

Sean McCulloch
Professor of Computer Science
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Research Interests:

- Algorithmic Computer Science
- NP-Complete Problems
- Applications of Game Theoretic Techniques to Computer Science
- Analysis of Poker Hand Data
- Design Automation
- Computational Science (especially Computational Geometry)

Education:

- Ph. D. Computer Science, University of Virginia, May 2002
- M.C.S. Computer Science, University of Virginia, August 1998
- B.A. Mathematics, State University of New York at Geneseo, May 1995
- B.A. Computer Science, State University of New York at Geneseo, May 1995

Appointments:

- August 2017-Present: Professor of Computer Science, Ohio Wesleyan University
- August 2008- August 2017: Associate Professor of Computer Science, Ohio Wesleyan University
- August 2001- August 2008: Assistant Professor of Computer Science, Ohio Wesleyan University
- September 1998- December 1998: Instructor, University of Virginia
- September 1996- September 2001: Graduate Research Assistant of Computer Science, University of Virginia
- September 1995- May 2001: Graduate Teaching Assistant of Computer Science, University of Virginia

Research Publications (* denotes mentored undergraduate author):

- Sean McCulloch. "Discussions of NP-Complete problems". Academic website available at <http://npcomplete.owu.edu>.
- Sean McCulloch, Daniel Bladow*, Tom Dobrow*, Haleigh Wright*. "Deep Barca: A Probabilistic Agent to Play the Game Battle Line". Proceedings of the 28th Modern Artificial Intelligence and Cognitive Science Conference, 2017. Available for download at <http://go.owu.edu/~stmccull/papers/Battleline-McCulloch.pdf>
- Sean McCulloch. "A Game-Theoretic Intelligent Agent for the Board Game Football Strategy". Proceedings of the 26th Modern AI and Cognitive Science Conference, 2015. Available for download at <http://go.owu.edu/~stmccull/papers/fbs-maics15.pdf>
- Kira Goldener* and Sean McCulloch. "Different Optimal Solutions in Shared Path Graphs". Proceedings of the 2012 Midstates Conference on Undergraduate Research in Computer Science and Mathematics.
- Zeal Jagannatha*, Nicole Peterson*, Sean Quigley*, Brooks Emerick*, Christopher Earl*, Sean McCulloch. The Shared Shortest Path Problem in Graphs. Proceedings of MCURCSM 2011.
- Paco Hope and Sean McCulloch. Statistical Analysis of Texas Hold'Em. Available for download at <http://go.owu.edu/~stmccull/papers/handanalysis.pdf>

- Sean McCulloch and James Cohoon. Quark Routing. In *13th International Conference on Field-Programmable Logic and Applications*. Lisbon, Portugal, September 1-3, 2003. (42% acceptance rate)
- Sean McCulloch. Auction-Based Routing in Field-Programmable Gate Arrays. Ph.D. Dissertation. May, 2002.
- J.L. Pfaltz, John Karro, Sean McCulloch. Distance in Anti-Matroids. *Congressus Numeratum* 127:5-22, 1997.
- John C. Knight, Matthew Elder, A.C. Chapin, Brownell K. Combs, Steven Geist, Sean McCulloch, Luis G. Nakano, Robert S. Sielken. Topics in Survivable Systems. Department of Computer Science, University of Virginia Technical Report CS-98-22, 1998.

Invited Talks:

- “Problem Solving With Ghostbusters”. Ohio Wesleyan University I³ Lecture, 2017.
- “Problems Even Fast Computers Can’t Solve”, Franklin University 2017.
- “Artificial Intelligence of Modern Board Games”, Kenyon College, November 2015
- “Designing an Artificial Intelligence for Football Strategy”, Hendix College, September 2015
- “A Game-Theoretic Intelligent Agent for the Board Game Football Strategy”, Modern Artificial Intelligence and Cognitive Science (MAICS), April 2015
- “Applying Game-Theoretic Techniques to Board Games”, The College of Wooster, February 2015.
- “Undecidability and What Future Computers Can’t Do”, Ohio Wesleyan TEDx Event, April 2013
- “Teach Problem Solving Techniques Using Games”, World Boardgaming Championships, August 2008
- “Economic Ties to Graph Problems”, Denison University, Fall 2005
- “Quark Routing”. 13th International Conference of Field-Programmable Logic and Applications. September 2003.
- “Auction-Based Routing for Field-Programmable Gate Arrays.” Oberlin College, Fall 2002.

Mentored Student Research:

As part of the OWU Summer Science Research Program

- Hanh Phan. Artificial Intelligence of Modern Board Games. Summer 2020
- Anton Kramskoi. Artificial Intelligence of Modern Board Games. Summer 2019
- Eugene Kramskoi. Artificial Intelligence of Modern Board Games, Summer 2018
- Khayyam Zubair. Artificial Intelligence of Modern Board Games, Summer 2016
- Zeal Jagannatha. The Shared Shortest Path Problem in Graphs. Summer 2011
- Christopher Earl. Shared Shortest Paths in Graphs. Accepted as a poster presentation at the *2006 Association for Computing Machinery Student Research Competition*. Named Grand Finalist and Third Prize Winner.
- Kumar Chheda. Extensions of Routing Algorithms. Summer 2004.
- Mohammad Mehkeri. Optimization of Routing Algorithms. Summer 2003.

All students in the OWU Summer Science Research Program present their work at the Patricia Belt Conrades Summer Science Research Symposium.

As part of the National Science Foundation sponsored Research Experience for Undergraduates

- William Elliman. Artificial Intelligence of Modern Board Games. Summer 2019
- Mira Jacobs. Artificial Intelligence of Modern Board Games. Summer 2018.
- Robet Warton. Developing an Artificial Intelligence for the Board Game “Eurorails”. Summer 2017
- Tom Dobrow. Deep Barca: An Artificial Intelligence for the Board Game “Battle Line”. Summer 2015.

- Daniel Bladow. Developing an Artificial Intelligence for the Game “Battle Line”. Summer 2014. Presented as a poster presentation at the National Conference on Undergraduate Research, April 2015.
- Haleigh Wright. Artificial Intelligence for Modern Board Games. Summer 2013
- Kira Goldner. Different Optimal Solutions in Shared Path Graphs. Summer 2012
- Ronald Fenelus. The Shared Shortest Path Problem in Graphs. Summer 2011
- Nicole Peterson. Towards a Strong Nash Equilibrium in Shared Shortest Paths. Summer 2010
- Sean Quigley. Nash Equalibriums in Shared Shortest Paths. Summer 2009
- Brooks Emerick. Characterizing Shared Shortest Paths in Graphs. Summer 2008
- Anthony Leguia. Sorting Out Children by Sorting Out Digraphs: Characterizing Digraphs with Outdegree Four. Summer 2007. Presented at the *2007 Midstates Consortium of Math and Science*.

All REU students present their work at the Ohio College Summer Research Symposium.

Honors Committee Member:

- Diego Venegas Vargas (Physics), Spring 2019
- Lan Nguyen (Computer Science), Spring 2018
- Brett Bowersox (Economics), Spring 2018
- Rowland Brown (Computer Science), Spring 2014 (mentored the project fall semester)
- Zeal Jagannatha (Computer Science), Spring 2011
- Amit Roy (Computer Science), Spring 2011
- Laura Pickens (Computer Science, Spring 2010
- Mohammed Mehkari (Computer Science), Spring 2005.
- Rahul Prasad (Computer Science), Spring 2004.

Independent Studies Mentored:

- Luke Walsh. *Designing a New Type System in Haskell*. Fall 2019
- Multiple Students. *Heuristics for NP-Complete Problems*. Spring 2019.
- Jason Perry. *Algorithms for Data Moning and Machine Learning*. Summer 2018.
- Tayyan Elahi. *Exploration of Data Minining*. Spring 2017.
- Eugene Kramskoi and Anton Kramskoi. *Procedurally Generated Algorithms*. Fall 2017.
- Daniel Thornton. *Analyzing NP-Complete Problems*. Spring 2016.
- Daniel O’Dea. *A Neural Network for the Game Hearthstone*. Spring 2016,
- Patrick Cain. *NoSQL Databases*. Spring 2015.
- Angela Jelenic and Alex Russell. *Cryptographic Algorithms*. Summer 2012
- Vagif Baratov. *Data mining*. Spring 2011
- Sahan Dissanayke. *Neural Networks*. Spring 2005.
- Brian Topping. *Directed Readings in Computational Theory*. Fall 2004.
- Charith Perera. *Pipelining Design and Architecture*. Fall 2001.

Courses Taught:

- CS103: Exploring Computer Science F07, Sp09, Sp10, Sp11, Sp12, Sp16, Sum17 (online), Sum18 (online), Sum19 (online), Sum20 (online)
- CS102: Problem Solving with Computers (no longer offered) Sp02, Sp05
- CS110: Introduction to Computer Science and Programming F01, F02, F03, Sp04, F04, Sp05, Sp06,

- CS200/CS230: Mathematical Foundations of Computer Science F06, F2008, Sp10, F10, F11, F12, Sum13, F13, F14, F15, Sp16, Sum16, F16, F17, Sp18, F19
- CS200: Honors Seminar- Secrets: Codes and Codebreaking Sp17, Sp18, Sp19
- CS250/CS210: Intermediate Computer Science and Data Structures Sp05
- CS255: Computer Organization Sp02, Sp03, Sp04, Sp06, Sp09, Sp11, Sp13, Sp15, Sp17, Sp19, Sp20
- CS270: Paradigms of Computation F01, F02, F05, F07, F08, F10, F12, F14, F16, F18, F19
- CS300: Data Mining and Machine Learning Sp07, Sp10, Sp12, Sp13, Sp15, Sp19, Sp20
- CS310: Database Systems F19
- CS320: Computer Architecture Sp 2006, F09, F13, Sp18
- CS340: Artificial Intelligence Sp03, Sp07, Sp12, Sp16
- CS360: Algorithm Analysis and Design F02, F04, F06, F08, F10, Sp13, F16
- CS380: Theory of Computation F03, F05, F07, F09, F11, F13, F15, F17, F18
- CS390: Software Engineering Methodology F12
- CS390: Object-Oriented Graphical and Event-Driven Programming Sp04
- CS499: Algorithms for the Design of Computer Chips Sp15
- Data 100: Introduction to Data Analytics Sp02
- Math 100: Beating the House: The Mathematics and Computer Science of Casino Gambling F17, F18, Sp20
- Math 104: Great Ideas in Mathematics Sum11, Sum12

At Franklin University:

- COMP202: Principles of Computer Languages Sum15 (online)
- COMP323: Fundamentals of Operating Systems F15 (online), Sp16 (online)
- COMP620: Analysis of Algorithms Sum13, Sum19 (online)
- COMP630: Issues in Database Management Sum2018 (online)
- COMP650: Systems Architecture and Engineering Sum2014
- COMP655 Distriuted/Operating Systems F11, Sum12, Sum14, Sum16 (online), F17 (hybrid), Sum18 (online), Sum20 (online)
- COMP670: Artificial Intelligence Sum 2020 (online)

Professional Activities:

- Contest Director, Ohio Wesleyan Programming Contest, 2007-present
- Judge, East Central North Region of the International Collegiate Programming Contest, 2015-present
- Reviewer, SIGCSE and ITISCE conferences, 2010-present
- Co-Organizor, Sagan National Colloquium series: “Data in our Lives”, 2016

University Service:

- Program Director, Data Analytics, 2016-present
- Chair of Hiring Committee, Data Analytics, 2017 and 2019
- Faculty Personnel Committee, 2016-2019
- Boardgame Club, Faculty Advisor, 2010-present
- Wesleyan Council of Student Affairs, faculty advisor, 2013-2015
- Smoking Policy Committee, 2014
- Webmaster, Math/CS department: 2009-present
- Lab Administrator, Math/CS department: 2001-present

Professional Memberships:

- Association of Computing Machinery (ACM)
- ACM Special Interest Group on Design Automation (SIGDA)
- ACM Special Interest Group on Computer Science Education (SIGCSE)