

Hiroki Sayama, D.Sc.

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24 Mt. Auburn St., Cambridge, MA 02138

Education

B.Sc. Information Science, University of Tokyo, Japan (March 1994)

M.Sc. Information Science, University of Tokyo, Japan (March 1996)

D.Sc. Information Science, University of Tokyo, Japan (March 1999)

Thesis title: "Constructing evolutionary systems on a simple deterministic cellular automata space"

Thesis supervisor: Prof. Yoshio Oyanagi

Professional Positions

1999-2002 Postdoctoral Fellow
New England Complex Systems Institute, Cambridge, MA, USA

2000-2001 Associate in Research
Edwin O. Reischauer Institute of Japanese Studies
Harvard University, Cambridge, MA, USA

2002-2004 Assistant Professor
Department of Human Communication
University of Electro-Communications, Tokyo, Japan

2002-present Affiliate
New England Complex Systems Institute, Cambridge, MA, USA

2003-2005 Adjunct Assistant Professor
Department of Complex Systems Science, Graduate School of Information Science
Nagoya University, Nagoya, Japan

2004-2005 Associate Professor
Department of Human Communication
University of Electro-Communications, Tokyo, Japan

2006-present Assistant Professor
Department of Bioengineering
Binghamton University, State University of New York, USA

Research Interests

Complex Systems

Complex dynamical networks, collective behaviors, nonlinear dynamics, pattern formation, self-organization, multiscale phenomena, social systems, modeling, simulation and visualization of complex systems, complex systems education

Artificial Life

Self-replication, self-repair, cellular automata, artificial chemistry, swarm behaviors, artificial evolutionary systems, robustness and evolvability of artifacts, application of artificial life to media art

Mathematical Biology

Theoretical population/evolutionary biology, spatially distributed ecological or evolutionary models, multilevel selection, speciation

Computer & Information Sciences

Automaton and formal languages, computation theory, information theory, parallel computation, nature-inspired computing

List of Publications and Other Achievements

Continuously updated and available online at <http://bingweb.binghamton.edu/~sayama/pub.html>

Teaching

1999 -2002 Teaching Assistant at several NECSI Courses and Advanced Training Programs
New England Complex Systems Institute

2002-2005 Course development and instruction for undergraduate and graduate programs
Department of Human Communication, UEC

- Algorithms and Data Structures (for sophomores)
- Graphs and Dynamical Networks (for sophomores and international students in English)
- Introduction to Computer Science (for sophomores and juniors)
- Introduction to Information Theory (for juniors)
- Mathematical Modeling and Simulation (for juniors)
- Advanced Lectures on Emergent Communication Systems Design (for graduates and international students in English)

- Other courses co-taught with other faculty
 - Introductory Seminar on Human Communication (for freshmen)
 - Topics on Modern Science and Technology (for sophomores)
 - Academic Reading in English (for juniors)
 - Fundamentals of Media Communication (for graduates)

Senior thesis project supervision for nineteen undergraduate students
Department of Human Communication, UEC

Master thesis project supervision for three graduate students
Department of Human Communication, UEC

Master thesis project remote supervision for two graduate students
Section Computational Science, University of Amsterdam, the Netherlands

Research supervision for one visiting researcher
Department of Human Communication, UEC

- 2003-2005 Part-time Lecturer
Intensive Course on Complex Systems Science II: Invitation to Self-Replication Studies
Department of Complex Systems Science
Graduate School of Information Science, Nagoya University, Japan
- 2003 Program Coordinator
An Intersection between Machines and Life -- Creating Artificial Systems That Exhibit Lifelike Behavior
UEC Open Lecture Series, UEC, Japan
- 2006-present Course development and instruction for undergraduate and graduate programs
Department of Bioengineering, Binghamton University, SUNY, USA
- BE-201/BIOL-333: Self-Organizing Systems (for sophomores)
 - BE-410: Complexity in Biological Systems (for seniors)
 - BE-450/451 Complex Systems Engineering/Complex Systems and Evolutionary Design (for seniors, participating as a faculty advisor for senior design project teams)
 - BE-510: Modeling Complex Biological Systems (for graduates)
- Master thesis project supervision for two graduate students
Department of Bioengineering, Binghamton University, SUNY, USA
- 2008 Instructor
New England Complex Systems Institute Summer School 2008
Cambridge, MA
- CX-202: Complex Systems Modeling and Networks
 - CX-203: Methods for the Study of Complex Systems
- 2008 Invited Lecturer
Second Annual French Complex Systems Summer School
Complex Systems Institute Paris Ile-de-France (ISC-PIF), Paris, France
- Continuous space, lattices and swarms: Pattern formation in complex systems

Research Grants

- 2002-2003 UEC Grant for the Promotion of Research and Education

- University of Electro-Communications, Japan
Subject: Emergence and evolution of patterns in spatially distributed locally interacting populations
Amount: JPY 1,300,000
Role: PI
- 2003 Visiting Researcher Support (as a host institution for short-term visit of Chris Salzberg)
International Information Science Foundation, Japan
Subject: Visualization and analysis of graph-based evolutionary dynamics
Amount: JPY 300,000
- 2003-2004 Grant for Research on Human and Entertainment
Hayao Nakayama Foundation for Science, Technology and Culture, Japan
Subject: Basic study on the possibility of physical implementation of self-replicating toys
Amount: JPY 1,000,000
Role: PI
- 2003-2004 Grant for Environmental Research
Showa Shell Sekiyu Foundation for Promotion of Environmental Research, Japan
Subject: Theoretical models and simulations of the effects of artificial modification of habitat structure on biodiversity
Amount: JPY 500,000
Role: PI
- 2005-2007 Grants-in-Aid for Scientific Research
Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan
Subject: Developing a kinematic model of self-replicating universal constructors
Amount: JPY 1,200,000
(Project canceled due to moving of PI)
Role: PI
- 2006-2007 Interdisciplinary Collaboration Grant
Division of Research, Binghamton University
Subject: Modeling judgment and decision making of collaborative teams working to satisfy variable requirements
Amount: \$8,000
Role: Co-PI (Collaboration with Shelley Dionne)
- 2006-2007 Mini-Grant for Short-Term Travel Support
Division of Research, Binghamton University
Amount: \$700
- 2007 Mini-Grant for Short-Term Travel Support
Division of Research, Binghamton University
Amount: \$1,000
- 2008-2009 Course, Curriculum, and Laboratory Improvement Grant
National Science Foundation (Award #: NSF DUE-0737313)
Subject: Teaching Social Complexity and Multidisciplinary Team Building: An Experimental Engineering Approach
Amount: \$149,955
Role: Co-PI (Collaboration with Craig Laramee, Shelley Dionne and David Sloan Wilson)

2008-2010 Conrad and Virginia Klee Foundation
Subject: Linking Youth and Community through Technology
Amount: \$
Role Co-PI (Collaboration with Pamela Mischen and Madhu Govindaraju)

Honors and Awards

1996 Best Presentation Award
Fujitsu Fifth Parallel Computing Workshop (PCW'95 Japan)

1997-1999 First-Class Scholarship
Japan Scholarship Foundation
Amount: JPY 2,688,000

1999-2001 Overseas Scholarship
Murata Overseas Scholarship Foundation, Japan
Subject: Study on parallel computation models that utilize logical structures immanent in the complexity of cellular automata
Amount: JPY 3,350,000

2002 Travel Award for Researchers Dispatched to International Conventions
Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan
Subject: Von Neumann's machine in the shell: Enhancing the robustness of self-replication processes (Presentation at the Eighth International Conference on Artificial Life, Sydney, Australia)
Amount: JPY 184,280

2007 Individual Development Award
Binghamton University / UUP
Amount: \$1,000

2008 Guest Scientist and Institute Colloquium Speaker
Max Planck Institute for the Physics of Complex Systems, Dresden, Germany
(Travel and local expenses fully covered by the Max Planck Institute)

2008 Invited Speaker
The 2007/2008 Dean's Distinguished Lecture Series
University of Vermont College of Engineering and Mathematical Sciences

2008 Individual Development Award
Binghamton University / UUP
Amount: \$1,000

2008-present Faculty Fellow
Center for Leadership Studies
Binghamton University, State University of New York

Academic Memberships

NECSI (New England Complex Systems Institute)
AAAS (American Association for the Advancement of Science)
IEEE (Institute of Electrical and Electronics Engineers)
IEEE Computer Society
IEEE Computational Intelligence Society
ACM (Association for Computing Machinery)
ISAL (International Society for Artificial Life)
ECSS (European Complex Systems Society)
SMB (Society for Mathematical Biology)
IPJS (Information Processing Society of Japan)
JSMB (Japanese Society for Mathematical Biology)
ALIREN (Artificial Life Research Network of Japan)
Society of Evolution Studies, Japan

Academic Services

1998-2005 Seminar Series Organizer
Artificial Life Independent Seminar in Tokyo / Ad-hoc Learning Initiative on Systems and Theories (ALIST)

1999 Meeting Organizer
“What’s Been Done, What’s Not Yet, and What Comes Next in Artificial Life”
ALIREN + ALIST Joint Meeting
Held at University of Tokyo, Japan

1999-present Board Member
ALIREN, Japan

2000 Meeting Co-Organizer
The 20th SIG Meeting on System Engineering: New Trends in Artificial Life
Society of Instrument and Control Engineers
Held at Nagoya University, Japan

2001 Reviewer
ECAL 2001: The Sixth European Conference on Artificial Life
Held in Prague, Czech Republic

2002-present Affiliate
New England Complex Systems Institute

2002-2003 Guest Editor (with Dan Braha, Mark Klein, and Yaneer Bar-Yam)
Concurrent Engineering: Research and Application (CERA) Journal Special Issue:
“A Complex Systems Perspective on Concurrent Engineering”

2003 Program Committee Member
The 2003 Annual Conference of the Japanese Cognitive Science Society
Held at UEC, Japan

2004 Program Committee Member
ICCS 2004: The Fifth International Conference on Complex Systems
Held in Boston, MA

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- 2004 Meeting Organizer
“Emergent Evolution in Artificial Life”
A workshop in the Sixth Annual Meeting of the Society of Evolutionary Studies, Japan
Held at University of Tokyo, Japan
- 2004 Program Committee Member
ALIFE IX: The Ninth International Conference on the Simulation and Synthesis of Living Systems
Held in Boston, MA
- 2004 Program Committee Member
ACA 2004: A Workshop on Artificial Chemistry and Its Applications
Part of ALIFE IX: The Ninth International Conference on the Simulation and Synthesis of Living Systems
Held in Boston, MA
- 2005 Program Committee Member
Special Session on Artificial Life in the 2005 IEEE Congress on Evolutionary Computation (CEC 2005)
Held in Edinburgh, UK
- 2005 Program Committee Member
ACA 2005: A Workshop on Artificial Chemistry and Its Applications
Part of ECAL 2005: The Eighth European Conference on Artificial Life
Held in Kent, UK
- 2006 Program Committee Member
Workshop on Artificial Chemistries and Artificial Life
Part of AISB'06: Adaptation in Artificial and Biological Systems
Planned to be held in Bristol, UK (cancelled)
- 2006 Scientific Committee Member
Workshop on Machine Self-Replication
Part of ALIFE X: The Tenth International Conference on the Simulation and Synthesis of Living Systems
Held in Bloomington, IN
- 2006 Program Committee Member
GECCO 2006: The 2006 Genetic and Evolutionary Computation Conference (Artificial Life, Evolutionary Robotics, Adaptive Behavior Track)
Held in Seattle, WA
- 2006 Program Committee Member
ICCS 2006: The Sixth International Conference on Complex Systems
Held in Boston, MA
- 2006-present Technical Committee Member
Technical Committee on Complex System Empowered Biological Networking
IEICE Communications Society, Japan
- 2006-2007 Reviewer

- The First IEEE Symposium on Artificial Life (IEEE ALife '07)
Held in Honolulu, HI
- 2007 Reviewer
The 2007 IEEE Congress on Evolutionary Computation (CEC 2007)
Held in Singapore
- 2007 Co-chair
Workshop on Machine Epigenesis
Part of ECAL 2007: The Ninth European Conference on Artificial Life
Planned to be held in Lisbon, Portugal (cancelled)
- 2007 Special Sessions Chair and Executive Committee Member
ICCS 2007: The Seventh International Conference on Complex Systems
Held in Boston, MA
- 2007 Program Committee Member
The Second International Workshop on Natural Computing
Held in Nagoya, Japan
- 2007-present Scientific Advisory Board Member
Lifeboat Foundation
- 2008 Program Committee Member
ALIFE XI: The Eleventh International Conference on the Simulation and Synthesis of Living
Systems
Held in Winchester, UK
- 2008 Technical Committee Member
The 2008 IEEE Congress on Evolutionary Computation (CEC 2008)
Part of WCCI 2008: The 2008 IEEE World Congress on Computational Intelligence
Held in Hong Kong, China
- 2008-present Editor
IPSI Transactions on Mathematical Modeling and Its Applications
- 2008 Co-Editor (with Thilo Gross)
Adaptive Networks: Theory, Models and Applications
Springer/NECSI Studies on Complexity Series
To be published in 2009
- 2008 Reviewer
The 18th International Conference on Artificial Neural Networks in Engineering (ANNIE
2008)
Held in St. Louis, MO
- 2008 Program Committee Member
The Third International Workshop on Natural Computing
Held in Yokohama, Japan
- 2009 Executive Committee Member
ICCS 2009: The Eighth International Conference on Complex Systems

Location TBD

2008-2009 Program Committee Member
The Second IEEE Symposium on Artificial Life (IEEE ALife '09)
Held in Nashville, TN

Occasional Reviewer for Professional Journals:

Artificial Life (MIT Press)
Physical Review Letters (American Physical Society)
Physical Review E (American Physical Society)
IPSJ Transactions on Mathematical Modeling and Its Applications (Information Processing Society of Japan)
Transactions of the JSAI (Japanese Society for Artificial Intelligence)
Physica A (Elsevier)
Physics Letters A (Elsevier)
Simulation Modelling Practice and Theory (SIMPAT, Elsevier)
InterJournal (NECSI online journal)

Services for Institutes and Departments

1999-2002 System Administrator
New England Complex Systems Institute

2002-2005 Special Admission Committee Member
Faculty of Electro-Communications, UEC

2002-2005 Department Webpage Committee Member
Department of Human Communication, UEC

2003-2004 Curriculum Development Working Group Member
Department of Human Communication, UEC

2003-2005 General Admission Committee Member
Faculty of Electro-Communications, UEC

2003-2005 Student Advisor
Department of Human Communication, UEC

2004-2005 University Planning and Examining Committee Member
UEC

2005 Master/Senior Thesis Projects Coordinator
Department of Human Communication, UEC

2005 Information Processing Center Steering Committee Member
UEC

2005 Faculty Reform Planning Working Group Member
Faculty of Electro-Communications, UEC

2006-present Publications Committee Member

Watson School of Engineering and Applied Science, Binghamton University

- 2006-present Research Committee Member
Watson School of Engineering and Applied Science, Binghamton University
- 2006-present Undergraduate Program Committee Member
Department of Bioengineering, Binghamton University
- 2007-present Department Webmaster
Department of Bioengineering, Binghamton University
- 2007-present Director
Collective Dynamics of Complex Systems (CoCo) Research Group
Binghamton University
- 2007-present Executive Committee Member
Evolutionary Studies Program (EvoS)
Binghamton University, State University of New York
- 2007-present Advisory Board Member
Center for Applied Community Research and Development (CACRD)
Binghamton University, State University of New York

Other Experiences

Computer Related Technical Expertise

Programming languages: Java, C/C++, Mathematica, Python, MATLAB, JavaScript, Lisp, Scheme, etc.
Parallel processing: Development of parallel applications using message passing libraries
System administration: Windows, MacOS (X, X Server & Classic), Linux (Fedora Core)
Server administration: Email, web, video streaming (mostly on MacOS X Server)
Network installation and administration: Small to middle size local area networks
Cluster installation and administration: Small-scale Linux-based PC clusters

Languages

Native in written and spoken Japanese
Fluent in written and spoken English (IELTS Overall Band Score: 8.0)