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 11/29/2024): Citation = 76, i10-index = 1

[4] ***DesignWeaver: Dimensional Scaffolding for Text-to-Image Product Design.***

Sirui Tao, Ivan Liang, Cindy Peng, Zhiqing Wang, Srishti Palani, and Steven Dow.

In CHI 2025 Revise & Resubmit Stage. [link]

[3] ***HotSpot: Screened Poisson Equation for Sign Distance Function Optimization.***

Zimo Wang, Cheng Wang, Taiki Yoshino, **Sirui Tao**, Ziyang Fu, and Tzu-Mao Li.

Under Review at CVPR 2025. [link]

[2] ***Physion++: Evaluating Physical Scene Understanding with Objects Consisting of Different Physical Attributes in Humans and Machines.***

Hsiao-Yu Tung, Mingyu Ding, Zhenfang Chen, **Sirui Tao**, Vedang Lad, Daniel Bear, Chuang Gan, Josh Tenenbaum, Daniel Yamins, Judith Fan, and Kevin Smith.

In Proceedings of the Annual Meeting of the Cognitive Science Society 2023. [link]

[1] ***Physion: Evaluating physical prediction from vision in humans and machines.***

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.

In Advances in Neural Information Processing Systems (NeurIPS Datasets & Benchmarks Track) 2021. [link]

Academic Experience

2024 - Now **UC San Diego Design Lab** - 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 - Now **UC San Diego 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 **UC San Diego 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 **UC San Diego 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.

Working Experience

2023 **SchedGo** - Data Engineer *Remote*

- Built the data infrastructure for product analytics and ML algorithm using Firestore;
- Conducted marketing data analytics to identify key user groups for promotion efforts;
- Designed 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*

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

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

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

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

- Researched and initiated the effort to build an Image-Labeling MLOps feature in our B2B product prototype to optimize the model adaptability for defect detection;
- Prototyped an MVP using Figma & Angular and got praise from the Director of Innovation;
- Crafted new IoT analytics to understand users' experience better when creating a digital twin.

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

- Refined the quality analytics team's workflow by automating data processing and report pipelines, saving more than 200 analytics hours/ year;
- Provided detailed documentation on Git to ensure continuous usage for teammates from non-technical backgrounds.

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

- Provided 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;
- Reduced manufacturing bottlenecks diagnosis and insight extraction time by 80% for manual inspection and analysis by algorithmically suggesting optimal parameters;
- Presented dashboards to the Director of Manufacturing Analytics Solutions.

Project Experience

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

- Led 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.
- Developed a hierarchical "context tree" structure to compress entire documents into a single prompt, enhancing LLMs' response relevance and creativity to user queries.

Volunteer Experience

2021 -2022 **Halıcıoğlu Data Science Institute** - Data Science Student Representative *La Jolla, CA, USA*

- Peer-advised undergraduate students; evaluated and improved the data science curriculum; promoted the program to external audiences.

2021 - 2022 **Mentor Collective** - Mentor at UCSD *La Jolla, CA, USA*

- Mentored first-year and transfer students; provided guidance and support for adapting to university life; connected students to campus resources and communities.

Skills

HCI	User-Centered Design, Interaction Design, Prototyping, Interview, 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

Teaching Experience

2024 Fall	DSGN 1 **Design of Everyday Things** - *TA with Prof. Michael Meyer*	*UCSD*
2024 Summer	CSE 175 **Entrepreneurship for Engineers** - *TA with Prof. Rakesh Kumar*	*UCSD*
2024 Spring	DSGN 1 **Design of Everyday Things** - *TA with Prof. Scott Klemmer*	*UCSD*
2024 Winter	COGS 9 **Introduction to Data Science** - *TA with Prof. Meenakshi Khosla*	*UCSD*

Honors & Awards

2023 - 2024	IGE Shah Fellowship, UCSD
20 Spr, 22 Win	TRELS Research Scholarship, AEP, UCSD
2021 - 2022	Data Science Student Representative, HDSI, UCSD
2021, 2022	HDSI Research Scholarship, HDSI, UCSD
2019 - 2023	Provost Honor, Warren College, UCSD