

Eric Aaron, Ph.D.

Department of Computer Science
 Colby College
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Research Interests

Interdisciplinary Computational Science, Robotics, Computational Modeling and Simulation, Artificial Intelligence, Hybrid Systems, System Verification, Cognitive Science

Education

- | | | |
|------|---|---------------|
| 2000 | Cornell University
Ph.D., Computer Science
Dissertation title: Tactic-Based Modeling of Cognitive Inference on Logically Structured Notation
Dissertation committee: David Gries (chair), Robert Constable, Anil Nerode, Michael Spivey | Ithaca, NY |
| 1995 | Cornell University
M.S., Computer Science | Ithaca, NY |
| 1992 | Princeton University
A.B., Mathematics | Princeton, NJ |

Employment

- | | | |
|------------|--|------------------|
| 2018-pres. | Colby College
Assistant Professor of Computer Science
Department of Computer Science
Courses taught: Computational Thinking: Scientific Applications (CS 152; Lab instructor), Data Structures and Algorithms (CS231; Lab instructor), Analysis of Algorithms (CS 375) | Poughkeepsie, NY |
| 2013-2018 | Vassar College
Visiting Assistant Professor of Computer Science
Department of Computer Science
Courses taught: Foundations of Computer Science (CMPU 145), Language Theory and Computation (CMPU 240), Analysis of Algorithms (CMPU 241), Modeling, Simulation and Analysis (CMPU 250), Compilers (CMPU 331), Advanced Special Topics: Intelligent Robotics (CMPU 395) | Poughkeepsie, NY |
| 2005-2013 | Wesleyan University
Assistant Professor of Computer Science
Department of Mathematics & Computer Science
Courses taught: Human and Machine Inference (COMP 134), Computer Science I (COMP 211), Data Structures (COMP 212), Automata Theory and Formal Languages (COMP 301 / 500), Algorithms and Complexity (COMP 312 / 510), Topics in Artificial Intelligence (COMP 352 / 552), Modeling for Animated Actors and Mobile Robots (COMP 572) | Middletown, CT |

2003–2005	Pomona College Visiting Assistant Professor of Computer Science Department of Mathematics & Computer Science Courses taught: Introduction to Computer Science (CS 51), Computability and Logic (CS 81), Theory of Computation (CS 142), Modeling for Animated Actors and Mobile Robots (CS 182), Senior Seminar (CS 190), Explorations in Inference (ID 1)	Claremont, CA
2002–2003	Rutgers University Research Assistant Professor Department of Computer Science & Center for Biomedicine, Imaging, and Modeling	Piscataway, NJ
2000–2002	University of Pennsylvania Postdoctoral Fellow Center for Human Modeling and Simulation & Institute for Research in Cognitive Science	Philadelphia, PA
1992–2000	Cornell University Research Assistant & Teaching Assistant Department of Computer Science Funded by NSF Graduate Research Traineeship <i>Computational Aspects of Cognitive Science</i> , a \$562,500 grant for which I wrote the largest portion of the “Proposed Research” section	Ithaca, NY

Publications (Refereed)

(Underlining indicates an undergraduate or B.A./M.A. student co-author.)

Epigenetic operators and the evolution of physically embodied robots.
J. Brawer, A. Hill, K. Livingston, E. Aaron, J. Bongard and J. H. Long.
Frontiers in Robotics and AI, 4:1, 2017.

Dynamical intention: Integrated intelligence modeling for goal-directed embodied agents.
Eric Aaron.
Frontiers in Robotics and AI, 3:66, 2016.

The struggle for safety: effectiveness of caterpillar defenses against bird predation.
I. Lichter-Marck, M. Wylde, E. Aaron, J. Oliver, and M. Singer.
Oikos, 124(4), 525–533, 2015.

Multi-robot foremost coverage of time-varying graphs.
Eric Aaron, Danny Krizanc, and Elliot Meyerson.
10th International Symposium on Algorithms and Experiments for Sensor Systems, Wireless Networks and Distributed Robotics (ALGOSENSORS 2014), 22–38, 2014.

DMVP: Foremost waypoint coverage of time-varying graphs.
Eric Aaron, Danny Krizanc, and Elliot Meyerson.
40th International Workshop on Graph-Theoretic Concepts in Computer Science (WG 2014), 29–41, 2014.

Herbivore diet breadth mediates the cascading effects of carnivores in food webs.
M. Singer, I Lichter-Marck, T. Farkas, E. Aaron, K. Whitney, and K. Mooney.
Proceedings of the National Academy of Sciences (PNAS) USA, 111(26), 9521–9526, 2014.

A multiple time-scale computational model of a tumor and its micro environment.
C. duBois, J. Farnham, E. Aaron, and A. Radunskaya.
Mathematical Biosciences and Engineering, 10(1), 121–150, 2013.

- Adaptive obstacle representations for dynamical navigation.
Eric Aaron, Juan Pablo Mendoza, and Foster Nichols.
Twenty-fifth Florida Artificial Intelligence Research Society Conference, 493–498, 2012.
- On the complexity of the multi-agent, multi-depot Map Visitation Problem.
Eric Aaron, Evangelos Kranakis, and Danny Krizanc.
Fourth International Workshop on Wireless Sensor, Actuator, and Robot Networks (Workshop, Eighth IEEE International Conference on Mobile Ad-Hoc and Sensor Systems), 795–800, 2011.
- Dynamic obstacle representations for robot and virtual agent navigation.
Eric Aaron and Juan Pablo Mendoza.
Twenty-fourth Canadian Conference on Artificial Intelligence, LNAI 6657, 1–12, 2011.
- Integrated dynamical intelligence for interactive embodied agents.
Eric Aaron, Juan Pablo Mendoza, and Henny Admoni.
Third International Conference on Agents and Artificial Intelligence, 296–301, 2011.
- Action selection and task sequence learning for hybrid dynamical cognitive agents.
Eric Aaron and Henny Admoni.
Robotics and Autonomous Systems, 58(9), 1049–1056, 2010.
- Approaches to learning for hybrid dynamical cognitive agents.
Eric Aaron and Henny Admoni.
First International Workshop on Hybrid Control of Autonomous Systems (IJCAI Workshop), 83–90, 2009.
- A framework for dynamical intention in hybrid navigating agents.
Eric Aaron and Henny Admoni.
Fourth International Conference on Hybrid Artificial Intelligence Systems, LNAI 5572, 18–25, 2009.
- Hybrid system reachability-based analysis of dynamical agents.
Eric Aaron.
Innovative Concepts for Agent-Based Systems: Second International Workshop on Radical Agent Concepts, LNAI 3825, 233–244, 2006.
- A metric for quantifying relative difficulty of dynamic navigation in fixed environments.
Eric Aaron.
Sixth IASTED International Conference on Robotics and Applications, 1–6, 2005.
- Online Markov decision processes for learning movement in video games.
Aaron Arvey and Eric Aaron.
Sixth International Conference on Computer Games: AI and Mobile Systems, 48–52, 2005.
- Hybrid dynamical systems, dynamical intelligence, and meta-intelligence in embodied agents.
Eric Aaron.
AAAI Spring Symposium on Metacognition in Computation, 18–23, 2005.
- Considering hierarchical hybrid systems for intelligent animated agents.
Eric Aaron and Dimitris Metaxas.
Innovative Concepts for Agent-Based Systems: First International Workshop on Radical Agent Concepts, LNCS 2564, 215–229, 2003.
- A hybrid dynamical systems approach to intelligent low-level navigation.
E. Aaron, H. Sun, F. Ivančić, and D. Metaxas.
Computer Animation 2002, 154–163, 2002.

Hybrid system models of navigation strategies for games and animations.

Eric Aaron, Franjo Ivančić, and Dimitris Metaxas.

Hybrid Systems : Computation and Control 2002, LNCS 2289, 7–20, 2002.

Scalable nonlinear dynamical systems for agent steering and crowd simulation.

S. Goldenstein, M. Karavelas, D. Metaxas, L. Guibas, E. Aaron, and A. Goswami.

Computers And Graphics, 25(6), 983–998, 2001.

A framework for reasoning about animation systems.

E. Aaron, D. Metaxas, F. Ivančić, and O. Sokolsky.

Third International Workshop on Intelligent Virtual Agents, LNAI 2190, 47–60, 2001.

Frequency vs. probability formats: Framing the three doors problem.

Eric Aaron and Michael Spivey.

Twentieth Annual Conference of the Cognitive Science Society, 13–18, 1998.

Formal justification of underspecification for S5.

Eric Aaron and David Gries.

Information Processing Letters, 64, 115–121, 1997.

Editorial Contributions

Frontiers Research Topics: Evolvability, Environments, Embodiment & Emergence in Robotics.

John H. Long, Jr., Eric Aaron, and Stéphane Doncieux, editors (forthcoming).

Peer-reviewed e-book of papers co-published in several Frontiers journals.

Lausanne, Switzerland: Frontiers Media. Publication expected in 2018.

Other Publications

Understanding the U.S. domestic computer science Ph.D. pipeline.

Susanne Hambrusch, Ran Libeskind-Hadas, and Eric Aaron.

Communications of the ACM, 58(8), 29–32, 2015.

A user-level introduction to the Nuprl proof development system.

Eric Aaron.

Technical Report MS-CIS-01-32, Department of Computer and Information Science, University of Pennsylvania, 2001.

Justifying calculational logic by a conventional metalinguistic semantics.

Eric Aaron and Stuart Allen.

Department of Computer Science Technical Report 99-1771, Cornell University, 1999.

Insight into theorem proving via eye movements.

Eric Aaron and Michael Spivey.

Department of Computer Science Technical Report 99-1733, Cornell University, 1999.

Designing a calculational logic theorem prover: Insight into search via eye movements.

Eric Aaron and Michael Spivey.

Department of Computer Science Technical Report 98-1680, Cornell University, 1998.

Conference Presentations

Adaptive obstacle representations for dynamical navigation.

Twenty-fifth Florida Artificial Intelligence Research Society Conference, Marco Island, FL, 2012.

On the complexity of the multi-agent, multi-depot Map Visitation Problem.

Fourth International Workshop on Wireless Sensor, Actuator, and Robot Networks (Workshop of Eighth IEEE International Conference on Mobile Ad-Hoc and Sensor Systems), Valencia, Spain, 2011.

Dynamic obstacle representations for robot and virtual agent navigation.
 Twenty-fourth Canadian Conference on Artificial Intelligence, St. John's, Canada, 2011.
 Eighth Canadian Conference on Computer and Robot Vision (CRV 2011), St. John's,
 Canada, 2011.

A framework for dynamical intention in hybrid navigating agents.
 Fourth International Conference on Hybrid Artificial Intelligence Systems, Salamanca,
 Spain, 2009.

A metric for quantifying relative difficulty of dynamic navigation in fixed environments.
 Sixth IASTED International Conference on Robotics and Applications, Cambridge, MA,
 2005.

Hybrid system reachability-based analysis of dynamical agents.
 Innovative Concepts for Agent-Based Systems: Second International Workshop on
 Radical Agent Concepts, Greenbelt, MD, 2005.

Hybrid dynamical systems, dynamical intelligence, and meta-intelligence in embodied agents.
 AAAI Spring Symposium on Metacognition in Computation, Palo Alto, CA, 2005.

Considering hierarchical hybrid systems for intelligent animated agents.
 Innovative Concepts for Agent-Based Systems: First International Workshop on Radical
 Agent Concepts, McLean, VA, 2002.

A hybrid dynamical systems approach to intelligent low-level navigation.
 Computer Animation, Geneva, Switzerland, 2002.

Hybrid system models of navigation strategies for games and animations.
 Hybrid Systems : Computation and Control, Palo Alto, CA, 2002.

A framework for reasoning about animation systems.
 Third International Workshop on Intelligent Virtual Agents, Madrid, Spain, 2001.

Pedagogical observations on a tactic-based student model.
 17th International Conference on Automated Deduction, Workshop on Deduction
 Systems for Mathematics Education, Pittsburgh, PA, 2000.

Designing a calculational logic theorem prover: Insight into search via eye movements.
 Northeast Cognitive Science Society Graduate Conference, Ithaca, NY, 1998.

Invited Presentations

Dynamical Intelligence.
 Christopher Newport University, Newport News, VA, 2015.
 University of Mary Washington, Fredericksburg, VA, 2015.
 University of Richmond, Richmond, VA, 2015.
 College of New Jersey, Ewing, NJ, 2014.

Dynamical intelligence: Navigation and intention.
 Colby College, Waterville, ME, 2015.
 Davidson College, Davidson, NC, 2014.
 College of Charleston, Charleston, SC, 2013.
 University of Puget Sound, Tacoma, WA, 2013.
 Vassar College, Poughkeepsie, NY, 2013.
 New College of Florida, Sarasota, FL, 2013.
 Haverford College, Haverford, PA, 2012.
 Sarah Lawrence College (Science Seminar Series), Bronxville, NY, 2010.

Verifiable dynamic actors.
University of Delaware, Newark, DE, 2003.
Texas Tech University, Lubbock, TX, 2003.

Tactic-based modeling of cognitive inference on logically structured notation.
University of Toronto, Toronto, Canada, 2000.

Why we need type information: An application to automated reasoning.
University of Geneva, Geneva, Switzerland, 1997.

Student Research Supervised (selected)

Thao Nguyen, 2016–2018

Dynamical Navigation and Intelligence Modeling.

Thao Nguyen and Theresa Law (co-supervised with John Long, Vassar College Cognitive Science), Summer 2016.

Dynamical Intention in Embodied Robots. (Vassar College Undergraduate Research Summer Institute)

Jake Brawer (co-supervised with Ken Livingston and John Long, Vassar College Cognitive Science), 2015–2016.

Evolving developmental genetics systems in physically embodied robots.

Joshua Hawthorne-Madell (co-supervised with Ken Livingston and John Long, Vassar College Cognitive Science), 2015–2016.

Genetic systems in evolving robots are sensitive to different types of noise.

Mikey Saugstad, 2015–2016.

Dynamical Navigation for ROS-based Turtlebots.

Jarrett Holtz, 2014–2015

An approach to motion tracking for social behavior analysis of laboratory mice.
(Vassar College Computer Science Thesis, 2015)

Exploration of the use of Kinect technology for motion tracking of complex social behaviors in mice. (Vassar College Undergraduate Research Summer Institute; co-supervised with Bojana Zupan, Vassar College Psychology, 2014)

Sharon Adongo (co-supervised with Jill Schneiderman, Vassar College Earth Science and Geography), 2013–2014.

Crowdsourcing for emergency preparedness: Towards a collaborative approach for improving resilience against disasters. (Science, Technology, and Society Senior Thesis, 2014)

Elliot Meyerson, 2013–2014. (Winner, Wesleyan Computer Science Senior Prize, 2014; co-mentored with Danny Krizanc, Wesleyan University Mathematics & Computer Science)

The Dynamic Map Visitation Problem: Foremost waypoint coverage of time-varying graphs. (Computer Science Honors Thesis, 2014)

Micah Wylde, 2011–2012.

Safe Motion Planning for Autonomous Driving. (Computer Science Honors Thesis, 2012)

- Juan Pablo Mendoza, 2009–2011. (Winner, Wesleyan Computer Science Senior Prize, 2010)
- A dynamical systems-based model for indoor robot navigation. (Computer Science Master's Thesis, 2011)
 - Dynamical systems-based navigation: Modeling and verification. (Computer Science Honors Thesis, 2010)
 - A dynamic tangent approach to wall representation in dynamical systems navigation. (Consortium for Computing Sciences in Colleges, Northeast region (CCSCNE) Student Poster, 2010)
 - Walls and polygonal obstacles in dynamical systems navigation. (Wesleyan University Hughes Summer Research Program, 2009)
- Foster Nichols, 2009–2011.
- Dynamical BDI-based intention recognition for virtual agents. (Computer Science Master's Thesis, 2011)
 - Constructing polygonal maps for navigating agents using extracted line segments. (Computer Science Honors Thesis, 2010)
 - Constructing precise maps for navigating agents using extracted line segments. (CCSCNE Student Poster, 2010)
- Samuel Roth (co-mentored with Michael Weir, Wesleyan University Biology), 2010–2011.
- Frame shift protein expression in *Saccharomyces cerevisiae*. (Wesleyan University Hughes Summer Research Program, 2011)
- Oufei Dong (co-mentored with Barbara Juhasz, Wesleyan University Psychology), 2010–2011.
- Eye movement patterns during mathematical theorem proving. (Wesleyan University Psychology Poster Session, 2011)
- Henny Admoni, 2007–2009. (Winner, NSF Graduate Research Fellowship, 2009)
- Demonstrations of dynamical intention for hybrid agents. (Computer Science Master's Thesis, 2009)
 - Decision making and learning for hybrid dynamical agents. (University Major Senior Thesis, 2008)
 - BDI for decision making in dynamic agents. (Wesleyan University Hughes Summer Research Program, 2007)
- Jesse Farnham, 2007–2008. (Winner, Wesleyan Computer Science Senior Prize, 2008)
- Performance enhancement and equivalence criteria for cellular automaton-based tumor simulations. (Computer Science Honors Thesis, 2008)
 - Identifying steady-state areas in cellular automaton-based tumor simulations. (Wesleyan University Hughes Summer Research Program, 2007)

Professional Activities and Other Service

- CRA-Education Committee (CRA-E)
- Computing Research Association (CRA), 2014–pres.
- Associate Program Chair (Associate Program Committee)
- ACM Special Interest Group on Computer Science Education (SIGCSE) Conference, 2013–2019.
- Co-Editor
- CRA-E *Undergraduate Research Highlights Series*, 2017–2018.
Series of CRA-E articles that recognize and publicize the work of outstanding undergraduate researchers.

Award Selection Committee (Chair)

CRA Outstanding Undergraduate Researchers Award, 2014–2018.
(Chair of Selection Committee, 2016, 2017; member of Committee, 2014, 2015, 2018).

Award Selection Committee

CRA Undergraduate Research Faculty Mentoring Award, 2016, 2019.

Program Committee / Paper Reviewer

International Conference on the Synthesis and Simulation of Living Systems (*ALIFE*), 2016, 2018.

AAAI Symposium on Educational Advances in Artificial Intelligence (*EAAI*), 2010–2019.

European Conference on Artificial Life (*ECAL*), 2017.

International Conference on Robotics and Automation (*ICRA*), 2010, 2011, 2013.

Journal of Applied Logic, 2007.

Hybrid Systems: Computation and Control (*HSCC*), 2007.

Association for the Advancement of Artificial Intelligence (*AAAI*) Conference on Artificial Intelligence, 2006.

International Joint Conference on Autonomous Agents and Multi-Agent Systems (*AAMAS*), 2002.

Eurographics Workshop on Animation and Simulation, 2001.

Conference Session Chair

ACM Special Interest Group on Computer Science Education (*SIGCSE*) Conference, 2013–2015, 2017.

IEEE International Conference on Mobile Ad-Hoc and Sensor Systems, 2011.

IASTED International Conference on Robotics and Applications, 2005.

Scholarship Applications Reviewer

Grace Hopper Celebration of Women in Computing, 2012–2017.

Robot Competition Faculty co-Supervisor

Vassar College Robot Competition, 2016.

Robot Challenge Advisor

Vassar College Robot Challenge, 2014.

Guest Lecturer / Laboratory co-Instructor

Vassar College Cognitive Science 211 (“Perception and Action”), Fall 2015, Fall 2016.

Wesleyan University Service (selected)

Steering Committee, McNair Post-Baccalaureate Achievement Program (supporting students from underrepresented groups in pursuing post-graduate degrees), 2007–2013

Co-Organizer, Science Thesis Celebration / Poster Session, 2009–2012.

Graduate Education Committee, 2010–2011.

Presenter, Cognitive Science Seminar, 2010.

title: *Dynamical intelligence: Navigation and intention.*

Guest Lecturer, Film / Molecular Biology 202, Spring 2006.

title: *Machine intelligence, artificial life, and human simulation: A no-depth examination.*

Department of Mathematics and Computer Science service, 2005–2013.

Advisory Committee; University Library Committee; Liaison for construction of Mellon-funded videoconference facility; etc.

Founder and Leader

Cognitive Modeling Lunch Group, Pomona College / Claremont Colleges, 2003–2005.

Founder and Seminar Leader

Cognitive Modeling Reading Group, University of Pennsylvania, 2000–2001.

Conference Chair and Organizer

First Annual Northeast Cognitive Science Society Graduate Conference, 1998.

Graduate Liaison to Computer Science

Cornell University Cognitive Studies Program, 1993–1999.

Workshop Assistant

Expanding Your Horizons, STEM education outreach for grade school girls, 1992–1994.

Media Coverage & Other Recognition

“Robotics and evolution: ‘Epigenetic’ changes affect robot’s development, study finds.” *Epigenetics Literacy Project*. Brett Smith, April 10, 2017.

“Epigenetics in Robotics.” *AZO Robotics*. Brett Smith, April 7, 2017.

“‘Mating’ Robots Take a Fast-Forward Leap in Digital Darwinism.” *Live Science*. Glenn McDonald, April 5, 2017.

“The robot sex experiment that let machines EVOLVE by passing ‘genetic material’ across several generations.” *Daily Mail (UK)*. Cheyenne Macdonald, April 5, 2017.

“Robotic evolution affected by both nature and nurture.” *Engineering and Technology Magazine*. Hilary Lamb, April 4, 2017.

“Robot epigenetics: Adding complexity to embodied robot evolution.” Anna Sigurdson, for *Frontiers Communication in Robotics and AI*. Coverage in:

Frontiers Blog. April 4, 2017.

Space Daily. April 4, 2017.

EurekaAlert! (American Association for the Advancement of Science). April 3, 2017.

Science Daily. April 3, 2017.

Science Newsline. April 3, 2017.

“Picky eaters are less likely to be eaten.” *Discover Magazine Blogs: Inkfish*. Elizabeth Preston, June 17, 2014.

“Variety in a caterpillar’s diet could spell its doom.” *Audubon Magazine News*. Chelsea Harvey, June 16, 2014.

“Diverse diet makes caterpillars more likely target for birds.” *Chicago Tribune*. Monte Morin, June 16, 2014.

“Diverse diet makes caterpillars more likely target for birds.” *Los Angeles Times*. Monte Morin, June 16, 2014.

“Caterpillars that eat multiple plant species are more susceptible to hungry birds.” Coverage in:

Science Daily. June 16, 2014.

Science Newsline. June 16, 2014.

The Monty Hall Problem, book by Jason Rosenhouse, 2009. *Oxford University Press*.

My work is presented and discussed in section *Humanity Fights Back*, pg. 149–151.

Cornell University 40 Years of Leadership in Research and Education booklet, 2005.

My eyetracking research is the topic of a sidebar column in a section about human factors, pg. 24.