluating physical prediction from vision in humans and machines. In Advances in Neural Information Processing Systems (NeurIPS Datasets & Benchmarks Track) 2021. [link]

## Academic Experience

2024 - Present **UCSD, The Design Lab (HCI Group) - Graduate Researcher** La Jolla, CA, USA

(Advised by Prof. Steven Dow)

- Led research projects on designing novel design-support interfaces to assist novice designers in idea divergence and convergence in individual and collaborative settings. The studies investigate how to enhance generative models using faceted meta-information structures to decompose design dimensions, thereby aiding designers' explorations. They also examine methods to encourage idea convergence in collaborative design environments better.
- Resulted in a full technical paper [4] in the Revise and Resubmit stage at ACM CHI 2025.

2023 - Present **UCSD, Visual Computing Group - Graduate Researcher** La Jolla, CA, USA

(Advised by Prof. Tzu-Mao Li)

- Combined neural methods with traditional graphics pipelines to enable flexible and physically informed forward and backward physical interaction prediction. Leveraged diffusion-based models to study discontinuity-aware super-resolution and compression techniques. Assisted in running experiments involving novel neural heat-diffusion-based loss terms for signed distance functions (SDF), achieving state-of-the-art performance on multiple 2D and 3D SDF-related benchmarks, such as surface reconstruction.
- Resulted in a full technical paper [3] under review at CVPR 2025.

2022 - 2023 **UCSD, Halıcıoğlu Data Science Institute - Undergrad Researcher** La Jolla, CA, USA

(Advised by Prof. Yusu Wang)

- Contributed to developing and implementing a novel graph neural network architecture capable of capturing long-range interaction information in graph-structured data, exhibiting similar or superior

performance compared to established models on selected datasets, with notably increased efficiency. Present the senior capstone and HDSI scholarship poster session - GraphHSCN.

2021 - 2022 **UCSD, CogTools Lab - Undergraduate Researcher** La Jolla, CA, USA

(Advised by Prof. Judith Fan)

- Contributed to the design and generation of 3D stimuli illustrating both rigid and non-rigid physical interactions. Conducted data analysis to quantitatively compare the physical understanding of state-of-the-art vision models with human perception, aiming to identify key limitations, suggest promising future directions, and provide future vision ML model researchers with a comprehensive benchmark dataset for evaluations. Additionally, assisted in building the online evaluation website to collect human prediction data on the physical stimuli.
- Resulted in two full technical papers [1, 2], published at NeurIPS 2021 and CogSci 2023.

## Skills

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|---|---|
| HCI | User-Centered Design, Interaction Design, Prototyping, Qualitative & Quantitative Methods, A/B Testing |
| Data Science | Scalable Analytics, Data Visualization, MLOps, Recommender System, Data Mining, Database |
| AI/ ML | LSTM, GAN, Diffusion Models, GNN, NeRF, 3D Gaussian Splatting, Reinforcement Learning, LLM |
| Software | Python, R, SQL, Angular, D3.js, PyTorch, Clickhouse, FireStore, DevOps, Agile, AV/ VR |
| Mathematics | Probabilistic Reasoning, Descriptive and Inferential Statistics, Stochastic Process |

## Working Experience

2023 **SchedGo - Data Engineer** Remote

- Build the data infrastructure for product analytics and ML algorithm using Firestore;
- Conduct marketing data analytics to identify key user groups for future promotion efforts;
- Design a survey model for the front end to gather more direct user feedback.

2022 - 2023 **San Diego Supercomputer Center - Deep Learning Engineer Intern** La Jolla, CA, USA

- Use Ray Tune to test scalable multi-GPU hyperparameter tuning on HPC infrastructure;
- Investigate data-centric MLOps solutions to make experimentation more time and resource-efficient.

2022 **Tesla - Data Scientist Intern** Fremont, California, USA

- Investigate lossless image compression solutions, saving ~20% of annual image storage;
- Build and deploy end-to-end process-agnostic advanced statistical process control and quality disposition tools with automatic alert systems; continuously monitor & improve based on user feedback from the process engineering team;
- Conduct data analyses on various datasets to identify root causes & validate model performance.

2021 **Bühler Group - Data Scientist Intern** Wuxi, Jiangsu, China

- Research and initiate the effort to build an Image-Labeling MLOps feature in our B2B product prototype to optimize the model adaptability for defects detection;
- Prototype an MVP using Figma & Angular within a cross-functional innovation team;
- Showcase the proposal to the division and get praise from the Director of Innovation;
- Refine and participate in reviewing new analytics features on our IoT platforms to help our customers with their digital twin adaptation journey with better business insight extraction with descriptive & predictive modeling.

2021 **J.D. Power - Analyst Intern** Shanghai, China

- Optimize workflow of the quality analytics team by refining the analytics processes via automating data processing and report pipelines, saving more than 200 working hours/ year for the team;

- Provide detailed documentation on Git to ensure continuous usage for teammates from non-technical backgrounds.

2020 **Bosch - Data Analyst Intern** Wuxi, Jiangsu, China

- Provide effective data analysis and visualization on Tableau for continuous monitoring of data and parameter tuning to gain valuable analytic insights based on the Bosch Industry 4.0 transformation roadmap;
- Cut down manual inspection and analysis time by providing crucial insight on key bottlenecks and reducing critical bottlenecks diagnosing time by 80% in manufacturing lines with insights on potential optimal parameters;
- Present dashboards to the MAS (Manufacturing Analytics Solution) Director at the monthly briefing.

## Project Experience

2023 **Tree-of-thoughts Context-aware Encoding for LLMs** La Jolla, CA, USA

- Lead the development of a context-aware encoding algorithm for Large Language Models (LLMs), improving knowledge retrieval accuracy and contextual understanding without requiring model fine-tuning.
- Develop a hierarchical "context tree" structure to compress entire documents into a single prompt, enhancing LLMs' response relevance and creativity to user queries.

## Teaching Experience

2024 Summer **UCSD CSE 175 - Entrepreneurship for Engineers - Teaching Assistant** La Jolla, CA, USA

2024 Spring, Fall **UCSD DSGN 1 - Design of Everyday Things - Teaching Assistant** La Jolla, CA, USA

2024 Winter **UCSD COGS 9 - Introduction to Data Science - Teaching Assistant** La Jolla, CA, USA

## Honors & Awards

2023 - 2024 IGE Shah Fellowship, UCSD ($3,850)

20 Spr, 22 Win TRELS Research Scholarship, AEP, UCSD ($1,000*2)

2021 - 2022 Data Science Student Representative, HDSI, UCSD

2021, 2022 HDSI Research Scholarship, HDSI, UCSD ($2,500*2)

2019 - 2023 Provost Honor, Warren College, UCSD