

Sara McAllister

PhD Candidate, Carnegie Mellon University

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Research Interests

Sara McAllister is a PhD candidate at Carnegie Mellon University, advised by Nathan Beckmann and Greg Ganger, expected to graduate in Summer 2025. 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

PHD IN COMPUTER SCIENCE, ADVISORS: NATHAN BECKMANN AND GREG GANGER

Pittsburgh, PA

Aug 2019. - Present

Carnegie Mellon University

MASTERS IN COMPUTER SCIENCE RESEARCH

Pittsburgh, PA

Aug 2019. - May 2022

Harvey Mudd College

B.S. IN COMPUTER SCIENCE, GRADUATED WITH HIGH DISTINCTION

Claremont, CA

Aug. 2015 - May 2019

Honors and Awards

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

Refereed Journal Publications

Kangaroo: Theory and Practice of Caching Billions of Tiny Objects on Flash

[Sara McAllister](#), Benjamin Berg, Julian Tutuncu-Macias, Juncheng Yang, Sathya Gunasekar, Jimmy Lu, Daniel S. Berger, Nathan Beckmann, Gregory R. Ganger

ACM ToS

August 2022

External-memory Dictionaries in the Affine and PDAM Models

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

ACM ToPC

September 2021

Refereed Conference Publications

CS-JEDI: Required DEI Education, by CS PhD Students, for CS PhD Students

Bailey Flanigan, Ananya Joshi, [Sara McAllister](#), Catalina Vajiac

🏆 *SIGCSE 2023*

Acceptance Rate: 35%

Kangaroo: Caching Billions of Tiny Objects on Flash

[Sara McAllister](#), Benjamin Berg, Julian Tutuncu-Macias, Juncheng Yang, Sathya Gunasekar, Jimmy Lu, Daniel S. Berger, Nathan Beckmann, Gregory R. Ganger

🏆 *SOSP 2021*

Acceptance Rate: 16%

The CacheLib Caching Engine: Design and Experiences at Scale

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

OSDI 2020

Acceptance Rate: 18%

Small Refinements to DAM Can Have Big Consequences for Data-Structure Design

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

SPAA 2019

Acceptance Rate: 40%

Talks and Posters

Overcoming Write Limitations to achieve Sustainable Flash Caching

MIT PDOS, 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

Leadership and Service

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

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

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

Sophia (Qingyang) Cao. CMU Statistics and Data Science undergraduate 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. University 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

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

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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

DEVELOPER 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