Sara McAllister

PhD Candidate, Carnegie Mellon University

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Biography

Sara McAllister is a PhD candidate at Carnegie Mellon University, advised by Nathan Beckmann and Greg Ganger. She is interested in computer systems, particularly caching and storage systems. Her work includes a focus on improving efficiency and sustainability through hardware-software co-design and grounding design choices in mathematical modeling. Her work has appeared at OSDI and SOSP, including receiving a Best Paper Award at SOSP 2021 for her paper "Kangaroo: Caching Billions of Tiny Objects on Flash". She is a 2021 NDSEG fellow and a 2023 EECS Rising Star. Sara also strives to increase inclusion in computer science, including by creating a DEI course for CS PhD students. Due to these efforts, she was awarded CMU's Graduate Student Service Award in 2022 and a Best Paper Award at SIGCSE 2023.

Education

Carnegie Mellon University — *Pittsburgh, PA*

PhD in Computer Science, Advisors: Nathan Beckmann and Greg Ganger — *Aug 2019. - Present*

Carnegie Mellon University — *Pittsburgh, PA*

Masters in Computer Science Research — *Aug 2019. - May 2022*

Harvey Mudd College — *Claremont, CA*

B.S. in Computer Science, Graduated with High Distinction — *Aug. 2015 - May 2019*

Honors and Awards

2023	**Rising Star in Electrical Engineering and Computer Science**	*EECS*
2023	**Exemplary Poster Presentation**, In computer and computational sciences at fellows conference	*NDSEG*
2023	**Best Paper Award**	*SIGCSE*
2022	**Graduate Student Service Award**, For the development of 15-996 CS-JEDI	*CMU*
2021	**Best Paper Award**	*SOSP*
2021	**Graduate Fellowship**, NDSEG	*DoD*
2021	**Graduate Research Fellowship**, GRFP	*NSF*
2019	**Class of '94 Award**, Outstanding CS graduate in a combination of course work, research, and service	*Harvey Mudd*
2019	**Departmental Honors**, Computer Science Department	*Harvey Mudd*
2019	**Clinic Team Award**, Outstanding performance on a team	*Harvey Mudd*
2019	**Outstanding Undergraduate Researcher Award**, Honorable Mention	*CRA*
2019	**Best Malware**, Most creative malware during capture the flag (CTF) competition	*Yelp*

Refereed Journal Publications

Kangaroo: Theory and Practice of Caching Billions of Tiny Objects on Flash — *ACM ToS*

Sara McAllister, Benjamin Berg, Julian Tutuncu-Macias, Juncheng Yang, Sathya Gunasekar, Jimmy Lu, Daniel S. Berger, Nathan Beckmann, Gregory R. Ganger — *August 2022*

External-memory Dictionaries in the Affine and PDAM Models — *ACM ToPC*

Michael A. Bender, Alex Conway, Martin Farach-Colton, William Jannen, Yizheng Jiao, Rob Johnson, Eric Knorr, Sara McAllister, Nirjhar Mukherjee, Prashant Pandey, Donald E. Porter, Jun Yuan, Yang Zhan — *September 2021*

Refereed Conference Publications

CS-JEDI: Required DEI Education, by CS PhD Students, for CS PhD Students — *SIGCSE 2023*

Bailey Flanigan, Ananya Joshi, Sara McAllister, Catalina Vajiac — *Acceptance Rate: 35%*

Kangaroo: Caching Billions of Tiny Objects on Flash — *SOSP 2021*

Sara McAllister, Benjamin Berg, Julian Tutuncu-Macias, Juncheng Yang, Sathya Gunasekar, Jimmy Lu, Daniel S. Berger, Nathan Beckmann, Gregory R. Ganger — *Acceptance Rate: 16%*

The CacheLib Caching Engine: Design and Experiences at Scale — *OSDI 2020*

Benjamin Berg, Daniel S. Berger, Sara McAllister, Isaac Grosof, Sathya Gunasekar, Jimmy Lu, Michael Uhlar, Jim Carrig, Nathan Beckmann, Mor Harchol-Balter, Gregory R. Ganger — *Acceptance Rate: 18%*

Small Refinements to DAM Can Have Big Consequences for Data-Structure Design *SPAA 2019*
Michael A. Bender, Alexander Conway, Martin Farach-Colton, William Jannen, Yizheng Jiao, Rob Johnson, Eric Knorr, **Sara McAllister**, Nirjhar Mukherjee, Prashant Pandey, Donald E. Porter, Jun Yuan, Yang Zhan *Acceptance Rate: 40%*

Talks

Overcoming Write Limitations to achieve Sustainable Flash Caching *UC Berkeley, 25 Jan 2024*
Overcoming Write Limitations to achieve Sustainable Flash Caching *Stanford, 24 Jan 2024*
Overcoming Write Limitations to achieve Sustainable Flash Caching *UC Santa Cruz, 11 Jan 2024*
Overcoming Write Limitations to achieve Sustainable Flash Caching *McGill (Remote), 16 Nov 2023*
FairyWREN: A Sustainable Cache for Write-Read-Erase Interfaces *PDL Retreat, 7 Nov 2023*
Scaling the bandwidth-per-TB wall with Declarative Storage Interfaces *PDL Retreat, 6 Nov 2023*
Overcoming Write Limitations to achieve Sustainable Flash Caching *Microsoft Pittsburgh, 2 Nov 2023*
CS-JEDI: DEI education by PhD students, for PhD students *McGill (Remote), 31 Oct 2023*
Overcoming Write Limitations to achieve Sustainable Flash Caching *MIT, 10 Oct 2023*
Efficient and Sustainable Data Retrieval *NDSEG Fellows, 31 July 2023*
Overcoming Write Limitations to achieve Sustainable Flash Caching *University of Toronto, 20 Mar 2023*
FairyWREN: A Superb Cache Co-optimized for Write-Limited Flash *PDL Retreat, 7 Nov 2022*
Caching on Flash: Kangaroo and Beyond *Meta, 11 Mar 2022*
Kangaroo: Caching Billions of Objects on Flash *Microsoft Research, 22 Nov 2021*
Kangaroo: Caching Billions of Objects on Flash *SOSP, 27 Oct 2021*
Building a Stronger, More Just Academic Community Through Mandatory Anti-bias Learning *UPitt Diversity Forum, 28 Jul 2021*
Kangaroo: Caching Billions of Objects on Flash *Cache@Scale, 4 Mar 2021*

Teaching

Carnegie Mellon University

Storage Systems (15-746/18-746) *TA, Fall 2023*
Parallel Computer Architecture and Programming (15-418/618) *TA, Spring 2022*
Diversity, Equity, and Inclusion in Computer Science and Society (15-996) *Co-Creator and TA, Spring 2021*

Harvey Mudd College

Programming Languages (CS131) *Grader and Tutor, Spring 2019*
Introduction to Computer Systems (CS105) *Grader and Tutor, Fall 2018*
Introduction to Computer Systems (CS105) *Grader and Tutor, Spring 2018*
Data Structures and Programming Development (CS70) *Grader and Tutor, Fall 2017*
Principles of Computer Science (CS60) *Grader and Tutor, Spring 2017*
Introduction to Biology and Computer Science (CS5 Green) *Grader and Tutor, Fall 2016*

Invited Speaker

Graduate Computer Architecture – Sustainable Computing (CMU 15-740) *Fall 2023*
Computer Systems – Kangaroo: Caching Billions of Tiny Objects on Flash (CMU 18-213/613) *Fall 2022*
Data Center Computing – Kangaroo Discussion (CMU 18-847C) *Spring 2022*
CS-JEDI – Panel on Allyship (CMU 15-996) *Spring 2022*
Computer Systems – Kangaroo: Caching Billions of Tiny Objects on Flash (CMU 18-213) *Fall 2021*
Storage Systems – Kangaroo: Caching Billions of Tiny Objects on Flash (CMU 18-746) *Fall 2021*

Mentoring

Suhas Thalanki. CMU computational data science masters capstone *Spring 2024 - Present*
Sriya Ravi. CMU computational data science masters capstone *Spring 2024 - Present*
Yu Liu. CMU computational data science masters capstone *Spring 2024 - Present*
Sophia (Qingyang) Cao. CMU CS undergraduate student *Fall 2023 - Present*
Sarvesh Tandon. CMU ECE masters student *Fall 2023 - Present*
Sherry (Yucong) Wang. CMU ECE undergraduate student *Fall 2022 - Present*
Akshath Karanam. CMU ECE masters student, After degree: Salesforce *Fall 2022*
Priyal Suneja. Univesity of Washington CS PhD student *Fall 2021 - Summer 2022*

Julian Tutuncu-Macias. CMU CS undergraduate student, After degree: Goldman Sachs — *Fall 2019 - Spring 2021*
Sheng Xu. CMU CS masters student, After degree: Amazon Web Services — *Spring 2020*
Karina Mejia. Ontario High School — *Summer 2016*

Leadership and Service

Faculty Hiring Committee — *Carnegie Mellon University*
One of two student committee members helping solicit student perspectives on faculty candidates — *Spring 2024*

CS-JEDI and Other DEI Initiatives — *Carnegie Mellon University*
Developed and implemented inclusivity initiatives with 2 other PhD students including an informal climate survey, a mandatory DEI class for CS PhD students, an advisor-advisee feedback form, and being awarded CMU's Graduate Student Service Award — *July 2020 - Mar. 2023*

PhD Admissions Committee — *Carnegie Mellon University*
PhD student in charge of reading applications for systems area in the Computer Science Department — *Dec. 2021 - Mar. 2022*

Parallel Data Lab (PDL) Meeting Coordinator — *Carnegie Mellon University*
Invited and scheduled talks for PDL weekly talk series — *Fall 2021*

Introductory Course (IC) Committee — *Carnegie Mellon University*
Co-organizer for first virtual orientation in the Computer Science Department — *Fall 2020*

Faculty Search - Student Committee — *Harvey Mudd College*
Interviewed each invited faculty candidate for the Computer Science Department — *Spring 2019*

Mentor and Proctor (Residential Assistant) — *Harvey Mudd College*
Led residential activities and crisis response in East Dorm with 82 residents — *Fall 2016 - Spring 2019*

Science Bus Volunteer and Treasurer — *Harvey Mudd College*
Instructed 4th and 5th graders from under-resourced schools in hands-on science lessons and managed ∼$3000 of grant money (April 2016 - May 2017) — *Aug. 2015 - May 2018*

STEAM:coders Site Coordinator and Instructor — *Harvey Mudd College*
Led CS-related activities for 25 middle-school ages students from disadvantaged communities — *Summer 2016*

Professional Experience

Graduate Research Assistant — *Carnegie Mellon University*
Advisors: Nathan Beckmann and Greg Ganger — *Aug. 2019 - Present*
- Researched caching systems to decrease cost and increase sustainability of providing internet services at scale
- Explored new memory and storage hardware interfaces, particularly for caching applications

Research Intern — *Microsoft Research*
Mentor: Amar Phanishayee — *Summer 2022*
- Researched serving large generative ML models more efficiently

Research Intern — *Microsoft Research*
Mentor: Daniel Berger — *Summer 2021*
- Researched in-kernel disaggregated memory solutions using CXL

Software Engineering Intern — *Yelp*
Database Team — *Summer 2019*
- Designed and implemented a Python library to manage MySQL database permissions
- Planned and started gradual roll out system, fully rolled out after internship across production

Clinic (Capstone) Project — *Harvey Mudd College*
Sponsored by Pure Storage — *Aug. 2018 - May 2019*
- Designed and implemented failover mechanisms for NFS VMs running on a two-controller system
- Technical lead, about file systems and network partitioning, on a team of 4

Undergraduate Research Assistant — *UNC Chapel Hill*
Advisor: Don Porter — *May 2018 - Aug. 2018*
- Investigated theoretical and experimental analysis of write-optimized dictionaries

Software Engineering Intern

Facebook

Devleper Experience Team

Summer 2017

- Developed and tested a Python library to restart and repair development servers
- Created a React and Hack PHP user interface to receive and store user inputs

Research Assistant

Harvey Mudd College

Advisor: Anna Ahn

May. 2016 - Jun. 2017

- Led data analysis of a three-legged walking study