# Wei-Min Shen

Computer Science Department and/or USC/ISI                    Home Residence
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Email: wmshen@usc.edu, *shen@isi.edu*, URL:  *http://www.isi.edu/robots*

## Education

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|---|---|
| PhD Computer Science, Carnegie Mellon University, Pittsburgh, USA | 1989 |
| Thesis: *Learning from the Environment Based on Actions and Percepts* | |
| Advisor: Professor Herbert A. Simon (Nobel Price Winner) | |
| MS Computer Science, Carnegie Mellon University, Pittsburgh, USA | 1986 |
| The First-Place Graduate Student selected by the Chinese government to study AI in USA | 1983 |
| MS Graduate Study, Institute of Automation, Academy of Sciences, China | 1983 |
| BS Electronics and Computer Engineering, Jiao-Tong University, Beijing, China | 1982 |

## Honors and Awards

| | |
|---|---|
| Senior Member, National Academy of Inventors, USA | 2024 |
| Honored World-Class Expert Scientific Reviewer for European Scientific Commission | 2010-2015 |
| USC Rose Hills Foundation Summer Science and Engineering Fellowship (for advisors) | 2010 |
| Best Robotics Paper Award at the 26th Army Science Conference | 2008 |
| Championship at the first ICRA planetary contingency robotic competition | 2008 |
| *Phi Kappa Phi Faculty Recognition Award*, University of Southern California | 2003 |
| *The Best Paper Award*, International Conference on Simulation of Adaptive Behaviors | 2002 |
| *The World Champion Award,* the International Robotic-Soccer Competition, Nagoya, Japan | 1997 |
| (Featured on CNN, ABC, Discovery, SCIENCE, and world-wide newspapers and magazines) | |
| *Meritorious Service Award*, Information Sciences Institute, University of Southern California | 1997 |
| *Second Place Award* in AAAI Robotics Competition, Portland, Oregon (featured on PBS and CNN) | 1996 |
| *National Scholarship Award for Education Abroad*, The Chinese Ministry of Education | 1983 |
| *First Place Student Award of National Graduate Examination*, Academy of Sciences, China | 1983 |
| *Outstanding University Graduate Award* (top 2%), Jiao-Tong University, Beijing, China | 1982 |

## Invited Keynote Speaker

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|---|---|
| Invited Keynote Speaker, the 7th World Conference on Structural Control and Monitoring, China | 2018 |
| Invited Keynote Speaker, Shen-Yang Institution of Automation, Science Academy, China | 2013 |
| Invited Keynote Speaker, International Conference on Swarm Intelligence, Brussels, Belgium | 2010 |
| Invited Keynote Speaker, Beijing Institution of Automation, Science Academy, China | 2008 |
| Invited Keynote Speaker, the 50th Anniversary of AI, Barcelona Science Museum, Spain | 2006 |
| Invited Keynote Speaker, the International Conference on Complex Systems, Boston, USA | 2004 |
| Invited Keynote Speaker, the TTI Vanguard Convention, Los Angeles, USA | 2001 |

## US Patents

| | | |
|---|---|---|
| METHOD AND APPARATUS FOR CONTROL OF MULTIPLE AUTONOMOUS MOBILE NODES BASED ON DYNAMIC SITUATIONAL AWARENESS DATA, U.S. App. No. 15/859,495 | | 2020 |
| Method and Apparatus for Biologically Inspired Autonomous Infrastructure Monitoring, US #14/716,852 | | 2017 |
| Method and Apparatus for Control of Multiple Autonomous Nodes | | |
| Based on Dynamic Situational Awareness Data | US #9,894,158 | 2015 |
| A Multifunctional Device for Assisting Human Transfer, Mobility, and Rehabilitation, US Patent Pending | | 2013 |
| A Genderless and Single-Side-Operational Connector Mechanism for Self-Reconfigurable, | | |
| Self-Assembly and Self-Healing Systems | US #8,234,950 | 2012 |
| Extremely Flexible Thruster System for Underwater Vehicles | US #8,082,870 | 2011 |

| Distributed Control & Coordination of Autonomous Agents in Dynamic and Reconfigurable Systems | US #006636781 | 2003 |
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## Research Experience

University of Southern California, Los Angeles, CA

| | | |
|---|---|---|
| Associate Professor of Computer Science | Computer Science Department, USC | 2019— |
| Director | Polymorphic Robotics Laboratory, USC/ISI | 1999— |
| Associate Director | Center for Robotics and Embedded Systems, USC | 2002— |
| Research Team Leader | Information Sciences Institute, USC | 1998— |
| Research Associate Professor | Computer Sciences Department, USC | 2005— |
| Research Assistant Professor | Computer Sciences Department, USC | 1995— |
| Computer Scientist | Information Sciences Institute, USC | 1994— |
| Co-Founder and Vice President | EpiSys Science Inc., San Diego, CA | 2012— |
| Co-Founder and Vice President | AARICO Corp, Los Angeles, CA | 2005— |

Microelectronics and Computer Technology Corporation (MCC), Austin TX

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|---|---|
| Project Leader | 1994 |
| Senior Member of Technical Staff | 1993-94 |
| Member of Technical Staff | 1989-93 |

Carnegie Mellon University, Pittsburgh, PA

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|---|---|---|
| Graduate Research Assistant | Department of Computer Science | 1983-89 |
| Graduate Teaching Assistant | Department of Computer Science | 1987-88 |

Chinese Academy of Sciences, Beijing, China

| | | |
|---|---|---|
| Graduate Research Assistant | Institute of Automation | 1982-83 |

## Teaching Experience

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|---|---|
| Foundation of Artificial Intelligence (CSCI-561), University of Southern California (USC) | 2013-2023 |
| Massive Data Mining Technology (DSCI-553), University of Southern California (USC) | 2019-2023 |
| Machine Learning for Data Science (INF552), University of Southern California (USC) | 2019-2020 |
| Foundation of Artificial Intelligence (CS360), University of Southern California (USC) | 2013-2018 |
| Advisor for PhD Students, University of Southern California, USA | 1996-2018 |
| Autonomous Robots (PTE587) USC, Department of Chemical Engineering and Material Science | 2007-09 |
| Lectures for PhD Seminar Series (CSCI 597), USC, Department of Computer Science | 2007-09 |
| Autonomous Learning and Discovery Robots (CS593) (Designer of this course), USC, CS Dept | 1997-98 |
| Autonomous Learning from the Environment (CS599), USC, Computer Science Department | 1996 |
| Deductive Databases and Data Mining (lectures for CS589), USC, Computer Science Department | 1995-96 |
| Data Mining and Knowledge Discovery in Databases, University of California at Los Angeles (UCLA) | 1998-99 |
| Data Mining Technology and Applications, NASA Jet Propulsion Laboratory, Pasadena, California | 1999 |
| Lectures on Autonomous Learning from the Environment, University of Texas at Austin, Business School | 1991 |
| Lectures on Semantic Integration of Heterogeneous Databases, UT Austin, Business School | 1994 |
| Introduction to Programming Languages (TA), Carnegie Mellon University, Computer Science | 1986-87 |

## Grants and Contracts

| | |
|---|---|
| KISR-USC Research Fund (Co-PI with Masri, $100K) | 2018 |
| US Air Force, NASA, NAV-COM, SBIR Phase I and II (Total of ~$750K) | 2014-2017 |
| DARPA TTO, Star Cell Project (PI, $1.0M) | 2013-2017 |
| USC/Keston Research Fund (PI, $100K) | 2017 |
| Qatar NSF, Reconfigurable robots for infrastructure inspection ($150K) | 2015-2016 |
| NAV-COM, SBIR Phase I ($200K) | 2014-2015 |
| NASA, STTR with EpiSciences Inc., $500K | 2013-2014 |
| DARPA, PHOENIX, (Co-PI with AMD-USA), $1.0M | 2012-2014 |
| DARPA, Mind's Eye, (Co-PI for Ram Nevatia), $1.2M | 2010-2013 |
| DARPA, CommEX, (Co-PI for Preston Marshall), $170K | 2010-2012 |
| AFOSR, Reconfigurable robots for security, (PI), $60K | 2010-2011 |

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|---|---|
| ARO, micro-reconfigurable robots, (PI), $50K | 2010-2011 |
| DARPA, LANDroids mobile robotic networks, (PI), $550K | 2008-2009 |
| AFOSR, Surprise-Based Learning (PI), $600K | 2006-2009 |
| NASA, Modular, Self-Reconfigurable and Multifunctional *SuperBot*, (PI) $4.23M | 2005-2008 |
| DARPA, Cognitive Architecture COGENT, (key contributor) $125K | 2006-2007 |
| DURIP, Self-Healing Robotic Modules, (PI) $200K, | 2005-2007 |
| Army Research Office, Self-reconfigurable robotics systems, (PI) $250K | 2004-2007 |
| DARPA, Applied Learning Networks, $400K (Co-PI for Joe Banister) | 2005-2007 |
| CiSoft, Robotics and AI for Intelligent Oil Field, Chevron-Texaco (PI), $150K | 2005-2007 |
| NSF, Space Self-Assembly via Self-Reconfigurable Robots,  (PI), $600K | 2002-2004 |
| NSF, Meta-pattern Based Data Mining Systems, (PI), $300K | 1996-1999 |
| AFOSR, Cooperative Control Program, (PI), $284K | 2001-2003 |
| AFOSR, Self-Organizing and Autonomous Learning Agents, (PI), $950K | 2000-2004 |
| AFOSR, Adaptive Agent Organizations, (PI), $700K | 1997-2000 |
| DARPA, Self-Reconfigurable Robots, (Co-PI for Peter Will), $3.0M | 1998-2002 |
| DARPA, Robust and Flexible Agent TeamCore, (Co-PI for Milind Tembe), $2.0M | 1998-2002 |
| EASTMAN CHEMICAL, Data Mining for Chemical Compound Design, (PI), $120K | 1993-1994 |
| MOTOROLA INC. Data Mining for VLSI Manufacturing Process Control, (PI), $100K | 1992-1993 |

# PhD Student Supervision

Current PhD students, University of Southern California
>       None


Former PhD students, University of Southern California
>       *Collins, Thomas*, Computer Science, 2012-present (thesis defensed in 2018)
>       *Chen, Chi-An*, Computer Science, 2012-present (thesis defensed in 2018)
>       *Barrios, Luenin*, Computer Science, 2010-2017 (thesis defensed in 6/2017)
>       *Jacob Everist*, Computer Science, 2004-2015 (thesis defensed on 2/2/2015)
>       *Nadeesha Ranasinghe*, Computer Science, 2006-2013 (thesis defensed on August 14, 2012)
>       *Feili Hou*, Computer Science, 2004-2010, Thesis topic: Optimal self-reconfiguration, Current at Apple.
>       *Mike Rubenstein*, 2004-2009, Computer Science, Thesis topic: Self-Assembly and Self-Healing for Robotic Collectives. Current Position: Assistant Processor, Northwestern University.
>       *Jay Modi*, 1998-2003, Thesis topic: Distributed Constraint Optimization for Multi-Agent Systems. Current position: Assistant Professor in Computer Science, Drexel University. (Deceased)
>       *Kasper Stoy,* 2001-2002, Thesis Topic: Control of Self-Reconfigurable Robots. Current position: Professor in Computer System Engineering, University of Copenhagen, University of Southern Denmark.
>       *Behnam Salemi,* 1997-2003, Thesis topic: Distributed Control for Chain-Typed Self-Reconfigurable Robots. Current position: Computer Scientist, Hughes Research Center, Malibu, CA.
>       *Jafar Adibi*, 1997-2002, Thesis topic: Self-Similarity and Extended Hidden Markov Models for Data Mining. Current position: Project Leader, Price Waterhouse.


PhD Committee Member, University of Southern California
>       *Mohamed H. Abdelbarr*, 2018, Civil Engineering, Main Advisor: Professor Sami Masri
>       *Jens Windau*, 2017, Computer Science, Main Advisor: Professor Laurent Itti
>       *Furqan Khan*, 2013, Main Advisor: Professor Ram Nevatia, Thesis title: Analyzing human activities in videos using component based models.
>       *Anna Li*, 2008, Main Advisor: Professor Steven Lu, Thesis topic: Massive User Enabled Evolving Web.
>       *Daniel Arbuckle*, 2007, Main Advisor: Professor Arisitdes Requicha. Thesis Topic: Self-Assembly Systems. Current position: USC.
>       *Ayanna Howard,* 1999, Main Advisor: Professor George Bekey. Current position: Associate Professor, George Tech. Thesis topic: Manipulation of deformed objects.
>       *Alex Guazzelli*, 1999, Main Advisor: Professor Michael Arbib. Current position: Computer Scientist in Brazil. Thesis topic: Hippocampus and navigation.
>       *James Montgomery,* 1998, Main Advisor: Professor George Bekey. Current position: Robotics in JPL. Thesis topic: Fuzzy control of autonomous helicopter.

*Michael McHenry,* 1998, Main Advisor: Professor George Bekey. Current position: Senior member of technical staff in JPL.

*Fernando Corbacho,* 1997, Main Advisor: Professor Michael Arbib. Current position: Computer Scientist, Madrid, Spain. Thesis topic: Integrated Learning in Rana Computatrix.

*Bonghan Cho*, 1996, Main Advisor: Professor Paul Rosenbloom. Current position, Philips Electronics Thesis topic: Fast matching in AI production systems.

University of Brussels, Belgium (September 2010)
> Invited committee member for PhD defense by Rehan O'Grady on self-assembly of swarm robots
> Supervisor: Dr. Marco Dorigo

University of South Denmark (September 2008)
> Invited committee member for PhD defense by *David Christensen* on self-reconfigurable robots
> Supervisor: Dr. Henrik Hautop Lund

University of Hong Kong (2007)
> Invited committee member for PhD defense by *Scott Howe* on self-reconfigurable architecture/structures
> Supervisor: Dr. H.Y.K. Lau

Politechnical University of Catalonia, Barcelona, Spain (December 2003)
> Invited committee member for PhD defense by *Jesus Cerquides* on Bayesian Network Classifiers
> Supervisor: Dr. Ramon López de Mántaras

University of New South Wales, Sydney, Australia (1998)
> Invited committee member for PhD defense by *Rex Kwok* on Computational Scientific Discovery
> Supervisor: Dr. Norman Foo

University of Texas at Austin, USA (1992 – 1994)
> *Rwo-Hsi Wang*, 1994, Supervisor: Dr. Al Mok. Thesis topic: Data analysis for electronic devices.
> *Tsing-Hwa Chi,* 1992, Supervisor: Dr. Andrew Whinston. Thesis topic: Learning for information management. Current position: Department Chairman and Professor, University of California at Long Beach.

# Master Student Supervision

University of Southern California

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|---|---|
| (see the list on my website) | 2019-2020 |
| *Shuo Cong, Zhapeng He, Niantian Zhang*, *and others*, Computer Science | 2016-2018 |
| *Grace Lo*, Computer Science, Supervised control of SuperBot robots | 2013 |
| *Teawon Han*, Computer Science, Adaptive locomotion for self-reconfigurable rolling track | 2012 |
| *Chi-An Chen*, Computer Science, Power sharing for self-reconfigurable robots | 2012 |
| *Yujie Hao*, Computer Science, distributed control of self-reconfigurable manipulation | 2010 |
| *Jens Windau*, Computer Science, inertia-based surface identification for robot locomotion | 2009-2010 |
| *David Yao*, Computer Science, control of self-reconfigurable robots | 2009 |
| *Rizwan Khan*, Computer Science, self-reconfigurable robots | 2008 |
| *Nisha Ganeriwal*, Computer Science, self-reconfigurable robots | 2008 |
| *Duckho Kim*, Computer Science, self-reconfigurable robots | 2007 |
| *Peter Shin*, Computer Science, self-reconfigurable robots | 2007 |
| *Nicholas Kiswanto*, Underwater autonomous vehicles | 2007 |
| *Lim Harold*, Underwater autonomous vehicles | 2006 |
| *Kenneth Payne*, Autonomous docking for self-reconfigurable robots | 2005 |
| *Harris Chiu*, Self-reconfigurable robot locomotion in complex environment | 2005 |
| *Jagadesh Venkendesh*, Self-reconfigurable robot locomotion in complex environment | 2005 |
| *James Han*, Self-reconfigurable robots for climbing behaviors | 2005 |
| *Harshit Suri*, The design and control of self-assembly FIMER robots | 2004 |
| *Kasra Mogharei*, The design and control of self-reconfigurable robots | 2004 |

| | |
|---|---|
| *Nadeesha Ranasinghe*, Simulation of self-reconfiguration in complex environment | 2003 |
| *Yusuf Ateskan*, Control of self-assembly modules in space | 2003 |
| *Aseem Mohanty,* Autonomous learning of object models from the environment | 2001 |
| *Yimin Lu,* Distributed Control of Self-Reconfigurable Robots | 2000 |
| *XueJun Wang*, Data mining and model discovery from legacy databases | 2000 |

# Other Student Supervision

University of Southern California

| | |
|---|---|
| Supervisor for SURE Fellowship Awardee Students | 2015-2017 |
| Supervisor for Rose Hills Foundation Summer Science and Engineering Fellowship Grant | 2010 |

Undergraduate students:

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|---|---|
| *Reese Mozer, Noah Olsman, Steven Spinn, Justin Lei, Michele Kawate, James Lee*. | 2010 |
| *Noah Olsman* is a recipient of NSF Research Experience for Undergraduates (REU) | |

High School students:

| | |
|---|---|
| Mane Williams, Harvard-Westlake High. | 2013 |
| Josh Lappen, Harvard-Westlake, (admitted to Stanford in 2013) | 2012 |
| Sebastian Boberg, Lucas Shen | 2009 |

PhD students under my supervision but departed before graduation

| | |
|---|---|
| Harry Chiu, taking an high-paid position in industry | 2006-2011 |
| Maxim Krivokon, (USC Scholarship) departed for a personal reason | 2003-2005 |
| Yimin Liu, departed for an attractive position in Oracle | 1998-2000 |
| Xuejun Wang, departed for an industry position for data mining | 1996-1998 |

# Consulting Experience

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|---|---|
| AARICO Corp., Los Angelos, CA, USA. | 2005-2020 |
| Episys Sciences Inc., San Diego, CA, USA. | 2012-2020 |
| Tsinghua University, Beijing, China | 2001 |
| Shanghai Grandar Electronic & Information Co., Ltd., Shanghai, China | 2001-2002 |
| G.K. Intelligent System, Houston, TX, USA.  Applying Data Mining to Enterprise Integration. | 1997-1998 |

The company also licensed a data mining software package developed by my DataCrystal project.

# Special Scientific Review Committee Invitations

| | |
|---|---|
| NASA, Scientific Review Committee for Robotics | 2016-2018 |
| US National Science Foundation, Panel Review for Robotics | 2010-2018 |
| EU Flagship Review Committee | 2012-2015 |
| EU Cognitive Systems and Robotics Proposal Review Committee | 2010-2015 |
| EU Large Integrated Project Review Committee | 2009-2012 |
| US Army Research Office, Five-Year Strategic Planning for Robotics in Mechanical Sciences | 2009 |
| External Proposal Reviewer for AFOSR, ARL, NASA | 1999-2007 |
| JPL, External Reviewer, NASA's Deep Space Mission System Program and Mars Technology Program | 2004-2006 |
| Portuguese National Foundation for Science and Technology, Special Proposal Review Committee | 2000 |
| US National Science Foundation, Panel Review for Computation and Social Systems Program | 1999 |
| US National Science Foundation, Panel Review for Robotics and Intelligent Systems Program | 1994-1995 |
| US National Science Foundation, Panel Review for Database and Information Management Program | 1991 |

# Invited Demonstrations

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|---|---|
| WIRED NextFest, LA Convention Center, http://www.wirednextfest.com/ Self-Reconfigurable Robots | 09/2007 |
| California Science Museum, Autonomous Soccer-Playing Robots | 07/1999 |

## Invited Presentations

| | |
|---|---|
| Invited Speaker for Self-Reconfigurable Robots, Cornell University, Computer Science Department | 2016 |
| IEEE Robotics and Automation Chapter at California Lutheran University, Buenaventura Section | 12/03/2014 |
| The 7th Robotics Workshop, US Army RDECOM/TARDEC Joint Center for Robotics | 12/11/2009 |
| Robotics Institute, Carnegie Mellon University, RI Seminar | 09/18/2009 |
| iRobot Corporation, topic: Self-Reconfigurable Robots | 05/20/2009 |
| Institution of Automation, Academy of Sciences, Beijing, China | 10/17/2007 |
| University of Rome, Italy, Seminar on Self-Reconfigurable Robots | 06/29/2007 |
| Oxford University, Pembroke College, Natural and Artificial Cognition | 06/23/2007 |
| Google, Santa Monica, Self-Reconfigurable Robots | 02/28/2007 |
| Japan External Trade Organization, LA Office | 02/27/2007 |
| Monterey Bay Aquarium Research Institute, Self-reconfigurable robots for underwater applications. | 9/9/2006 |
| Universitat de Girona; Girona, Spain | 10/25/2006 |
| Universitat Rovira I Virgili, Tarragona, Spain | 10/26/2006 |
| Oxford University, Robotics Seminar on Self-reconfigurable robots | 11/2006 |
| University of California, Berkeley, EECS, Seminar on Self-Assembly | 11/14/2005 |
| University of Pennsylvanian, GRASP Robotics Seminar | 4/8/2005 |
| University of Maryland at College Park, Robotics Seminar | 06/2004 |
| NASA Workshop on Modular and self-reconfigurable systems | 4/2004 |
| Spanish Council for Scientific Research | 12/2003 |
| Spanish Artificial Intelligence Research Institute | 12/2003 |
| Institute de Robòtica i Informàtica Industrial, Barcelona, Spain | 12/2003 |
| Australian Center for Field Robotics Seminar, University of Sydney, Self-Reconfigurable Robots | 7/24/2003 |
| UC San Diego, Invited AI Seminar, Self-Reconfigurable Robots and Digital Hormones | 2/22/2003 |
| NASA Ames Research Center, Invited Presentation, Self-Assembly for RoboSphere | 11/2002 |
| Stanford Research Institute, Invited Colloquium, Self-Reconfigurable Robots | 11/2002 |
| Naval Research Laboratory, Invited AI Seminar, Self-reconfigurable Robots | 06/2002 |
| UCLA, Invited CS Seminar, Self-Reconfigurable Robots and Digital Hormones | 1/31/2002 |
| NASA Langley Research Center,  Workshop on Human and Robotics Space Exploration | 11/2001 |
| NASA Ames Research Center, Invited Seminar, Self-Reconfigurable Robots | 8/2001 |
| MicroSoft Research Center, Invited Seminar, Soccer and Self-Reconfigurable Robots, Beijing, China | 6/2001 |
| Tsinghua University, Self-Reconfigurable Robots, Beijing, China | 6/2001 |
| Chinese Science Academy, ShenYang Institute of Automation, Invited Seminar, On Self-Reconfiguration | 4/2001 |
| ShanHai JiaoTong University, Invited Talk, Self-Adaptive Robot Organizations, China | 4/2001 |
| American Radiology Society, Data mining techniques and their medical applications | 11/1999 |
| USC Aerospace and Mechanical Engineering Invited Seminar, On Adaptive Organizations | 1999 |
| UCLA, Invited CS Seminar, Model Construction from Databases | 1999 |
| University of British Columbia, Invited CS Seminar, Soccer Robots | 1998 |
| Simon Fraser University, Invited CS Seminar, Model Construction from Database | 1998 |
| Carnegie Mellon University, Invited CS Seminar, On Soccer Robots | 1997 |
| Brazil-US International NSF-Workshop, Porto Alegre, Intelligent Robotics Agents | 1997 |
| The First International Conference on Intelligent Data Analysis, Barden-Barden, Germany | 1996 |
| University of California at Irvine, Invited CS Seminar, Metapattern-Based Data Mining | 1996 |
| UCLA, Invited CS Seminar, Metapattern-Based Data Mining | 1996 |
| Italian International Conference on Abstract Intelligent Agents, Invited Talk, Autonomous Learning | 1994 |
| University of Texas at Austin, Invited MS Seminar, Integration of Heterogeneous Databases | 1994 |
| Eastman Chemical Company, TN, Invited Corporate Seminar, Data Mining for Chemical Databases | 1994 |
| Bellcore Inc., NJ, Invited Corporate Seminar, Data Mining for Telecommunication Databases | 1993 |
| University of Texas at Austin, Invited Seminar for Management Science, Autonomous Learning Agents | 1991 |

## Research Interests

I am interested in interdisciplinary research in the following areas:

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|---|---|
| Self-Reconfigurable Robots and Systems | Surprise-Based Learning (Advanced Machine Learning) |
| Swarm Robotics, Systems, Applications | Self-Organization Theories and Models |

Data mining and knowledge discovery        Biologically inspired systems and theories
Computational scientific discovery         Machine learning
Multi-agent systems                        Distributed constraint optimization
Distributed control of complex systems     Modeling of complex systems and Brain
Life science and technology                Autonomous Adaptive Systems

## Research Projects

| | |
|---|---|
| Swarm UAVs for Mine Detection | 2018-2020 |
| Autonomous Robots for Underground Water Pipe Inspection (PipeFish) | 2017-2018 |
| Self-Assembly for space applications (StarCell) | 2013-2018 |
| Modular Reconfigurable Robots for Self-Assembly | 2012-2013 |
| Visual Intelligence and Activity Recognition by Learned, Structured Models | 2010-2012 |
| Surprise-Based Learning | 2006-Present |
| SuperBot: Modular, reconfigurable and multifunctional robots | 2005-Present |
| CATALINA: Autonomous underwater robots | 2004-Present |
| Self-configuring, self-optimizing, self-healing, and tethering robotic network | 2008-2009 |
| SERES:  Self-healing robots | 2005-2007 |
| MORPHOSE:  Self-reconfigurable robots | 2004-2007 |
| SOLAR:  Space self-assembly via self-reconfigurable robots | 2002-2004 |
| CiSoft: Robotics application for intelligent oil field | 2005-2006 |
| HORMCOMM: Hormone-inspired adaptive communication | 2001-2003 |
| SOALA: Self-organizing and autonomous learning robots and agents | 2000-2004 |
| CONRO: Self-reconfigurable robots | 1998-2002 |
| DYNAMITE: Dynamic and real-time distributed resource allocation in multi-agent systems | 1998-2002 |
| TEAMCORE: Robust and flexible multi-robot agent teams | 1998-2001 |
| ADAPTEAM: Adaptive and self-organizing agent teams | 1997-2000 |
| Dreamteam: Soccer-playing robot teams (1997 world champion) | 1997-1999 |
| DataCrystal: Metapattern-based, integrated data mining systems | 1996-2000 |
| YODA: Indoor navigation robots | 1996 |
| SIMS: Intelligent data mediator | 1995-1998 |
| DSQTM: Distributed semantic query/transaction manager (~50,000 lines), MCC | 1992-1994 |
| CYC: Learning in very large knowledge base, MCC | 1990-1992 |

## PhD Dissertation

Shen, W.-M.  *Learning from the Environment Based on Actions and Percepts*                          1989
Carnegie Mellon University, under the supervision of Nobel Laureate Professor Herbert A. Simon

## Books

1. Shen, et. al. *Swarm and Self-Reconfigurable Robots* (co-editor), 2011
2. Shen, W.-M., *Autonomous Learning from the Environment* (Foreword by Professor Herbert A. Simon), W. H. Freeman, Computer Science Press, 1994.
3. Shen, W.-M., (editor) Learning Action Models: A Collection of Research Papers, AAAI Press, 1993.
4. Gini, M., W.-M. Shen, C. Torras, H. Yuasa (editors) Intelligent Autonomous Systems, IAS7, IOS Press, 2002.
5. Shen, W.-M. (editors) *Handbook of Data Mining and Knowledge Discovery*, Oxford University Press, 2001.

## Journal Publications

1. Thomas Joseph Collins and W.-M. Shen, Surprise-Based Learning of State Represenatations, *Biologically Inspired Cognitive Architectures*, 24:1–20, 2018.
2. Thomas Joseph Collins and W.-M. Shen, A Robust Cognitive Architecture for Learning from Surprises, *Biologically Inspired Cognitive Architectures*, 21(C):1–12, 2017.
3. Mohammad R. Jahanshahi, Wei-Min Shen, Tarutal Ghosh Mondal, Mohamed Abdelbarr, Sami F. Masri, and Uvais A. Qidwai. Reconfigurable Swarm Robots for Structural Health Monitoring-A Brief Review. *International Journal of Intelligent Robotics and Applications*, pp. 1–23, May 2017.
4. Mohamed Abdelbarr, Yulu Luke Chen, Mohammad R Jahanshahi, Sami F Masri, Wei-Min Shen and Uvais A Qidwai. 3D dynamic displacement-field measurement for structural health monitoring using inexpensive RGB-D based sensor. *Smart Materials and Structures*, 26(12):125016, 2017.

5.  Hou, Feili, and W.-M. Shen, Graph-Based Optimal Reconfiguration Planning for Self-Reconfigurable Robots, *Robotic and Autonomous Systems*, In Press, 2013.

6.  Hou, Feili, and W.-M. Shen, MorphLine: a Distributed and Autobomous Self-Reconfiguration Planning Method for Modular Robots, *IEEE Transaction on Robotics*, Under Review, 2013.

7.  Rubenstein, M., W.-M. Shen, Y. Sai, and CM Chuong, Regenerative Patterning in Swarm Robots - Mutual Benefits of Research in Robotics and Stem Cell Biology, *International Journal for Developmental Biology*, 53:869-881, 2009.

8.  Mark Yim, Wei-Min Shen, Behnam Salemi, Daniela Rus, Mark Moll, Hod Lipson, Eric Klavins, and Gregory S. Chirikjian. Modular Self-Reconfigurable Robot Systems -- Challenges and Opportunities for the Future. *IEEE Robotics and Automation Magazine*, 43–53, March, 2007.

9.  Colombano, S.P., and Wei-Min Shen. Self-Sustaining Robotic Systems, Guest Editorial, *Autonomous Robots*, 20(2):83-84, 2006.

10. Shen, W.-M., Maks Krivokon, Harris Chiu, Jacob Everist, Michael Rubenstein, Jagadesh Venkatesh, Multimode Locomotion for Reconfigurable Robots, *Autonomous Robots*, 20(2):165-177, 2006.

11. Modi, P. J., W.-M. Shen, M. Tambe, and M. Yokoo, ADOPT: Asynchronous Distributed Constraint Optimization with Quality Guarantees, *Artificial Intelligence Journal*, 161(1-2):180, January 2005.

12. Shen, W.-M, P. Will, A. Galstyan, C.-M. Chuong, Hormone-inspired self-organization and distributed control of robotic swarms, *Autonomous Robots*, 17:93-105, 2004.

13. Jiang, T-X., Wideltz, RB., Shen, W.-M., Will, P., Wu, DY., Lin, CM., Jung, JS., Chuong, CM., 2004. Integument pattern formation involves genetic and epigenetic controls operated at different levels: Feather arrays simulated by a digital hormone model. *International Journal on Developmental Biology*, 48, 2004.

14. Salemi, B., P. Will, and W.-M. Shen, Distributed Task Negotiation in Modular Robots, Special Issue on "Modular Robotics", *Journal of the Robotics Society of Japan* (RSJ), 2003.

15. Stoy, K., W-M. Shen, P.M. Will, A Simple Approach to the Control of Locomotion in Self-Reconfigurable Robots, Robotics and Autonomous Systems, 44(3-4), 191-199, 2003.

16. Shen, W.-M., Self-Organization through Digital Hormones, *IEEE Intelligent Systems*, 81-83, 8/2003.

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# Conference Planning and Administration

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|---|---|
| Program Committee, Distributed Autonomous Robotic Systems (DARS) | 2012-2018 |
| Program Committee, Robotics Sciences and Systems (RSS) | 2015 |
| Program Committee, International Conference on Swarm Intelligence (ANTS) | 2012 |
| Program Committee, IEEE International Conference on Robotics and Automation (ICRA) | 2006-2012 |
| Co-Chair, Workshop on self-reconfigurable robots, ICRA | 2010-2012 |
| Program Committee, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) | 2006-2011 |
| Chair, Workshop on self-reconfigurable robots, IROS | 2008 |
| Chair, Workshop on self-reconfigurable robots, IROS | 2007 |
| Co-Chair, Workshop on self-reconfigurable robots, Robotic Science-System Conference | 2006 |
| Scientific Committee, Workshop on self-replication machines, ALIFE X Intl Conference. | 2006 |

Co-Chair for the 3rd Conference on Robosphere for space exploration (NASA Ames)          2006
Program Committee, AAAI conference                                                        2006
Chair for self-reconfigurable robot workshop at Robotic System Conference at MIT          2005
Co-Chair for the 2nd Conference on Robosphere for space exploration (NASA Ames)           2004
Co-Chair for the 7th International Conference on Intelligent and Autonomous Systems        2002
Organizing Chair, ICRA Workshop on Self-Reconfigurable Robots, Seoul, Korean.             2001
Organization Committee for International RoboCup Midsize Competition                  1997-2001
Program Committee, Annual conference for American Association of Artificial Intelligence  1998, 2000
Organizing Chair, Robot Demonstration at International Conference of Autonomous Agents     1999
Program Committee, European Conference on Principles and Practice of Knowledge Discovery  1997-1999
Program Committee, International Conference on Agent Theories, Architectures, and Languages  1997-1998
Program Committee, International Conference on Knowledge Discovery and Data Mining        1996-1998
Program Committee, Workshop on Deductive and Object-Oriented Databases, Singapore          1995
Member of Penal, Intelligent Data Analysis, Baden-Baden Germany                           1995
Member of Scientific Committee: The 2nd International Workshop on Abstract Intelligent Agent, Italy.          1994
Chair, Workshop on Learning Action Models, AAAI conference, Washington DC.                1993

# Journal Editing and Paper Reviewing

*Invited Guest Editor, Special Issue of Self-Reconfigurable Modular Robots, Robotics Journal*          2018
*Co-Guest-Editor,* Special Issue on Self-Reconfigurable Robots, *Robotic and Autonomous Systems Journal*   2013
*Journal Reviewers: (1996-Present)*
> *(1) Proceedings of National Academy of Sciences (NPAS), (2) Journal of Field Robotics,*
> *(3) International Journal on Robotics Research, (4) IEEE Transactions on Robotics and Automation,*
> *(5) Autonomous Robots, (6) Robotics and Autonomous Systems,*
> *(7) IEEE Transactions on Knowledge and Data Engineering,*
> *(8) Artificial Intelligence, (9) Machine Learning, Decision Support Systems,*
> *(10) Distributed and Parallel Databases, (11) Journal of Artificial Intelligence Research,*
> *(12) IEEE Transactions on Mechatronics*

*Conference Paper Reviewers:*
> International Conference on Intelligent Robotics Systems (2003-2010), International Conference on Robotics and Automation (1999-2010), International Conference on Robotics Science and Systems (2008-2010) National conference on Artificial Intelligence (1998), International Joint Conference on Artificial Intelligence (1993), Data Engineering Conference (1993), Conference of Cognitive Science (1992), IFIP World Computer Congress (1988).

*Co-Guest-Editor,* Special Issue on Self-Sustaining Robotic Systems, *Autonomous Robots Journal*, 2005-2006.
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*Editorial Board Member, The Handbook of Data Mining and Knowledge Discovery*, Oxford University Press. 2001.
*Editorial Board Member, Intelligent Data Analysis*. 1996-Present.

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