DAVID CAO

HE/HIM   DAVID@CAO.SH   HTTPS://CAO.SH

EDUCATION

UC San Diego
2019–2023

- Senior, **Computer Science (B.S.) & Ethnic Studies (B.A.)** · GPA: **3.782**

- Selected coursework: Programming Languages (graduate level), Computer Graphics, Deep Learning, Advanced Data Structures, Software Engineering · Antiracist Healthcare, Ethnic Studies: Theoretical Approaches, Decolonizing Education

---

RESEARCH EXPERIENCE

Research Intern, PLSE Lab, University of Washington
Summer 2022

- *Advisor*: Zachary Tatlock

- Created and implemented a case study for an equivalence graph-based database tool (paper currently under submission)

- Experimented with alternate database index implementations. Implemented multiple versions of hash tables for performance testing

Undergraduate Researcher, Programming Systems Group, UC San Diego
2020–Present

- *Advisor*: Nadia Polikarpova

- Built library learning tool which learns abstractions from corpus of programs. Responsible for algorithm design and immplementation, technical writing, experiment creation, and tool evaluation. Joint first author on a published paper at a major PL conference (**POPL 2023**)

- Contributed to type-directed synthesis tool for generating programs composed of REST API calls. Rewrote program search engine and candidate ranking procedure, speeding up both by several orders of magnitude. Published paper at a major PL conference (**PLDI 2022**)

- Created resource analysis tool which automatically infers the specific resource use of programs. Achieved **2nd prize** at POPL 2021 Student Research Competition (undergraduate) with a recorded/edited video poster and 3-page abstract

---

PUBLICATIONS

† denotes equal authorship

[1]   Zhang, Y., Wang, Y. R., Flatt, O., **Cao, D.**, Zucker, P., Rosenthal, E., Tatlock, Z., Willsey, M., "Better Together: Unifying Datalog and Equality Saturation". **Under submission**.

[2]   **Cao, D.**[†], Kunkel, R.[†], Nandi, C., Willsey, M., Tatlock, Z., Polikarpova, N., "Babble: Learning Better Abstractions with E-Graphs and Anti-Unification". In: POPL '23: 50th ACM SIGPLAN Symposium on Principles of Programming Languages. Boston, MA, USA: ACM, Jan. 2023. URL: https://arxiv.org/abs/2212.04596.

[3]   Guo, Z., **Cao, D.**, Tjong, D., Yang, J., Schlesinger, C., Polikarpova, N., "Type-Directed Program Synthesis for RESTful APIs". In: PLDI '22: 43rd ACM SIGPLAN International Conference on Programming Language Design and Implementation. San Diego, CA, USA: ACM, June 9, 2022. DOI: 10.1145/3519939.3523450.

TEACHING EXPERIENCE

Tutor, CSE 130
2020–2021

- Helped plan and run an upper division computer science course at UCSD covering lambda calculus, functional programming, and Haskell

- Provided weekly student office hours for students to ask questions about course material or request support for the course

- Coordinated with teaching staff (other tutors, TAs, and the professor) to create a safe learning environment for students

SERVICE

Campus Diversity Engagement Coordinator, SPACES   *2022–Present*

- Engaged in outreach work with cultural student organizations and resource centers on campus to organize events for students

- Procured funding for programs to help empower marginalized students at UCSD and in San Diego more broadly

- Organized and provided *Alternative Campus Tours and Panels* to hundreds of high school and college students, providing information on resource centers and the history of student activism at UCSD

Mentor, SPIS 2020   *Summer 2020*

- Assisted in setting up and running a survey summer program on computer science topics at UCSD

- Offered continued mentorship for new CS students to help them get accustomed to UCSD and succeed in the CSE program; provided assistance with class selection, internship/job preparation, etc.

- Provided assistance to students completing beginning Python programming tasks

- Created spisbot, a Discord bot written in Python to administrate the SPIS 2020 Discord server which is still used today. Implemented automated onboarding, a ticket queue system, and automatically-generated and -assigned breakout rooms

PRESENTATIONS

Automatic Dependent Resource Analysis **[video poster] [abstract]**   *POPL 2021 SRC*

SELECTED PROJECTS

UCSF Science Policy Group website   *2022*

- Built and designed a website in Webflow, in coordination with and using feedback from organizers working for equitable science policy

seascape   *2019–2020*

- Built and designed a hosted website using Haskell and TailwindCSS which provides aggregate course and professor ratings for UCSD course sections, along with a search-based interface

- Created a web scraper using Selenium and Haskell to ingest UCSD professor feedback ("CAPE") data

- Currently receives ≈75,000 visits yearly

HONORS & AWARDS

CRA Outstanding Undergraduate Researcher Award Finalist   *2023*
Note: list of awardees will be published online ≈ end of Dec. 2022

Honorable Mention, Excellence in Research, UCSD CSE   *2021*

2nd Prize, Student Research Competition (Undergraduate), POPL 2021   *2021*