KATHERINE M. BRAUGHT

(563)-570-3362 | Champaign, IL

EDUCATION

Ph. D. in Computer Science   Aug. 2021-current
University of Illinois Urbana Champaign   *GPA: 4.0*
Area: Computers and Education

M.S in Computer Science   Aug. 2021-Aug 2024
University of Illinois Urbana Champaign   *GPA: 4.0*
Area: Formal Methods for Verification

BS in Computer Science, University Honors   Aug. 2016- Dec. 2020
Iowa State University, Ames, Iowa   *GPA: 4.0*
Minor: Biology
Summa Cum Laude, Top 2% of College

RESEARCH

Ph. D. Student Researcher, **University of Illinois Urbana Champaign**
Siebel School, June 2024-present
Mentor: Jeff Erickson, Ph.D.

- Developing an quantitative study of grades in algorithms courses
- Exploring novice difficulties using graph algorithms
- Formalizing observations about formal methods educational experiences and student motivations
- Developing training for TAs

Ph. D. Student Researcher, **University of Illinois Urbana Champaign**
Coordinated Science Lab, Aug. 2021-Aug 2024
Mentor: Sayan Mitra, Ph.D.

- Formalized causality in stochastic systems
- Built tools to formally verify C code – Verse library
- Developed methods to expand model verification to source code
- Analyzed autonomous vehicle systems using probabilistic programming

Ph. D. Student Researcher, **NASA**
Langley May 2023-August. 2023
Mentor: Alwyn Goodloe, Ph.D.

- Implemented probabilistic monitoring in Copilot
- Developed examples for Copilot monitoring

Ph. D. Student Researcher, **Air Force Research Lab**
Wright Patterson Air Force Base, May 2022-August. 2022
Mentor: Kerrianne Hobbs, Ph.D.
- Synthesized a reinforcement learning controller for the Inspection Problem
- Integrated runtime assurance into a RL controller

Student Researcher, **Iowa State University**
Department of Computer Science, Aug. 2019-Dec. 2020
Mentor: David Fernández-Baca, Ph.D.
- Formulated the no rainbow 4-coloring problem as a SAT problem
- Developed a pipeline to analyze information availability matrices for phylogenetic trees

NSF REU Researcher, **Carnegie Mellon University**
Software Engineering Institute, May 2020-Sept. 2020
Mentor: Eunsuk Kang, Ph.D.
- Utilized formal methods to reason about erroneous human behavior in medical devices
- Developed a tool to generate erroneous behavior through phenotypical errors
- Formally defined high order phenotype errors through regular expressions

Collaborating Software Developer, **University of Minnesota**
Earl E. Bakken Medical Devices Center, May 2020-June 2020
Project Supervisor: David Nedrelow, MS
- Developed python and bash programs to analyze and modify output from finite element analysis software
- Computationally created models of tissues expansion and bone resorption in the hard palate for medical device design

Freshman Honors Program Researcher, **Iowa State University**
Department of Genetics, Development, and Cell Biology, Jan. 2017-Dec. 2017
Mentor: Thomas Peterson, Ph.D.
- Developed an automated system to analyze regions of DNA to find suitable primer sequences
- Utilized scripting and existing programs to compare NGS data with a *Zea mays* reference genome on a HPC

NSF Bioinformatics REU Researcher, **Auburn University**
Department of Weed and Soil Sciences, May 2017- July 2017
Mentor: Scott McElroy, Ph.D.
- Analyzed *Euphorbia maculata* genome utilizing Biopython and Unix scripting in an HPC cluster
- Extracted DNA from field samples of *Euphorbia* plants

Quarknet Student Researcher, **University of Iowa, CERN**
Department of Physics
- Developed a scintillating plate material for potential use in the CERN particle collider
- Set up muon telescopes for data collection

TEACHING WORK EXPERIENCE

Teaching Assistant, **University of Illinois**
CS 173 Discrete Structures
Aug. 2024-Present
- Teach students in weekly tutorial (approx. 200 students) and office hours (2-10 students)
- Grade biweekly exams covering proof techniques

Course Assistant, **University of Illinois**
CS 591 Teaching Assistant Training
Aug. 2024-Present
- Manage attendance of approx. 300 students
- Grade student reflection assignments
- Develop and improve training lectures for engineering TAs

Teaching Assistant, **Iowa State University**
COM S 311 Introduction of Algorithm Analysis and Design
Aug. 2019-Nov. 2020
- Taught a recitation of about 25 students weekly and held weekly office hours for 5-20 students
- Graded theoretical and application algorithm assignments

Teaching Assistant, **Iowa State University**
COM S 327 Advanced Programming Techniques
Aug. 2018-Dec. 2018
- Assisted 5-30 students during office hours two hours a week
- Graded and debugged 20 student C/C++ assignments weekly

Teaching Assistant, **Iowa State University**
COM S 207 Careers in Computer Science
Jan. 2018-May 2018
- Managed class of 135 students and graded weekly assignments

Learning Assistant, **Iowa State University**
BIOL 212 Principles of Biology II
Aug. 2017-Dec. 2017

- Facilitated discussion of complex biological concepts with three groups of five students
- Planned activities with teaching staff for active learning

PROFESSIONAL WORK EXPERIENCE

Backend Developer: Systems, **IBM**
Jan. 2021-Aug. 2021
- Developed software in proprietary language for IBMi
- Implemented new data type support for a database

Platform Software Engineering Co-op, **Collins Aerospace (of Raytheon Technologies)**
Jan. 2019-July 2019
- Developed platform level software for touch screen hardware in C
- Created and maintained nightly continuous integration testing using Atlassian tools and Tcl scripting

Software Development Intern, ***Workiva Inc.***
May 2018-Dec. 2018
- Developed microservices in Java on an Agile team
- Maintained existing programs and implemented new features

PROGRAMMING SKILLS AND TOOLS

Proficient Java, Python, LaTeX
Intermediate C, C++, BASH
Beginner Kotlin
Tools
Git, SVN, Atlassian Tools, Gurobi Optimizer
Development Environments
Linux, Windows, and Mac

PUBLICATIONS

Chen, H., **Braught, K.,** Herman, G., Erickson, J. Novice Difficulties in Graph Layering for Algorithm Design, SIGCSE TS 2025, *under submission*
Braught, K. Mitra,S: Strucutral and Sequential Causal in Hidden Markov Models, CREST 2023 Workshop, Short submission
Li, Y. Zhu, H. **Braught, K.** Shen, K. Mitra, S.: Verse: A Python library for reasoning about multi-agent hybrid system scenarios, TACAS 2023
Parvini, G. **Braught, K.**, Fernández-Baca, D.: Checking phylogenetic decisiveness in theory and in practice (February 2020), Lecture Notes in Bioinformatics

Parvini G, **Braught K**, Fernandez-Baca D. Checking Phylogenetics Decisiveness in Theory and in Practice. IEEE/ACM Trans Comput Biol Bioinform. 2021 Nov 16;PP. doi: 10.1109/TCBB.2021.3128381. Epub ahead of print. PMID: 34784284.

PRESENTATIONS

Braught, K., Fernández-Baca, D. "Generating Decisive Sub-matrices for Phylogenetic Tree Construction", Iowa State University Honors Program Poster Presentation, December 6th, 2020. Virtual poster presentation

Braught, K., Kang, E., Zhang, C. "A Generalized Approach to Phenotypical Erroneous Human Behavior Generation", Carnegie Mellon Institute for Software Research RUESE Closing Talks, July 31st, 2020. Virtual oral and poster presentation

Braught, K., Fernández-Baca, D. "A Pipeline for Generating Decisive Submatrices for Confidently Constructing Phylogenetic Trees", 14th ISU Symposium on Undergraduate Research and Creative Expression, April 22nd, 2020. Virtual oral presentation

Braught, K., McElroy, S., "Identification of herbicide resistance in psbA gene and analysis of latex related genes in Euphorbia maculate", Auburn University REU Research Symposium, July 28th 2017, Poster presentation

MENTORSHIP POSITIONS

Community Advisor, **Iowa State Department of Residence**
Aug. 2017-May 2018, Aug. 2019-Nov. 2020
- Supervised and supported a community of 70 residents
- Worked 15 hours a week with students and completing administrative duties

Freshman Learning Community Peer Mentor, **Iowa State Department of Computer Science**
Jan. 2018-Dec. 2018
- Led Computer Science Freshman learning community meetings for 60 students
- Planned weekly activities to promote bonding and career development

Women in Computer Science Peer Mentor, **Iowa State Department of Computer Science**
Aug. 2018-Dec. 2018
- Mentored 12 freshman women to increase retention in the Com S major
- Planned biweekly professional development activities

HONORS AND AWARDS

Iowa State University Dean's List 2016-2020
Iowa State University Top 2% of College of Liberal Arts and Sciences 2016-2020
Iowa State University Summa Cum Laude Graduate 2020
Mark Giese Computer Science Scholarship Recipient – 2020
Cardinal Leadership Level I Scholarship Recipient – 2016-2020
President's Award for Competitive Excellence Scholarship Recipient – 2016-2020
Sina Severson Scholarship Recipient - 2017-2020
LAS Excellence Scholarship Recipient - 2017-2020
Arthur Collins Computer Science Scholarship Recipient - 2019
Women in Science and Engineering Scholarship Recipient – 2017-2018
Alpha Phi Omega Service Fraternity Emerging Leader Award Recipient – 2016