Heather M. Guarnera

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Education

Ph.D. in Computer Science, 2020, Kent State University.
Dissertation: "*Hyperbolicity, Injective Hulls, and Helly Graphs*," Advisor: Dr. Feodor F. Dragan

M.S. in Computer Science, 2015, The University of Akron.
Thesis: "*Detection of Named Branch Origin for Git Commits,*" Advisor: Dr. Michael L. Collard

B.S. in Computer Science with a Mathematics Minor, 2013, The University of Akron.
Honors Research Thesis: "*iSciCalc - An iOS Linear Algebra Calculator,*" Advisor: Dr. Michael L. Collard

Academic Experience

- *Assistant Professor*. Department of Computer Science, The College of Wooster, Wooster, Ohio. 8/20-present.
- *Part-time Instructor*. Department of Computer Science, Kent State University, Kent, Ohio. 6/20-8/20.
- *Graduate Assistantship*. Department of Computer Science, Kent State University, Kent, Ohio. 9/15-5/20.
- *Part-time Instructor*. Department of Computer Science, Kent State University, Kent, Ohio. 6/19-8/19.
- *Part-time Instructor.* Department of Computer Science, Kent State University, Kent, Ohio. 6/18-8/18.
- *Research Assistantship*. Department of Computer Science, Kent State University, Kent, Ohio. 5/17-8/17.
- *Research Assistantship*. Department of Computer Science, Kent State University, Kent, Ohio. 5/16-8/16.
- *Research Assistantship*. Department of Computer Science, The University of Akron, Akron, Ohio. 12/14-8/15.
- *Graduate Assistantship*. Department of Computer Science, The University of Akron, Akron, Ohio. 9/13-5/14.

Industry Experience

- *Software Engineer Consultant.* Vivi Dynamics, Applied Methods and Research Experience (AMRE), Wooster, Ohio, 2023.
- *Software Engineer Consultant.* Line45, Applied Methods and Research Experience (AMRE), Wooster, Ohio, 2021.
- *Software Engineer Consultant*. GraphSQL, Kent, Ohio. 2016
- *Associate Software Engineer*. BGI-LLC, Akron, Ohio. 2014
- *Software Engineer Intern*. BGI-LLC, Akron, Ohio. 2012-2014

Research Interests

My research lies at the intersection of software engineering, socio-technical systems, and applied algorithmic graph theory in software ecosystem analysis. My research interests in graph theory and algorithms focus on the broad category of hyperbolic graphs, and includes the design and analysis of graph algorithms, complex network analysis, and algorithmic applications in software engineering, such as mining software repositories. I am particularly interested in social patterns in software development.

Works in Preparation undergraduate student*

- **H. Guarnera**, L. Torres*, M. Collard, A. Garcia, "Women's Contribution to Open-Source Software", 32-pages, under preparation for *Springer Nature Computer Science*.

Publications (refereed conference & journal) undergraduate student*

13 Baltasar Berretta*, Gus Thomas*, **Heather Guarnera**. "Dependency Update Adoption Patterns in the Maven Software Ecosystem", in Proceedings of the 22nd International Conference on Mining Software Repositories (MSR 2025). [doi] [arXiv]

12 Leilani Torres*, **Heather Guarnera**, Michael Collard, and Amber Garcia. *Impact of Gender on OSS File Contributions*, in Proceedings of the 56th ACM Technical Symposium on Computer Science Education V.2 (SIGCSE TS 2025), Feb 26 - Mar 1, 2025, Pittsburgh, PA, 2 pages. [doi]

11 F. Dragan, G. Ducoffe, **H. Guarnera**. "Fast deterministic algorithms for computing all eccentricities in (hyperbolic) Helly graphs," Journal of Computer and System Sciences 149:103606, 2025. [doi] [arXiv]

10 D. Cohen-Cobos*, K. Sanders*, L, DeGroot, **H. Guarnera**, C. Leary, J. Lindner, N. Manz. Chemistry does general relativity: reaction-diffusion waves can model gravitational lensing, Frontiers in Physics, 2024. [doi]

9 **H. Guarnera**, F. Dragan, A. Leitert. Injective Hulls of Various Graph Classes, Graphs and Combinatorics 38, 112 (2022). [doi] [arXiv]

8 A. Mohammed, F. Dragan, **H. Guarnera**. "Fellow Travelers Phenomenon Present in Real-World Networks," the 10th International Conference on Complex Networks & Their Applications, 2021, pp 194-206. [doi]

7 F. Dragan, G. Ducoffe, **H. Guarnera**. "Fast deterministic algorithms for computing all eccentricities in (hyperbolic) Helly graphs," the 17th Algorithms and Data Structures Symposium (WADS'21), 2021. [doi] [arXiv]

6 F. Dragan, **H. Guarnera**. Helly-gap of a graph and vertex eccentricities, Theoretical Computer Science, 867:68-84, 2021. [doi] [arXiv]

5 F. Dragan, **H. Guarnera**. Eccentricity terrain of δ-hyperbolic graphs, Journal of Computer and System Sciences, 112:50-65, 2020. [doi] [arXiv]

4 F. Dragan, **H. Guarnera**. Eccentricity function in distance-hereditary graphs, Theoretical Computer Science, 833:26-40, 2020. [doi] [arXiv]

3 F. Dragan, **H. Guarnera**. Obstructions to a small hyperbolicity in Helly graphs, Discrete Mathematics, 342(2):326 – 338, 2019. [doi] [arXiv]

2 **H. Michaud,** D. Guarnera, M. Collard, and J. Maletic. (2016), "Recovering Commit Branch of Origin from GitHub Repositories," 32nd IEEE International Conference on Software Maintenance and Evolution (ICSME'16), Raleigh, NC, Oct 2-10, 2016, pp. 290 - 300 *(29% acceptance rate)*. [doi]

1 **H. Michaud**, K. Liszka, C. Chan, "Application of Data Mining to Learning Assessment", in The International Conference on Education and Psychological Sciences (ICEPS'14), Taipei Taiwan, 2014.

Advised Refereed Poster Presentations undergraduate student*

- Faiaz Azmain*, Habiba Hye*, KM Khalid Saifullah*, *Sentiment Analysis in Software Engineering: Evaluating Generative Pre-trained Transformers* [Poster abstract]. National Conference on Undergraduate Research (NCUR 2025), Pittsburgh, PA, April 7-9, 2025.
- Leilani Torres*, **Heather Guarnera**, Michael Collard, and Amber Garcia. *Impact of Gender on OSS File Contributions* [Poster absract], in Proceedings of the 56th ACM Technical Symposium on Computer Science Education V.2 (SIGCSE TS 2025), Feb 26 - Mar 1, 2025, Pittsburgh, PA, 2 pages. [doi]

Presentations

- 11/23. "Negative curvature in real-world networks", Invited talk at Oberlin College, Oberlin, OH. November 9, 2023.
- 10/23. "Geometric characteristics of real-world networks", Science Round Table, Wooster, OH. October 27, 2023
- 03/23. "Fellow travelers phenomenon in real-world networks and applications", Invited talk at Denison University, Granville, OH. March 20, 2023.
- 08/21. "Fast deterministic algorithms for computing all eccentricities in (hyperbolic) Helly graphs", WADS 2021: Algorithms and Data Structures Symposium (virtually), Halifax, Nova Scotia, Canada. [slides]
- 09/20. "Hyperbolicity, injective hulls, and Helly graphs", Invited talk at Kent State University Graduate Seminar, Kent, Ohio. September 17th, 2020. [slides]
- 02/18. "Hyperbolicity, injective hulls, and Helly graphs", Kent State University Computer Science Research Day. Kent, Ohio. February 2, 2018. [slides] [poster]
- 10/16. "Recovering Commit Branch of Origin from GitHub Repositories", ICSME 2016: International Conference on Software Maintenance and Evolution, Raleigh, North Carolina. October 2 - 10, 2016. [slides]

Proposals

- CAREER: Large-scale Analysis of Underrepresented Groups in Software Ecosystems, H. Guarnera (PI). National Science Foundation. Amount: $492,867. Period: 5 years. *Not awarded*.

Awards, Funding, and Other Support

$18,000: University Fellowship, Kent State University, 2019.
Awarded annually to advanced doctoral students to recognize excellent scholarship and research potential. Recipients receive a doctoral-level assistantship appointment for the Fall semester and a non-service University Fellowship appointment for the Spring semester.

$975: NSF Student Travel Grant, Kent State University, 2016.
Supported the travel costs associated with presenting at ICSME 2016.

$300: Graduate Student Senate Domestic Travel Award, Kent State University, 2016.
Supported the travel costs associated with presenting at ICSME 2016.

$5,000: Graduate Dean's Award, Kent State University, 2015.
Awarded to enhance Kent State University's recruitment and support of academically excellent students with diverse backgrounds by promoting graduate education characterized by diversity in views, experiences, and ideas in the pursuit of research, scholarship, and creative excellence.

$18,000: Honors Scholarship, The University of Akron, 2009-2012.
A renewable award of $2,250 per semester (up to 8 semesters) to Honors students with a sufficient GPA.

$24,000: University Scholarship for Excellence, The University of Akron, 2009-2012.
A renewable award of $3,000 per semester (up to 8 semesters) to students with excellent academic performance.

Teaching

My teaching interests are in theoretical and algorithmic computer science. This includes introduction to algorithms, programming, and algorithmic graph theory. I particularly enjoy finding clean and aesthetic solutions to difficult problems in a manner that is easy to present and explain. I have experience as a primary lecturer in a variety of undergraduate and graduate-level (*) classes, with class sizes ranging

from 10 students to 75+ students, at institutions including The University of Akron (UA), Kent State University (KSU), and The College of Wooster (COW). I also have significant experience teaching in small labs and mentoring students one-on-one on their academic projects. I have advised 26 students on a year-long independent study research project, and have also served as a mentor to several students working on teaching assistantships and internships.

Course Instructor			
Scientific Computing	COW	CSCI 100	Fa'20, Sp'21, Su'21, Fa'21, Sp'22, Sp'23, Fa'24, Fa'25
Algorithm Analysis	COW	CSCI 200	Sp'22, Sp'23, Sp'24, Sp'25
Principles of Computer Organization	COW	CSCI 210	Fa'21
Programming Languages	COW	CSCI 222	Fa'20
Problem Seminar	COW	CSCI 279	Fa'21, Fa'24
Software Ecosystems	COW	CSCI 399	Fa'24
Combinatorics and Graph Theory	COW	MATH 223	Sp'21
Technology in Society	COW	FYSM 101	Fa'25
Design and Analysis of Algorithms	KSU	CS 4/56101*	Fa'17, Su'18, Fa'18, Sp'19, Su'19, Fa'19, Su'20
Discrete Structures for Computer Science	KSU	CS 23022	Sp'16, Fa'16, Sp'17
Computer Literacy	KSU	CS 10001	Sp'18
Lab Instructor			
Computer Science II Lab	KSU	CS 23001	Su'17
Computer Science IA Lab	KSU	CS 13011	Fa'15
Computer Science IB Lab	KSU	CS 13012	Fa'15, Su'17
Computer Science I Lab	UA	3460:209	Fa'13, Sp'14
Introduction to Computer Science Principles	KSU	CS 10051	Fa'15
Project Advisor			
Honors Class Project Agreement	KSU	CS 46101	Fa'17
Junior Independent Study	COW	CSCI 401	Fa'24 (tutorial 299), Fa'25
Senior Independent Study (1st semester)	COW	CSCI 451	Fa'20, Sp'21, Fa'21, Fa'22, Fa'23, Fa'24
Senior Independent Study (2nd semester)	COW	CSCI 452	Sp'21, Su'21, Sp'22, Sp'23, Sp'24, Su'25, Sp'25
Internship	COW	IDPT 415	Su'21, Fa'21, Sp'22, Su'22, Su'23, Fa'23, Sp'24, Fa'24, Sp'25, Su'25
Teaching Assistantship	COW	IDPT 398	Sp'21, Fa'21, Sp'22, Sp'23, Sp'24, Fa'24, Sp'25

Course Development

- 2020: Create new course MATH 130 Mathematical Foundations of Computing, a requisite for CS majors
- 2021: Create a fully remote, partially asynchronous 6-week version of CSCI 100 Scientific Computing for the summer
- 2024: Create and pilot a new requisite course for CS majors - CSCI 401 Junior Independent Study
- 2024: Create and pilot a new special topics course CSCI 399 Software Ecosystems

Service

- 2020: Participate in CS 10-year curriculum review to develop a syllabus for a new Mathematical Foundations of Computing course
- 2020-25: Admissions Liaison for Computer Science
- 2020-22: Assessment Leader for Computer Science
- 2020-21: Advisor during STEM Success Initiative Advising Week for prospective computer science students
- 2021: Computer Science visiting assistant professor search committee member
- 2021-22, 2023-24, 2024-25: Computer Science tenure-track assistant professor search committee member
- 2021-25: Conduct Board committee member
- 2021-23: ACM ICPC Contest Coordinator
- 2024: Complete CS 10-year curriculum review; create CSCI 401 Junior Independent Study course; present to EPC with the department
- 2024-25: MCS Thoughtfulness Coordinator
- 2024-25: I.S. Working Group member
- 2025: Advisor during STEM Success Initiative Advising Week for prospective computer science students
- 2025-now: Faculty representative for the aspiring CS club "Black & Code"
- 2025-now: Strategic Planning and Priorities Advisory Committee (SPPAC) member

Scholarly Development

- 12/6/21-12/10/21: Remote participant to "Metric Graph Theory and Related Topics", Centre International de Recontres Mathématiques (CIRM) in Marseille, France.

- 2/24/23-2/25/23: Brought five students to participate in the Ohio Celebration for Women in Computing, Huron, OH.
- 4/15/23: Present ozobot workshops for Exploring STEM Day, designed for 5th-8th grade girls in surrounding counties
- 3/5/24: Participated as a panelist in The College of Wooster's MiSTEM Women's Day Panel.
- 4/13/24: Present ozobot workshops for Exploring STEM Day, designed for 5th-8th grade girls in surrounding counties
- 4/12/25: Present ozobot workshops for Exploring STEM Day, designed for 5th-8th grade girls in surrounding counties

Pedagogical Development

- 11/22/19: Attended Kent State University training workshop "Project Good to Go", which focused on creating an inclusive environment for student veterans with disabilities both in and out of the classroom.
- 1/8/20: Attended Kent State University training workshop "Communicating Across Generations" on interpersonal communication between different generations and communication skills to establish effective teams.
- 6/22/20 - 6/26/20: Attended The College of Wooster's training workshop "Building Connections" on hybrid course design in the context of COVID, police violence, and immigration restrictions.
- 8/20/21: Participated in STEM Inclusive Classrooms Workshop on shifting to more positive and inclusive language in the classroom, with a focus on inclusivity for international students.
- Fall 2021: Foundations of Classroom Incivility by Effective & Efficient Faculty
- 1/31/22: Participated in STEM Faculty Learning Community workshop on building an anti-racist lab.
- 2/28/22: Participated in STEM Faculty Learning Community workshop on student study skills relating to course outcomes.
- 9/21/22: Attended webinar "How to 'Flip' the Classroom" from The Chronicle of Higher Education.
- 9/21/22: Attended webinar "Transparent Instruction: What, Why, and How?" By Dr. Mary-ann Winkles, which focused on TILT (transparency in teaching and learning).
- 8/10/23: Participated in Neurodiverse Student Workshop on working effectively with students on the autism spectrum.
- 2/2/24: Attended McAllister & Quinn Grant Development Training Workshop on STEM Opportunities
- 2/23/24: Attended McAllister & Quinn Grant Development Training Workshop on developing a proposal budget
- 3/12/24: Participated in Council of Independent Colleges Workshop on Funding the Future: Proposal Development for Computer Scientists and Grant Officers
- 8/21/24: Participate in STEM Faculty Learning Community workshop on inclusive classroom engagement and discussion.
- 9/6/24: Participate in STEM Faculty Learning Community workshop on making exams more inclusive.
- 10/16/24: Instantiate MCS book club reviewing IEEE book on EDI in Software Engineering, focusing on inclusive mentoring.
- 10/30/24: MCS book club, chapter focus: effective interventions to promote diversity in the CS classroom
- 11/13/24: MCS book club, chapter focus: software engineering through community-engaged learning
- 3/17/25 - 3/18/25: Participate in Experiential Learning Workshop, focusing on decreasing barriers and increasing the impact of EL
- 6/17/25: Attended Ohio Five Faculty Development Workshop on Working Class / First-Gen Students & Open Education at OWU

Other Professional Activities

- External reviewer for Discussiones Mathematicae Graph Theory (2020, 2022).
- External reviewer for the 44th International Workshop on Graph-Theoretic Concepts in Computer Science (WG 2018), Cottbus, Germany.
- Presenter at the Computer Science Graduate School Information Session for prospective graduate students, Kent State University, 5/1/17 and 4/30/18.

Hackathons, Programming Contests, and STEM Fairs

- Judge for Kent Hack Enough 2018, Kent State University, 10/21/18.
- Mentor for Kent Hack Enough 2019, Kent State University, 9/27/19.
- Judge for Kent Hack Enough 2019, Kent State University, 9/29/19.
- Judge for Akron Public Schools Science, Technology, Engineering, and Math EXPO, Ellet High School, 1/25/20.
- Coach for the College of Wooster team participating in the 14th Ohio Wesleyan Programming Contest, 11/13/21.
- Coach for the College of Wooster team participating in the 32nd Denison Spring Programming Contest, 2/19/22.
- Coach for the College of Wooster team in the 32nd ACM ECNA Intercollegiate Programming Contest, 2/26/22.
- Coach for three College of Wooster teams participating in the 33rd Denison Spring Programming Contest, 2/11/23.

Mentor for Student Internships

- 2021 Summer. Huy Kieu, Software Engineer Intern at Equinix in Sunnyvale, California.
- 2021 Summer. Bolanle Oladeji, Software Engineer Intern at Cyborg Mobile LLC in Renton, Washington.
- 2021 Summer, 2021 Fall, 2022 Spring. Derek Hinojosa, Software Engineer Intern at JP Morgan Chase in Columbus, Ohio.
- 2022 Summer. Yong-Seok Lee, Software Engineer Intern for Vertex Software Inc. in Wooster, Ohio.
- 2023 Spring. Yasmine Fazazi, Software Engineer Intern for OneEighty in Wooster, Ohio.
- 2023 Summer. Ethan Kramer, Middleware Developer for Westfield Insurance in Westfield, OH.
- 2023 Summer. Sean Shi, Data Analyst for China Higher Education Student Information in Beijing, China.
- 2023 Fall, 2024 Spring, 2025 Spring. Yasmine Fazazi, Software Engineer Intern for Schneider Electric in Richfield, OH.
- 2024 Spring. Olayinka Jimba, Software Engineer Intern for Tabula Rasa HealthCare.
- 2024 Summer. Mastewal Berhe, Software Engineer Intern for Microsoft.

- 2024 Summer, 2024 Fall, 2025 Spring. Yasmine Fazazi, Data Scientist for Schneider Electric in Richfield, OH.
- 2024 Summer, 2024 Fall, 2025 Spring. Eric Liu, Software Engineer Intern for MIM.
- 2024 Fall. Diya Misra, Data Scientist for Schneider Electric in Richfield, OH.
- 2024 Fall. Olayinka Jimba, Software Engineer for A New Health.
- 2025 Summer. Riker Sweazey, Computer Science Instructor, OH.

Research Mentor for Student Projects

Mentor for Two-Semester Independent Study Theses

Name	Title	pp	Major(s) & Co-Advisors	Year
Olayinka Jimba	ShipIt: Bridging Cost-Efficient Cloud Monitoring and Deployment Automation		CSCI	2025
Habiba Hye	AI-Driven Dermatological Diagnostics through Advanced Imaging and Deep Learning	73	CSCI	2025
Leilani Torres	EasyGoing: A Human-Centered Web Application for Student Organization using LLMs - The intersection of UI, UX, and AI with empirical analysis of LLM accuracy and usability testing	70	CSCI + PSYC	2025
Kai Francis	Simulating Cyber-Attacks: A practical exploration of vulnerabilities and defenses in web security	72	CSCI	2025
Linda Berhe	Med-Mingle: A research framework for AI-enhanced content moderation and peer support in digital health communities	97	CSCI	2025
Baltasar Berretta	Cybersecurity and electronic medical records	70	CSCI	2025
Alex Chavez	FlightCLub: A study on adaptive gameplay through AI difficulty adjustment	79	CSCI	2025
Oliver Dhyandchand	Applying software engineering concepts to create a website for the College of Wooster's Computer Science department	78	CSCI	2025
Yasmine Fazazi	The Buddy System: Incorporating AI in Mental Health - Mobile App Development and Empirical Study of AI Perceptions	105	CSCI + PSYC (Nathan Foster)	2024
Levi Gainer	Micromouse: End to End Implementation of a Competitive Maze-Solving Robot	95	CSCI	2024
Nini Curcione	Comprehensive Usability Testing and UX/UI Evaluation of Ni Hao Pengyou: Advancing the Traveler's Experience Through an Innovative Application	123	CSCI	2024
Tigist Berhe	A Comprehensive Review of Cybersecurity Threats and Mitigation Strategies to Secure Health Data for a Full Stack Web Application	112	CSCI	2024
Sobika Thapa	The evolution of Human-Computer Interaction and its technological advancement with a focus on applications with Electric Paint	100	CSCI	2023
Keeton Purvis	Cubulus: Procedural World Generation Using Marching Cubes	87	CSCI	2023
Rekik Ziku	Visualizing Movement: Predicting Interstate Migration Probabilities and Populations of US States using Markov Chain Analysis	157	CSCI + MATH (Pam Pierce)	2023
Craig Akiri	Building an 8-bit Computer: From Design to Implementation	100	CSCI	2023
Daniel Cohen-Cobos	Simulating Reaction-Diffusion waves to model Gravitational Lensing	117	CSCI + PHYS (Niklas Manz)	2023
Troy Baughman	Applications of Constraint Programming in Sports Scheduling	74	MATH	2022
Richie Pajak	A Simulation of the Economic Impact of Disaster Events	81	CSCI	2022
Brandon Charles	A Comprehensive Empirical and Simulation Analysis on How Minimum Wage Increases Impact Unemployment	180	CSCI + ECON (Huiting Tian)	2022
Bijeta Lamichhane	Environmental Socialization in College: A Survey Research and Network Analysis of Changes in Climate-Conscious Concerns and Behaviors	126	MATH + CMDS (Denise Bostdorff)	2022
Alon Liberman	Highlights Generation for Tennis Matches using Computer Vision, Natural Language Processing, and Audio Analysis	102	CSCI + MATH	2022
Raey Aweke	Abyssinia: The Design and Development of a Tower Defense Game	94	CSCI	2022
Jack De La Cruz	The Running Man: A 3D AI-Controlled and Procedurally Generated Infinite Runner	77	CSCI	2021
Tanaka Chingonzo	Imali: A Technical Analysis Mobile Application in React Native	83	CSCI	2021
Zhen Guo	Defeating the COVID-19 Infodemic on Twitter: A SIP Agent-Based Model of Rumor Propagation and Truth Bot Intervention	117	CSCI + SOCI (Tom Tierney)	2021

Mentor for One-Semester Honors Project Theses

- Caitlynn Lenhoff. “Exploration and Analysis of Graph Traversal Algorithms,” Kent State University Honors Class Project Agreement, 20 pages, 2017.

Mentor for Research Assistantship
- Spring 2023. Linda Berhe. “Investigation into vertex pursuit games on graphs.”
- Summer 2023. Oreofe Solarin. “Vertex pursuit games on graphs: cop-win strategies.”
- Summer 2023, Fall 2023, Spring 2024. Torence Mwindaare. “Vertex pursuit games on graphs: cop-win strategies” and “Hyperbolicity and leanness in real-world networks”
- Summer 2024, Fall 2024. Leilani Torres. “Women in open-source software: programming languages and contributions”
- Fall 2024, Spring 2025. Hiruy Worku. “Time series analysis of open-source software contributions”