Stone Tao

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Highlights

AI researcher interested in reinforcement learning, robotics, decision making, and building efficient and adaptable intelligent systems. Co-founded the Lux AI Challenge, where the first season of our multi-agent competition attracted 1,100+ teams and 22,000+ submissions from 80+ countries.

Education

2019–2023 **B.S. Double-Major in Computer Science and Cognitive Science, Math Minor**, *UC San Diego*, San Diego, CA, Advisors: Hao Su, Steven Dow. GPA: 3.99/4.00.

Graduate Courses: Computer Vision (ML meets Geometry), Robotics and RL, Differentiable Programming, Recommender Systems, Embodied AI;

Undergraduate Courses: Decision-Making in the Brain, Parallel Computing, Statistical NLP, Programming Languages, Advanced Optimization Methods for Data Science, Design and Analysis of Algos, Advanced Data Structures, Operating Systems, Computer Architecture, Foundations of Real Analysis, and more.

Publications & Preprints

In submission **Abstract-to-Executable Trajectory Translation for One-Shot Task Generalization**.
Stone Tao, Xiaochen Li, Tongzhou Mu, Zhiao Huang, Yuzhe Qin, Hao Su
arXiv, project page, (Accepted at NeurIPS 2022 Deep RL Workshop)

In submission **Emergent Collective Intelligence From Massive-Agent Cooperation and Competition**.
Hanmo Chen*, **Stone Tao***, Jiaxin Chen, Weihan Shen, Xihui Li, Sikai Cheng, Xiaolong Zhu, Xiu Li
arXiv, (Accepted at NeurIPS 2022 Deep RL Workshop)

ICLR 2023 **ManiSkill2: a Unified Benchmark for Generalizable Manipulation Skills**.
Jiayuan Gu, Fanbo Xiang, Zhan Ling, Xinyue Wei, Xiqiang Liu, Xuanlin Li, Rui Chen, **Stone Tao**, Tongzhou Mu, Pengwei Xie, Yunchao Yao, Yihe Tang, Xiaodi Yuan, Zhiao Huang, Hao Su
project page

NeurIPS 2021 (Datasets and Benchmarks) **Maniskill: Generalizable Manipulation Skill Benchmark with Large-scale Demonstrations**.
Tongzhou Mu, Zhan Ling, Fanbo Xiang, Derek Cathera Yang, Xuanlin Li, **Stone Tao**, Zhiao Huang, Zhiwei Jia, Hao Su
arXiv, project page

Experience

2020–Now **UC San Diego: Hao Su Lab**, *Undergraduate Researcher*, Advisor: Hao Su.

- Researching reinforcement learning and robotics
- Current research areas include imitation learning, demonstration-based RL, intersections of language models and paradigms with RL, and skill discovery/learning.
- Researching and developing the ManiSkill challenge to benchmark RL, CV, and robotics in learning manipulation skills and achieving object generalization.

2019–Now **UC San Diego: ProtoLab**, *Undergraduate Researcher*, Advisor: Steven Dow.

- Researching intersections of AI and HCI
- Current research areas include AI-assisted tools and the use of NLP in systems requiring in-depth synthesis of information such as peer-review systems.
- Previously developed the Design for San Diego competition's front and backend.

2021–Now **Lux AI Challenge**, *Co-Founder*.

- Lead the research, development, and design of creative, accessible, and inclusive AI competitions.
- Season 1 finished with 1,100+ teams, 800+ github stars, 22,000+ submissions, 8,000,000+ matches run, and had one of the most diverse group of participants ever. Enabled competitors to research novel deep RL and IL methods to a unique large-scale multi-agent problem.
- Currently working on season 2 in collaboration with Kaggle.

2021 **QuantCo**, *ML Engineer Intern*, Advisor: T. Ben Thompson.

- Researched high precision and accurate function approximation using deep neural nets, decision trees, and boosting. Helps automatically migrate slow, complex, hand-built calculators in old systems to new systems, and learn fast differentiable approximations
- Results beat LGBM, deep neural nets, and other methods by 100x or by being feasible in high dimensions.
- Developed OCR+NLP tools for analysis of insurance documents for automatic categorization of insurance types and their properties

2020 **LaunchDarkly**, *Software Engineer Intern*.

- Worked full stack on feature workflows, semantic patches, and conflict handling to enable state independent scheduling of feature flagging, a feature requested by LaunchDarkly's largest business customers.

Leadership

2021– **Co-Founder of the Lux AI Challenge:** Initiated the original project concept and invited others to co-found the non-profit organization and competition. Successfully held one of the largest multi-agent AI competitions in collaboration with Kaggle. Raised over $80,000 in funds for the competition.

2020–2022 **Founding President of ACM AI at UCSD:** Founded the largest organization on AI at UCSD, seeking to cultivate a community of AI enthusiasts as well as lower the barriers for learning AI. Grew the organization from zero to 1000+ members in 2 years, working with my board to develop social events, workshops, seminars, and competitions.

Current Student Mentees

2022– Kevin Chan (BS UCSD, Regent's Scholar)

2022– Doris Zhang (BS UCSD, Regent's Scholar)

Presentations / Talks

2022 **Abstract-to-Executable Trajectory Translation for One-Shot Task Generalization**.
Presented at the NeurIPS 2022 Deep RL Workshop

2022 **Emergent Collective Intelligence From Massive-Agent Cooperation and Competition**.
Presented at the NeurIPS 2022 Deep RL Workshop

2022 **Lux AI Challenge: How we Build Creative and Accessible AI Competitions for Fun and Research**.
Kaggle Podcast (Invited)

2022 **AI Competition Design For Multi-Agent Environments / Games**.
Presented at the Learning in Foundation Environments meeting organized by Joseph Suarez. I discussed insights from designing the Lux AI challenge and what made it a popular AI competition, addressing topics such as environment design as well as competition accessibility.
slides

Awards

2021–2022 **UCSD CSE Alumni Advisory Board Leadership Excellence Scholarship**

2019– **UCSD Provost Honors List (every year)**

2019–2021 **MIT Battlecode (AI Competition) Finalist**: Made finals 3 times in a row (2019-2021), placing 1st out of all soloists and 5th overall in 2020, competing against over 600 teams of high school to graduate students. Won the Five Rings adaptive strategy award for spearheading an influential strategy in 2021.

Open Source Projects Created

2022 **Robojax**: A Jax-based library with RL algorithms and other approaches with a focus on robotics. Provides fast implementations of various computer vision tools for RGBD and pointcloud processing. https://github.com/StoneT2000/robojax

2022 **Jax bandits**: An assortment of algorithms for multi-armed bandits with support for massive parallelization in Jax. https://github.com/StoneT2000/jax-bandits

2021 **Reinforcement Learning Gym and Library in Typescript**: Implements a gym interface and algorithms like PPO and DQN in Typescript for reinforcement learning on browsers and Node.js. https://github.com/StoneT2000/rl-ts

2020 **Dimensions - Generalized AI Competition Framework**: Simple framework for creating language agnostic, scale-able, AI programming competitions. Provides plugins to run on Google Cloud and use various databases in 3 lines of code. https://github.com/stonet2000/dimensions

Teaching Experience

2023 Winter **CSE 291: Machine Learning for Robotics**: Wrote various course materials and Google Colab notebooks covering robotics, robotics environments, reinforcement learning, and imitation learning

2020 Spring – **Various Workshops on topics in AI, UCSD**: As a part of ACM AI at UCSD, I led and developed workshops on search and planning algorithms, deep learning, computer vision, as well as reinforcement learning. At the peak, I organized and ran a workshop in front of 100+ people live.

2020 Spring **CSE 12: Basic Data Structures and Object-Oriented Design, UCSD**: Held office hours and wrote unit tests for grading homework automatically in Java.

Skills

Programming Languages	Python, Typescript/Javascript, C/C++, Go, Java, SQL
AI	Reinforcement Learning, 2D/3D Computer Vision, Deep Learning, Tree Learners, Boosted Trees
Frameworks	Jax, Pytorch, Tensorflow, Pandas, scikit-learn, Numpy, Node.js, React, MongoDB, Express.js
Tools	Docker, Google Cloud, Jupyter Notebook, Git, Adobe Photoshop, Figma

Interests / Other

Languages	English, Chinese
Sports	Fencing (Saber), Fencing Coaching
Music	Violin, Viola