David M Kahn

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PROFILE

Final Year PhD Student at **Carnegie Mellon University** studying **Programming Languages**
Specializes in **Type Systems** for **Automated Cost Analysis**
Advised by **Jan Hoffmann**

EDUCATION

CARNEGIE MELLON UNIVERSITY — CS PHD CANDIDATE, 2018-PRESENT
CARNEGIE MELLON UNIVERSITY — MS IN CS, AWARDED DURING PHD, 2022
CORNELL UNIVERSITY —BS IN CS, MAGNA CUM LAUDE, MATH & PHIL MINORS, 2018

RESEARCH INTERESTS

I enjoy leveraging deep connections between various fields of study to squeeze surprising amounts of power out of program analyses. So far my work has drawn from type theory, logic, combinatorics, quantum physics, linear algebra, automata, numerical optimization, and more to develop static analyses capable of automatically verifying quantitative properties of programs.

PUBLICATIONS

Automatic Amortized Resource Analysis with Regular Recursive Types, Grosen, Kahn, & Hoffmann, *https://arxiv.org/pdf/2304.13627.pdf*, **LICS 2023**

Automatic Amortized Resource Analysis with the Quantum Physicist's Method, Kahn & Hoffmann, *https://dl.acm.org/doi/pdf/10.1145/3473581*, **ICFP 2021**

Raising Expectations: Automating Expected Cost Analysis with Types, Wang, Kahn, & Hoffmann, *https://dl.acm.org/doi/pdf/10.1145/3408992*, **ICFP 2020**

Exponential Automatic Amortized Resource Analysis, Kahn & Hoffmann, *https://arxiv.org/abs/2002.09519*, **FoSSaCS 2020**

Scalable Verification of Probabilistic Networks, Smolka, Kumar, Kahn, Foster, Hsu, Kozen, & Silva, *https://arxiv.org/pdf/1904.08096.pdf*, **PLDI 2019**

Undecidable Problems for Probabilistic Network Programming, Kahn, *https://drops.dagstuhl.de/opus/volltexte/2017/8096/*, **MFCS 2017**

TEACHING INTERESTS

I want to teach for two reasons: Firstly, I want to share the beauty of the topics I have chosen to study with the next generation, so that they might fall in love with the topics as I have. Secondly, I want to be the instructor that I always wanted as a student, supporting my students with compassion and empathy. We are in a computerized field, but I believe heavily in a human approach to both the subject and the students, and I want to be there to make that happen.

TEACHING EXPERIENCE

INSTRUCTOR - 15-150 PRINCIPLES OF FUNCTIONAL PROG. (CARNEGIE MELLON) 2022
Sole instructor for ~70 students. Designed successful new extra credit opportunity for students to get exposure to research papers. Provided lecture recordings and course materials online, developed exams, handled academic integrity cases, and led team of undergraduate TAs.

TA - 15-814 TYPES AND PROGRAMMING LANGUAGES (CARNEGIE MELLON) 2021
Sole TA under Frank Pfenning. Designed assignments, recorded lectures, graded, guest lectured, and answered online questions. Postmortemed assignments and lectures.

REU STUDENT MENTOR (CARNEGIE MELLON) 2020
Taught and mentored undergraduate student on programming language research project. Student later joined my research group as a PhD student.

TA - 15-317 CONSTRUCTIVE LOGIC (CARNEGIE MELLON) 2019
Under Karl Crary. Ran recitation, designed assignments, graded, answered online questions.

TA - CS 2800 DISCRETE STRUCTURES (CORNELL) 2016
Under Joseph Halpern, 2016. Graded and answered online questions.

COMMUNITY INVOLVEMENT

SPEAKER'S CLUB MEMBER 2022-PRESENT
Reviewer of PhD students' speaking skills, a graduation requirement.

PHD STUDENT COUNCIL MEMBER 2021-PRESENT
Rebuilt post-pandemic social institutions. Led initiative to reinvigorate social spaces.

DOCTORAL REVIEW COMMITTEE MEMBER 2020-PRESENT
Assisted in departmental oversight and steering. Developed new writing skills graduation requirement. Arranged online social activities during covid for student mental health/community.

STUDENT VOLUNTEER HOST 2020-PRESENT
Hosted various game nights and events for admitted student visit days, incoming students, etc.

PROGRAMMING LANGUAGES AREA LUNCH ORGANIZER 2019
Arranged programming language talks weekly for the Carnegie Mellon community.

LOGOS UNDERGRADUATE PHILOSOPHY JOURNAL EDITOR 2014-2017
Reviewed philosophy papers for journal inclusion. Assisted in running the journal-hosted Kretzmann Lecture and Life Raft Debate. Appointed to board member in second year.

EAGLE SCOUT 2013
Achieved Eagle Scout for revamping the Valley Forge Historical Trail, leading over 200 man-hours of volunteer work. Awarded National Medal of Merit.

PROFESSIONAL EXPERIENCE

APPLIED SCIENTIST INTERN (AMAZON) 2021
Code Guru team member. Built novel Python type inference tool using experimental data flow engine. Caught and fixed issues in existing code representation. Offered return internship.

SOFTWARE ENGINEERING INTERN (FACEBOOK) 2018
Hack Lang team member. Worked to design and implement the *dynamic* type for gradual typing. Overhauled Hack typechecker and fixed type-safety issues across entire codebase. Offered job.

SUMMER RESEARCH ACTIVITIES (CORNELL) 2015-2017
- Constructive mathematics focusing on bar induction under Robert Constable. 2017
- Designing analyses for a probabilistic network language under Dexter Kozen. 2016
- Signal processing for hand control in soft robotics under Robert Shepherd. 2015

PROFESSIONAL SERVICE

REVIEWER FOR LICS CONFERENCE 2022

REVIEWER FOR POPL CONFERENCE 2021

ARTIFACT EVALUATOR FOR POPL CONFERENCE 2021

REVIEWER FOR FOSSACS CONFERENCE 2021

REVIEWER FOR MSCS JOURNAL 2020-2021

REVIEWER FOR ESOP CONFERENCE 2020

FAVORED PROGRAMMING LANGUAGES

OCaml, Python, Java

OTHER INTERESTS

board games, hiking, theatre, singing