# AZAD M. MADNI ABBREVIATED CURRICULUM VITAE

## EDUCATION

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| Ph.D. | 1978 | Engineering<br>*Major:* Engineering Systems; *Minors:* Computer Methodology, AI<br>University of California, Los Angeles, Los Angeles, California 90095<br>*Dissertation:* Adaptive Classification of Myoelectric Signal Patterns for Multifunctional Prosthesis Control |
| M.S. | 1971 | Engineering<br>University of California, Los Angeles, Los Angeles, California 90095<br>*Thesis:* On the Solution of Implicit Ordinary Differential Equations |
| B.S. | 1968 | Engineering<br>University of California, Los Angeles, Los Angeles, California 90095 |
| "Mini"-MBA | 1990 | AEA/Stanford Program for Senior Executives<br>Executive Institute at Stanford University, Palo Alto, California 94305 |

## PROFESSIONAL EXPERIENCE

7/09 – Present **Executive Director**, Systems Architecting and Engineering Program, USC
- Expanded curriculum to reflect advances in systems architecting and engineering.

7/09 – Present **Professor** - Astronautical Engineering and Industrial and Systems Engineering, USC
- Founded Distributed Autonomy and Intelligent Systems Laboratory
- Founded doctoral program in Systems Architecting and Engineering in Astronautical Engineering department
- Conducted research for NSF, DoD-SERC, DoD-AIRC, Boeing, General Motors

9/12 - present **Professor -** ROSSIER School of Education (courtesy appointment), USC
- Technology-enabled storytelling approach to teaching.

3/11 - present **Professor -** Keck School of Medicine (courtesy appointment), USC
- Systems modeling approaches to management of chronic diseases.
- Faculty Affiliate of Ginsberg Institute for Biomedical Therapeutics

3/09 – 6/09 **Visiting Professor** - Department of Industrial and System Engineering, USC
- Revised curriculum of Systems Architecting and Engineering Program

7/94 – present **Founder, CEO and CTO** - Intelligent Systems Technology Inc.
- Grew company 1588% in first 5 years – solving defense, aerospace, automotive and societal problems through innovative intelligent systems approaches.
- Led research on sponsored programs: DARPA, DHS, NASA, NIST, DOE, DTRA, TATRC, AFOSR, AFRL, ARL, ONR, NAVAIR, NAVSEA, SPAWAR, Boeing, NGC, Raytheon, SAIC, ORINCON, and others.

11/77 – 8/94 **Executive Vice President for R&D and CTO** (last position)– PERCEPTRONICS, Inc.
- Led company to become a leader in AI and Simulation-Based Training; company did successful IPO.

6/73 - 11/77 **Guidance, Navigation & Control Engineer** – Rockwell International, Space Division

- Developed model-based performance testing approach for Shuttle navigation system.

6/68 - 9/72 **Systems Engineer** – The Ralph M. Parsons Company
- Analyzed shock spectra of partially buried 3D structures to simulated nuclear explosions.

## SPONSORED RESEARCH (2010- 2020): as Principal/Co-Principal Investigator

1. Co-Principal Investigator. "Development of Modular, Scalable, and Extensible Advanced Manufacturing Curriculum Based on Systems Engineering Concepts," Production Engineering and Education and Research (PEER), Track I NSF ECR Proposal, NSF, October 1, 2019 to Sep 30, 2022.
2. Principal Investigator. "Model Based Systems Engineering Research Testbed for Adaptive Cyber-Physical-Human Systems." Sponsor: DOD-SERC, December 2019.
3. Principal Investigator. "Next Generation Adaptive Cyber-Physical-Human Systems (RT-183)." DOD-SERC, September 14, 2017 to September 13, 2019.
4. Principal Investigator. "Hardware-Software Testbed for Autonomous Vehicle Technology Integration and Behavior Evaluation." General Motors, August 7, 2018 to August 7, 2020.
5. Principal Investigator. "Formal Methods in Resilient Systems Design using a Flexible Contract Approach (RT-210)." DOD-SERC, September 28, 2018 to September 29, 2019.
6. Principal Investigator. "Model Based Systems Engineering (MBSE) Methods and System Analytics for Autonomous System-of-Systems (SOS) Networks." General Motors R&D, June 10, 2016 to November 30, 2018.
7. Principal Investigator. "Formal Methods in Resilient Systems Design using a Flexible Contract Approach." DOD-SERC, Phase I (Incubator): February 24, 2015 to July 13, 2015. Phase I Amount: $20,000. Phase II: August 10, 2016 to December 31, 2018.
8. Principal Investigator. "Extending Flexible Contracts for Mission Assurance." DOD-SERC Incubator, June 23, 2017 to June 22, 2018.
9. Principal Investigator. "Systems Engineering: Elegant Design." The Boeing Company, September 6, 2013 to December 31, 2013.
10. Principal Investigator. "Experiential Design Language and Distributed Cognition Research Project." The Boeing Company, August 31, 2014 to December 31, 2015.
11. Principal Investigator. "Experiential Design Language and Distributed Cognition Research Project." The Boeing Company, January 2, 2015 to December 31, 2015.
12. Co-Principal Investigator. "Systems 2020." Office of the Director of Defense Research and Engineering (DDR&E), Sept 1, 2009 to July 28, 2010.
13. Co-Principal Investigator. "Development of 3-Year Roadmap to Transform the Discipline of Systems Engineering," National Security Agency (NSA), September 30, 2009 to March 31, 2010.
14. Principal Investigator. "VisualAnalytix™: Identification and Visualization of Interactions and their Consequences within Complex Systems;" Sponsor: Office of the Secretary of Defense.
15. Principal Investigator. "SYSEME/HSI™: Software and Systems Engineering Methodology for Human System Integration," 2010-2011. Sponsor: Defense Threat Reduction Agency (DTRA).

## COURSE DEVELOPMENT AND TEACHING

- SAE 546, Engineered Resilient Systems and SoS; 2016 (developed and taught)
- SAE 547, Model Based Systems Engineering, 2011-2014 (developed and taught)
- SAE 548, Systems/System-of-Systems Engineering, 2012-2014 (developed and taught)

- SAE 549, Systems Architecting, 2009-present (extensively revised and taught)
- SAE 599, Foundations of Cyber-Physical-Human Systems (developed)
- Process Design and Management (The Boeing Company)
- Complex Systems and Socio-technical Systems Thinking (The Boeing Company)
- Complex Systems Design and Management (The Boeing Company)
- Cognitive Engineering and Human-Systems Integration (The Boeing Company)
- Creating "Sweaty Palms Effect" Through Modeling and Simulation Technology (U.S. Navy, Center for Surface Combat Systems)
- Process Modeling and Simulation for Manufacturing, and Concurrent Design/Engineering (Hughes Aircraft Company, Raytheon Co., Northrop Grumman Corp., Amgen, SPAWAR)
- Developing and Managing High Performance Organizations (SPAWAR Systems Center)
- Intelligent Systems Technologies: Current Status and Future Prospects, Tel Aviv, Israel (Israel Aircraft Industry, Israeli Air Force, TADIRAN)
- Battlefield Artificial Intelligence and Robotics. State of the Arts Seminar/ IDEA (London, Paris, Munich, D.C., Boston, Orlando, Los Angeles)
- Strategic Defense Initiative: Information Management, UCLA Extension
- Intelligent Interfaces in Man-Machine Systems, UCLA Extension
- Smart Systems and Human Factors in Battlefield Robotics, UCLA Extension
- Decision Aids Technology: Concepts, Systems and Applications, UCLA Extension
- Kalman Filtering Theory and Applications, Rockwell International, Space Division, Downey, CA

## SELECTED REFEREED JOURNAL PUBLICATIONS (2009-present)

1. Madni, A.M. MBSE Testbed for Rapid, Cost-Effective Prototyping and Evaluation of System Modeling Approaches, Applied Sciences Journal, 2021, 11(5), 2321; https://doi.org/10.3390/app11052321, Mar 2021.
2. Purohit, S. and Madni, A.M. Analysis of System Integration Strategy with Inter-Level and Intra-Level Dependency Matrix (I2DM), IEEE Systems Journal, 2021.
3. Pouya, P. and Madni, A.M. Expandable POMDP Framework for Modeling and Analysis of Autonomous Vehicle Behavior, *IEEE Systems Journal*, July 2020.
4. Madni, A.M. Exploiting Augmented Intelligence in Systems Engineering and Engineered Systems, *INSIGHT Special Issue*, Systems Engineering and AI, March 2020.
5. Madni, A.M., Erwin, D., and Sievers, M. Constructing Models for Systems Resilience: Challenges, Concepts, Formal Methods, and Illustrative Examples, MDPI *Systems*, 2020, ***8,***3; doi:10.3390/systems8010003.
6. Madni, A.M. Transdisciplinary Systems Engineering: Exploiting Disciplinary Convergence to Address Grand Challenges, *IEEE SMC Magazine*, Vol. 5, Issue 2, pp. 6-11, April 2019.
7. Madni, A.M. and Purohit, S. Economic Analysis of Model Based Systems Engineering, MDPI *Systems*, special issue on *"Model-Based Systems Engineering,"* Feb 2019
8. D'Ambrosio, J., Adithan, A., Ordoukhanian, E., Paranandum, P., Ramesh, S., Madni, A.M., and Sundaram, P. A MBSE Approach for Development of Resilient Automated Automotive Systems, MDPI *Systems*, special issue on *"Model-Based Systems Engineering,"* Jan 2019.
9. Ordoukhanian, E., and Madni, A.M. Model Based Approach to Engineering Resilience in Multi-UAV System-of-Systems, MDPI *Systems*, special issue on *"Model-Based Systems Engineering,"* Feb 2019.

10. Madni, A.M., Madni, C.C., and Lucero, D.S. Leveraging Digital Twin Technology in Model-Based Systems Engineering, MDPI *Systems*, special issue on *"Model-Based Systems Engineering,"* Feb 2019 **(most cited article in Digital Twins and Model Based Systems Engineering; citations:333)**
11. Madni, A.M., and Madni, C.C. Architectural Framework for Exploring Adaptive Human-Machine Teaming Options in Simulated Dynamic Environments, MDPI *Systems*, special issue on *"Model-Based Systems Engineering,"* December 9, 2018.
12. Madni, A.M., Sievers, M., Madni, A., Ordoukhanian, E., and Pouya, P. Extending Formal Modeling for Resilient System Design, *INSIGHT*, Vol. 21, Issue 3, pp. 34-41, October 2018.
13. Madni, A.M., Sievers, M. and Madni, C.C. Adaptive Cyber-Physical-Human Systems: Exploiting Cognitive Modeling and Machine Learning in the Control Loop, *INSIGHT*, Vol. 21, Issue 3, pp. 87-93, 2018.
14. Madni, A.M. and Sievers, M. Model-Based Systems Engineering: Motivation, Current Status, and Research Opportunities, *Systems Engineering*, Special 20th Anniversary Issue, Vol. 21, Issue 3, 2018.
15. Madni, A.M. "People-Driven Software Development: A 21st Century Imperative," *CrossTalk, The Journal of Defense Software Engineering, Vol. 29, No. 2,* 2016
16. Ring, J. and Madni, A.M. Resilience, Latent Faults, and Systems that Learn, *Insight,* Special Issue, Vol. 18, issue 1, April 2015.
17. Madni, A.M. "Expanding Stakeholder Participation in Upfront System Engineering Through Storytelling in Virtual Worlds," *Systems Engineering*, Vol. 18, No. 1, pp. 16-27, Jan. 2015.
18. Madni, A.M. "A Systems Perspective on Compressed Sensing and its Use in Reconstructing Sparse Networks, *IEEE Systems Journal*, Vol. 8, Issue 1, March 2014.
19. Madni, A.M. and Sievers, M. "System of Systems Integration: Key Considerations and Challenges," *Systems Engineering*, Vol. 17, No. 3, pp. 330-347, Fall 2014.
20. Madni, A.M. and Sievers, M. "Systems Integration: Key Perspectives, Experiences, and Challenges," *Systems Engineering*, Vol. 17, No. 1, p. 37-51, Spring 2014.
21. Madni, A.M. "Generating Novel Options During Systems Architecting: Psychological Principles, Systems Thinking, and Computer-Based Aiding," *Systems Engineering*, Volume 17, Number 1, pp. 1-9, 2014.
22. Neches, R. and Madni, A.M. "Towards Affordably Adaptable and Effective Systems," *Systems Engineering*, Vol. 16, No. 2, pp. 224-234, Summer 2013.
23. Madni, A.M. "Elegant Systems Design: Creative Fusion of Simplicity and Power, *Systems Engineering*, Vol. 15, No. 3, pp. 347-354, Fall 2012.
24. Madni A. "Adaptable Platform-Based Engineering: Key Enablers and Outlook for the Future," *Systems Engineering*, Vol. 15, No, 1, pp. 95-107, Spring 2012.
25. Madni, A.M. "Producing the Best for Aerospace and Defense: USC's Systems Architecting and Engineering Program," *Astropolitics*, 9:165-172, 2011.
26. Madni, A.M. "Heuristic Development of the Generalized Inverse," *Journal of Integrated Design and Process Science*, June 2011, Vol. 15, No. 2, pp. 1-7.
27. Madni, A.M. "Game-based Simulation for Cross-Cultural Decision-Making Training," *Human Factors and Ergonomics in Manufacturing & Service Industries Journal*, Vol. 23, No. 2, pp. 85-94, March/April 2013.
28. Madni, A.M. "Integrating Humans With and Within Software and Systems: Challenges and Opportunities," (Invited Paper) *CrossTalk, Journal of Defense Software Engineering*, May/June 2011, "People Solutions."
29. Madni, A.M. "Towards a Generalizable Aiding-Training Continuum for Human Performance Enhancement," *Systems Engineering*, Vol. 14, No. 2, pp. 129-140, Summer 2011.

30. Madni, A.M. “Transdisciplinary System Science: Implications for Healthcare and Other Problems of Global Significance,” *Transdisciplinary Journal of Engineering & Science*, Vol. 1, No. 1, pp. 38-54, December 2010.
31. Madni, A.M. “Integrating Humans with Software and Systems: Technical Challenges and a Research Agenda,” *Systems Engineering*, Vol. 13, No. 3, pp. 232-245, Autumn (Fall) 2010.
32. Moini, A., and Madni, A.M. “Leveraging Biometrics for User Authentication in Online Learning: A Systems Perspective,” *IEEE Systems Journal*, Special issue on Biometrics Systems, Vol. 3, No. 4, pp. 469-476, December 2009.
33. Madni, A.M., and Andrecut, M. “Efficient Heuristic Approaches to the Weapon Target Assignment Problem,” *AIAA Journal of Aerospace Computing, Information, and Communication*, Vol. 6, pp. 405-415, June 2009.
34. Madni, A.M., and Jackson, S. "Towards a Conceptual Framework for Resilience Engineering." *IEEE Systems Journal*, 3.2, 181-191, 2009 **(highly cited article in resilience engineering; 566 citations)**

## AUTHORED AND EDITED BOOKS

1. Madni, A.M., “*Transdisciplinary Systems Engineering: Exploiting Convergence in a Hyper-connected World*,” (foreword by Norm Augustine), Springer, September 2018.
2. Bahill, T. and Madni, A.M. “*Trade-off Decisions in System Design,”* (foreword by John Slaughter), Springer, Dec. 2016.
3. Madni, A.M. and Boehm, B. (eds), *“Engineered Resilient Systems: Challenges and Opportunities in the 21st Century,”* Procedia Computer Science 28 (2014), ISSN 1877-0509, Elsevier, 2014.
4. Madni, A.M., Boehm, B. et al. (eds.) *Disciplinary Convergence: Implications for Systems Engineering Research*, Springer, 2018.
5. Madni, A.M., and Sievers, M. Model Based Systems Engineering, MDPI *Systems*, 2018-2019
6. Madni, A.M., Boehm, et al., Recent Trends and Advances in Model Based Systems Engineering, Springer, 2022
7. Madni, A.M. and Augustine, N. Handbook of Model Based Systems Engineering, Springer (expected date: 2022)

## BOOK CHAPTERS (names listed in order of authorship)

1. Madni, A.M., Purohit, S., and Madni, *A. Digital Twin Technology-Enabled Research Testbed for Game-Based Learning and Assessment in Theoretical Issues of Using Simulations and Games in Educational Assessment*, O'Neil, H. (Eds.), Taylor & Francis, Spring 2020
2. Madni, A.M., and Sievers, M. Closed Loop Mission Assurance Based on Flexible Contracts: A Fourth Industrial Revolution Imperative, in *Systems Engineering in the Fourth Industrial Revolution: Big Data, Novel Technologies, and Modern Systems Engineering*, Kenett, R., Swarz, R.S., and Zonnenshaim, A. (Eds.), Wiley and Sons, Fall 2019
3. Madni, A.M. and Bahill, T. *Handling Uncertainty in Engineered Systems, Handbook of Systems Science*, 1st Edition (Eds.: Metcalf, G.S., Deguchi, H., and Kijimo, K.), Springer, 2019.
4. Ordoukhanian, E. and Madni, A.M. Human-Systems Integration Challenges in Resilient Multi-UAV Operation in *Advances in Intelligent Systems and Computing*, Vol. 595, 2017.
5. Parnell, G., Cilli, M., Madni, A.M., and Roedler, G. Introduction to Trade-off Analysis, in *Trade-off Analytics*, Parnell, G. (Ed.), Wiley, 2016. (co-contributors to chapter in INCOSE Decision Analysis Working Group).

6. Parnell, G. Madni, A.M. Bordley, R.F. A Conceptual Framework and Mathematical Foundation for Trade-off Analysis, in *Trade-off Analytics*, Parnell, G. (Ed.), Wiley, 2016. (co-contributors to chapter in INCOSE Decision Analysis Working Group)
7. Madni, A.M. and Ross, A. Exploring Concept Trade-Offs, in *Trade-off Analytics,* Parnell, G. (Ed.), Wiley, 2016.
8. Madni, A.M., Sievers, M., "System of Systems Integration: Fundamental Concepts, Challenges and Opportunities," in *Exploring the Fundamentals of Systems-of-Systems Engineering*, Hsu, J (Ed.), AIAA, 2016.
9. Madni, A.M., Moini, A., and Madni, C. "Cross-Cultural Decision-Making Training Using Behavioral Game Theoretic Framework" in *Advances in Cross-Cultural Decision Making*, Schmorrow, D. and Nicholson, D. (Eds.), CRC Press, 2010.
10. Madni, A.M. Assessment of Enabling Technologies for Computer-Aided Concurrent Engineering (CACE), *Technology Assessment in Software Applications*, (Eds.: Harold F. O'Neil Jr. and Eva L. Baker) Lawrence Erlbaum Associates, 1994, pp. 131-152.
11. Madni, A.M., and Freedy, A. Intelligent Interfaces for Human Control of Advanced Automation and Smart Systems in *Human Productivity Enhancement, Training and Human Factors in Systems Design*, Vol. 1, (Ed.: J. Zeidner), pp. 318-331, Praeger, 1986.
12. Madni, A., Samet, M., and Purcell, D. Adaptive Models in *Information Management, Applications in Artificial Intelligence* (Ed.: S. Andriole), Petrocelli Books, Inc., Princeton, NJ, 1985, pp. 279-294.
13. Freedy, A., Madni, A., and Samet, M. *Adaptive User Models: Methodology and Applications in Man-Computer Systems*, Vol. 2, (Ed.: W.B. Rouse) Jai Press Inc., 1985, pp. 249-293.

**REFEREED CONFERENCE PAPERS (2012-present)**

1. Singal, A., Iyengar, S.S., Kumar, L., Madni, A.M. Hardware Routed Quantum Key Distribution (QKD) Networks, IET Quantum Communication, accepted for publication, March 13, 2022.
2. Madni, A.M. and Purohit, S. "Augmenting MBSE with Digital Twin Technology: Implementation, Analysis, Preliminary Results, and Findings," *2021 IEEE Systems, Man, and Cybernetics International Conference*, Melbourne, Australia, Oct 17-20, 2021.
3. Wheaton, M. and Madni, A.M. "Modeling of Case Studies for Dynamic Exploration of Alternate Outcomes," *2021 AIAA SciTech*, Nashville, Tennessee, Jan 11-15, 2021.
4. Trujillo, A. and Madni, A.M. "Evaluating Value Proposition of Design Reuse," *2021 AIAA SciTech*, Nashville, Tennessee, Jan 11-15, 2021.
5. Trujillo, A. and Madni, A.M. "An MBSE Approach Supporting Technical Inheritance and Design Reuse Decisions," *AIAA ASCEND Conference, Designed to Accelerate Our Off-World Future*, Nov 16-18, 2020.
6. Wheaton, M., Pawlikowski, E., and Madni, A.M. "Dynamic Case Analysis Methodology Using Model Based Approach," *2020 ASCEND*, Las Vegas, Nevada, Nov 16-18, 2020.
7. Madni, A.M. "MBSE Research Testbed for Rapid and Flexible Experimentation," *NDIA 22nd Annual Systems and Mission Engineering Conference*, November 10-13, 2020.
8. Madni, A.M., Sievers, M., Purohit, S., and Madni, C. "Toward a MBSE Research Testbed: Prototype Implementation and Lessons Learned," *IEEE SMC Int'l Conference*, Toronto, CA, Oct 11-14, 2020.
9. Pouya, P., and Madni, A.M. "A Probabilistic Online Policy Estimator for Autonomous System Planning and Decision Making," *IEEE SMC Int'l Conference*, Toronto, CA, Oct 11-14, 2020.
10. Trujillo, A. and Madni, A.M. "Assessing Required Rework in a Design Reuse Scenario," *2020 IEEE SMC International Conference*, Toronto, Canada, Oct 11-14, 2020.

11. Trujillo, A. and Madni, A.M. “Exploration of MBSE Methods for Inheritance and Design Reuse in Space Missions,” *Proceedings of 2020 Conference on Systems Engineering Research (CSER)*, Redondo Beach, CA, 2020.
12. Ordoukhanian and E., Madni, A.M., “Ontology-Enabled Hardware-Software Testbed for Engineering Adaptive Systems,” *Proceedings of 2020 Conference on Systems Engineering Research (CSER)*, Redondo Beach, CA, 2020.
13. Sievers, M. and Madni, A.M., “Dynamic Causal Hidden Markov Model Risk Assessment,” *2020 Conference on Systems Engineering Research*, Redondo Beach, CA, Oct 8-10, 2020.
14. Trujillo, A. and Madni, A.M. “Exploration of MBSE Methods for Inheritance and Design Reuse in Space Missions,” *2020 Conference on Systems Engineering Research*, Redondo Beach, CA, Oct 8-10, 2020.
15. Purohit, S., and Madni, A.M., “Employing Digital Twins within Model-Based Systems Engineering,” *Conference on Systems Engineering Research* (CSER 2020), Redondo Beach, CA, October 08-10, 2020.
16. Purohit, S., and Madni, A.M. “Towards Making the Business Case for MBSE,” *2020 Conference on Systems Engineering Research*, Redondo Beach, CA, Oct 8-10, 2020.
17. Madni, A.M., “Models in Systems Engineering: From Engineering Artifacts to Source of Competitive Advantage,” *Conference on Systems Engineering Research* (CSER 2020), Redondo Beach, CA, October 8-10, 2020.
18. Madni, A.M. “Minimum Viable Model to Demonstrate the Value Proposition of Ontologies for Model Based Systems Engineering,” *2020 Conference on Systems Engineering Research*, Redondo Beach, CA, Oct 8-10, 2020.
19. Mesmer, B., Watson, M., McKinney, D., and Madni, A.M., “Transdisciplinary Systems Engineering Approaches,” *Conference on Systems Engineering Research* (CSER 2020), Redondo Beach, CA, October 08-10, 2020.
20. Pouya, P., and Madni, A.M., “Probabilistic System Modeling for Complex Systems Operating in Uncertain Environments,” *Conference on Systems Engineering Research* (CSER 2020), Redondo Beach, CA, October 08-10, 2020.
21. Pouya, P. and Madni, A.M. “Leveraging Probabilistic Modeling and Machine Learning in Engineering Complex Systems and System-of-Systems,” *2020 SciTech*.
22. Madni, A.M., Purohit, S., Erwin, D. and Minnichelli, R. “Analyzing Systems Architectures using Inter-Level and Intra-Level Dependency Matrix (I2DM),” *2019 IEEE International Conference on Systems, Man and Cybernetics*, Bari, Italy.
23. Sievers, M., Madni, A. M., Pouya, P., and Minnichelli, R., "Trust and Reputation in Multi-Agent Resilient Systems," *2019 IEEE International Conference on Systems, Man and Cybernetics*, Bari, Italy, 2019, pp. 741-747, doi: 10.1109/SMC.2019.8914615.
24. Madni, A.M., Erwin, D. and Madni, A. “Exploiting Digital Twin Technology to Teach Engineering Fundamentals and Afford Real-World Learning Opportunities,” *2019 ASEE 126th Annual Conference and Exposition*, Tampa, FL, June 15-19, 2019.
25. Madni, A.M. “Toward Realizing Next Generation Resilient Cyber-Physical-Human Systems,” *2019 IISE Annual Conference and Expo*, Orlando, FL, May 18-21, 2019.
26. Ordoukhanian, E. and Madni, A.M. “Toward Evaluating Resilience Mechanisms for Multi-UAV System of Systems,” *AIAA Science and Technology Forum*, San Diego, CA, January 7-11, 2019.
27. Madni, A.M., Sievers, M., Erwin, D. “Formal and Probabilistic Modeling in the Design of Resilient Systems and System-of-Systems,” *AIAA S&T Forum*, San Diego, CA, Jan 7-11, 2019.
28. Sievers, M., Madni, A.M., and Pouya, P. “Assuring Spacecraft Swarm Byzantine Resilience,” *AIAA Science and Technology Forum*, San Diego, California, January 7-11, 2019.

29. Wheaton, M., and Madni, A.M. "Model-Based Approach for Resilience and Affordability Tradeoff Analysis," *AIAA Science and Technology Forum*, San Diego, California, January 7-11, 2019.
30. Madni, A.M. "Formal Methods in Resilient Systems Design Using a Flexible Contract Approach," *21st Annual Systems Engineering Conference*, Tampa, Florida, October 22-24, 2018.
31. Madni, A.M. "Next Generation Adaptive Cyber-Physical Systems," *21st Annual Systems Engineering Conference*, Tampa, Florida, October 22-24, 2018.
32. Madni, A.M., Madni, C.C. and Sievers, M. "Adaptive Cyber-Physical-Human Systems," *2018 INCOSE International Symposium*, July 7-12, 2018.
33. Madni, A.M., Sievers, M., Ordoukhanian, E., and Pouya, P., and Madni, A. "Extending Formal Modeling for Resilient Systems," *2018 INCOSE International Symposium*, July 7-12, 2018.
34. Wheaton, M. and Madni, A.M. "Model-Based Tradeoffs for Affordable Resilient Systems," *2018 INCOSE International Symposium*, July 7-12, 2018.
35. Orellana, D. and Madni, A.M. "Extending MBSE To Address Human-Systems Integration Considerations in the System Life Cycle," *2018 IEEE Systems Conference* (SysCon), Vancouver, British Columbia, Canada, April 23-26, 2018.
36. Madni, A.M. "Formal Methods for Intelligent Systems Design and Control," *AIAA SciTech Forum, 2018 AIAA Information Systems, AIAA InfoTech@Aerospace*, Kissimmee, Florida, January 8-12, 2018.
37. Madni, A.M. and Sievers, M. "Model-Based Systems Engineering: Motivation, Current Status, and Needed Advances," *Conference on Systems Engineering Research*, Mar 23-25, 2017, Redondo Beach, CA.
38. Madni, A.M., Sievers, M., Humann, J., Ordoukhanian, E. "Model-Based Approach for Engineering Resilient System-of-Systems: Application to Multi-UAV Swarms," *Conference on Systems Engineering Research*, Mar 23-25, 2017, Redondo Beach, CA.
39. Kaslow, D., Madni, A.M. "Validation and Verification of MBSE-compliant CubeSat Reference Model," *Conference on Systems Engineering Research*, March 23-25, 2017, Redondo Beach, CA.
40. Adler, A. and Madni, A.M. "High Reliability Imperative for Networked Autonomous Vehicles," *Conference on Systems Engineering Research*, March 23-25, 2017, Redondo Beach, CA.
41. Orellana, D. and Madni, A.M. "An Architecture Profile for Human-Systems Integration," *Conference on Systems Engineering Research*, March 23-25, 2017, Redondo Beach, CA.
42. Humann, J., Jin, Y. Madni, A.M. "Scalability in self-organizing systems: an experimental case study on foraging systems," *Conference on Systems Engineering Research*, Mar 23-25, 2017, Redondo Beach, CA.
43. Klingensmith, K., Madni, A.M. "Architecting Cyber-Secure, Resilient System-of-Systems," *Conference on Systems Engineering Research*, March 23-25, 2017, Redondo Beach, CA.
44. Klingensmith, K., Madni, A.M." Resilience Concepts for Architecting an Autonomous Military Vehicle System-of-Systems," *Conference on Systems Engineering Research*, March 23-25, 2017, Redondo Beach, CA.
45. Madni, A.M., D'Ambrosio, J., Sievers, M., Humann, J., Ordoukhanian, E., Sundaram, P. "Model-Based Approach for Engineering Resilient System-of-Systems: Applications to Autonomous Vehicle Network" *Conference on Systems Engineering Research*, March 23-25, 2017, Redondo Beach, CA.
46. Ordoukhanian, E., Madni, A.M., "Introducing Resilience into Multi-UAV System-of-Systems Network," *Conference on Systems Engineering Research*, March 23-25, 2017, Redondo Beach, CA.
47. Sievers, M. and Madni, A.M. "Contract-Based Byzantine Resilience for Spacecraft Swarm," *2016 AIAA Science and Technology Forum and Expo*, Grapevine, Texas, Jan 9-13, 2017.

48. Madni, A.M., Richey, M., Ordoukhanian, E., Venkatesh, J., Zender, F., Chang, K., Nance, M., "Exploiting Storytelling in Collaborative Systems Engineering: Towards a Smart Experiential Dashboard," *Conference on Systems Engineering Research 2016,* Huntsville, AL.
49. Sievers, M., Madni, A.M., "Agent-Based Flexible Design Contracts for Resilient Spacecraft Swarms," *AIAA Science and Technology 2016 Forum and Exposition,* San Diego, CA.
50. Ordoukhanian, E., Madni, A.M., "Resilient Network of Systems," *AIAA Science and Technology 2016 Forum and Exposition,* San Diego, CA.
51. Shao, A., Madni, A.M., Wertz, J. "Quantifying the Effect of Orbit Altitude on Mission Cost for Earth Observation Satellites," *AIAA Science and Technology 2016 Forum and Exposition,* San Diego, CA.
52. Wheaton, M.J. and Madni, A.M. "Resiliency and Affordability Attributes in a System Tradespace," *AIAA Space 2015 Conference and Exposition,* Pasadena, CA.
53. Sievers, M., Madni, A.M., "Defining 'Credible Faults' – A Risk-Based Approach," *AIAA Space 2015 Conference and Exposition*, Pasadena, CA.
54. Ordoukhanian, E. and Madni, A.M., "System Tradeoffs in Networked System," *AIAA Space 2015 Conference and Exposition*, Pasadena, CA.
55. McKelvin, Jr., M.L., Castillo, R., Bonanne, K., Bonnici, M., Cox, B., Gibson, C., Leon, J.P. Gomez-Mustafa, J. Jimenez, A., and Madni, A.M. "A Principled Approach to the Specification of System Architecture for Space Missions," *AIAA Space 2015 Conference and Expo,* Pasadena, CA.
56. Madni, A.M., Richey, M.C., Paulson, C., Spraragen, M., Nance, M., and Vander Wel, M. "Model-Based Optimization of Learning Curve: Implications for Business and Government," *INCOSE International Symposium*, 2015, Seattle, WA.
57. Madni, A.M., Spraragen, M., and Madni, C.C., "Exploring and Assessing Complex System Behavior through Model-Driven Storytelling," *IEEE Systems, Man and Cybernetics International Conference,* invited special session "Frontiers of Model Based Systems Engineering," San Diego, CA, Oct 5-8, 2014.
58. Sievers, M.W. and Madni, A.M. "A Flexible Contracts Approach to System Resiliency," *IEEE Systems, Man and Cybernetics International Conference,* invited special session "Frontiers of Model Based Systems Engineering," San Diego, CA, Oct 5-8, 2014.
59. Goerger, S.R., Madni, A.M., and Eslinger, O.J. "Engineered Resilient Systems: A DOD Perspective," *Conference on Systems Engineering Research (CSER 2014)*, Eds.: Azad M. Madni, et al., Redondo Beach, CA, March 21-22, 2014.
60. Orellana, D.W. and Madni, A.M. "Human System Integration Ontology: Enhancing Model Based Systems Engineering to Evaluate Human-System Performance," *Conference on Systems Engineering Research* (CSER 2014), Eds.: Azad M. Madni, et al., Redondo Beach, CA, March 21-22, 2014.
61. Ordoukhanian, E. and Madni, A.M., "Blended Wing Body Architecting and Design: Current Status and Future Prospects," *Conference on Systems Engineering Research* (CSER 2014*),* Eds.: Azad M. Madni, et al., Redondo Beach, CA, March 21-22, 2014.
62. Spraragen, M., and Madni, A.M. "Modeling of Emotional Effects on Decision-Making by Game Agents," *Conference on Systems Engineering Research* (CSER 2014), Eds.: Azad M. Madni, et al., Redondo Beach, CA, March 21-22, 2014.
63. Siegel, N.G. and Madni, A.M. "The Digital Battlefield: A Behind-the-Scenes Look from a Systems Perspective," *Conference on Systems Engineering Research* (CSER 2014), Eds.: Azad M. Madni, et al., Redondo Beach, CA, March 21-22, 2014.
64. Rahimi, M. and Madni, A.M. "Toward a Resilience Framework for Sustainable Engineered Systems," *Conference on Systems Engineering Research* (CSER 2014), Eds.: Azad M. Madni, et al., Redondo Beach, CA, March 21-22, 2014.

65. Humann, J. and Madni, A.M. "Integrated agent-based modeling and optimization in complex systems analysis," *Conference on Systems Engineering Research* (CSER 2014), Eds.: Azad M. Madni, et al., Redondo Beach, CA, March 21-22, 2014.
66. Madni, A.M., Nance, M., Richey, M., Hubbard, W., and Hanneman, L. "Toward an Experiential Design Language: Augmenting Model-Based Systems Engineering with Technical Storytelling in Virtual Worlds," *Conference on Systems Engineering Research* (CSER 2014), Eds.: Azad M. Madni, et al., Redondo Beach, CA, March 21-22, 2014.
67. Richey, M., Nance, M., Hanneman, L., Hubbard, W., Madni, A.M. and Spraragen, M. "A Complex Sociotechnical Systems Approach to Provisioning Policies for Future Workforce." *Conference on Systems Engineering Research* (CSER 2014), Eds.: Azad M. Madni, et al., Redondo Beach, CA, March 21-22, 2014.
68. Orellana, D. and Madni, A.M. "Analyzing Human Machine Interaction and Interfaces through Model Based System Engineering Practices," *Proceedings INCOSE International Symposium*, 9-12 July, Rome, Italy, 2012.
69. Orellana, D. and Madni, A.M. "Extending Model Based Systems Engineering for Human Machine Interaction Analysis and Fault Tolerant Design," *Infotech@Aerospace*, May 2012.

**SELECTED RECENT PRESENTATIONS**

1. Madni, A.M. "Model-Based Interactive Storytelling: Exploiting Convergence of Systems Engineering and Entertainment Arts" Institute of Industrial and Systems Engineering Body of Knowledge, IISE Webinar, February 24, 2022.
2. Madni, A.M. "From Models to Interactive Stories in Virtual Worlds: Model Based Systems Engineering in the 21st Century," Gordon Center Conference (co-sponsored by the Gordon Center and Technion), Israel, June 22-23, 2021.
3. Madni, A.M. "Data Exploitation," 24th Annual Ground Systems Architectures Workshop, Renaissance Los Angeles Airport Hotel, "Opportunities in Data Exploitation," March 2-5, 2020.
4. Madni, A.M. (Invited Panelist) "Model Based Engineering: Paradigm Shift or Business as Usual?" *2020 IEEE Aerospace Conference*, Big Sky, Montana, March 7-14, 2020.
5. Madni, A.M. "From Models to Interactive Stories in Virtual Worlds: Model Based Systems Engineering in the 21st Century," Sigma Theta Mu Lecture, *13th Annual INCOSE Great Lakes Regional Conference* (GLRC 13), October 22-25, 2019.
6. Madni, A.M. "The Evolution of Intelligent Systems and Formal Methods," Keynote Address, AIAA Intelligent Systems Technical Committee Workshop, The Aerospace Corporation, August 7-8, 2018.
7. Madni, A.M. "Formal Methods in Resilient Systems Design Using a Flexible Contract Approach," *21st Annual Systems Engineering Conference*, Tampa, Florida, October 22-24, 2018.
8. Madni, A.M. "Next Generation Adaptive Cyber-Physical Systems," *21st Annual Systems Engineering Conference*, Tampa, Florida, October 22-24, 2018.
9. Madni, A.M. "The Evolution of Intelligent Systems and Formal Methods," Keynote Address, AIAA Intelligent Systems Technical Committee Workshop, The Aerospace Corporation, August 7-8, 2018.
10. Madni, A.M. "Exploding the Boundaries of Systems Engineering," *Proceedings of the 2018 Annual International Symposium of the International Council on Systems Engineering (INCOSE)*, Panelist, Washington DC, July 2018.
11. Madni, A.M. "Resilient Cyber-Physical-Human Systems and the Role of Machine Learning," Keynote Presentation, Center for Systems and Software Engineering Annual Research Review, University of Southern California, March 14, 2018.
12. Madni, A. M. "Systems Engineering in the 21st Century: Trends, Opportunities, and a New Mindset," Invited Talk, INCOSE-LA, Nov 9, 2016.

13. Madni, A.M., "Understanding Systems Architecture and Complexity Through Interactive Model-Based Storytelling," *CESUN Conference*, George Washington University, June 27-29, 2016.
14. Madni, A.M., "Model Based Systems Engineering Meets Interactive Storytelling in Virtual Worlds," Northrop Grumman Corporation, Lunch and Learn, April 2016.
15. Madni, A.M., "Model, Stories, Immersive Experience: System Engineering in 21st Century", INCOSE Regional Mini-Conference, Keynote talk, April 2016.
16. Madni, A.M., "Exploiting Disciplinary Convergence in Complex Systems Engineering," Center for Systems and Software Engineering (CSSE), Keynote talk, March 2016.
17. Madni, A.M., "Experiential Design Through Model-Driven Storytelling in Virtual Worlds," Aerospace Corporation Colloquium (national broadcast), September 24, 2014.

## HONORS AND AWARDS

- *2022 University Professor of Astronautics* appointed by USC President, Carol Folt
- *2021 Joint INCOSE/ASEE Outstanding Educator Award* (inaugural award)
- *2021 INCOSE Benefactor Award* (award made only the second time in the history of the council)
- *2021* Appointed Holder of *Northrop Grumman Foundation Fred O'Green Chair in Engineering*
- *2021 Elected Member, National Academy of Engineering*
- *2021 Dean's Professor of Astronautical Engineering* appointed by Viterbi Dean Yannis Yortsos
- *2021 Judith A. Resnik Space Award* from IEEE Aerospace and Electronic Systems Society for leading the development of Model Based Testing Methods and Software for Shuttle Navigation System and sustained excellence in aerospace systems research & education
- *2020 Entrepreneur Achievement Award* from IEEE-USA for leadership in entrepreneurial spirit – for a lifetime of innovation, mentoring, and philanthropy
- *2020 Norbert Wiener Outstanding Research Award* from IEEE Systems Man and Cybernetics Society
- *2020 Ferguson Award* for Excellence in Systems Engineering from NDIA
- *2020 Fellow* of Washington Academy of Sciences (WAS)
- *2020 President's Award* from Orange County Engineering Council
- *2019 Pioneer Award* from IEEE Aerospace and Electronic Systems Society for contributions to advanced simulation-based training & intelligent decision aiding for aerospace systems
- *2019 Leland Atwood Award* from AIAA/ASEE for excellence in engineering education and research
- *2019 Leadership Award* from ASME CIE for advancing the use of computers in engineering
- *2019 Founders Award* from INCOSE for increasing global stature of INCOSE
- *2019 International Presidential Award* from Society of Modeling and Simulation for sustained and significant contributions to modeling and simulation technology
- *2019 William B. Johnson International Inter-Professional Founders Award* from the Engineers' Council
- *2019 Prestigious Pioneering Educator Award* from Orange County Engineering Council
- *2019 Honoree for Amy King Dundon-Berchtold University Club Faculty Recognition*
- *2018 Outstanding Professional Services Award from INCOSE*
- *2017 IEEE SMC System Science and Engineering Award* for leadership of most active Systems Science and Engineering Technical Committee (for Model Based Systems Engineering)

- *2017 Dean's Award for Innovation in Teaching and Education* from Viterbi Dean Yanni Yortsos
- *2017 John F. Guarrera Engineering Educator of the Year* from the Engineers' Council
- *2017 James E. Ballinger Engineer of the Year* from the Orange County Engineering Council
- *2016 Lifetime Achievement Award* from the Boeing Company
- *2016 Visionary Systems Engineering Leadership Award* from the Boeing Company
- *2016 INCOSE RMC Special Award* for Pioneering Industry-Relevant Contributions to Transdisciplinary Systems Engineering
- *2016 Distinguished Engineering Educator Award* from the Engineers' Council
- *2016 Outstanding Educator Award* from Orange County Engineering Council
- *2014 Lifetime Achievement Award* from INCOSE for seminal contributions to SE theory and practice.
- *2013 IISE Prize for Innovation in Curriculum Development*
- *2013 Susan C. Ruth Distinguished Service Award* from INCOSE-LA
- *2012 Life Fellow* Institute of Electrical and Electronics Engineering (IEEE)
- *2012 Fellow* of American Institute of Aeronautics and Astronautics (AIAA)
- *2012 Fellow* of American Association of Advancement of Science (AAAS)
- *2012 Exceptional Achievement Award* from INCOSE for Transformative Advances in Multi-disciplinary Approaches to Systems Engineering
- *2011 Life Fellow* of International Council on Systems Engineering (INCOSE)
- *2011 Pioneer Award* from INCOSE for Seminal Contributions to System Science and Engineering and to Society (other award winners: Si Ramo, Norm Augustine)
- *2008 President's Award* from SDPS for leading the society's growth and influence worldwide
- *2007 Life Fellow* of Institution of Electronics and Telecommunications Engineers (IETE)
- *2006 C.V. Ramamoorthy Distinguished Scholar Award* from SDPS
- *2006 Life Fellow* of Society of Design and Process Science (SDPS)
- *2005 Fellow* of International Council on Systems Engineering (INCOSE)
- *2004 Developer of the Year Award* from the Technology Council of Southern California
- *2004 DARPA Sustained Excellence by a Performer*, Info. Processing Technology Office
- *2004 DARPA Significant Technical Achievement*, Info. Processing Technology Office
- *2001 Fellow* of Institute of Electrical and Electronics Engineering (IEEE)
- *2000 Developer of the Year Award* from the Technology Council of Southern California
- *2000 Blue Chip Enterprise Award* from Mass Mutual and U.S. Chamber of Commerce
- *2000 Distinguished CEO* of *Computerworld's* Top 100 Emerging Companies to Watch
- *1999 SBA's National Tibbetts Award for California* for Innovation Research, Commercialization and Successful transition to Industry and Government
- *1995-1997 Visiting Distinguished Industry Fellow* in NASA JPL's Space Microelectronics Center
- *1976 Rockwell International Technology Utilization Award on NASA's Space Shuttle Program for Spatially Correlated TACAN Error Model and Fortran IV Computer Program (Feb 19, 1976)*
- *1976 Rockwell International Technology Utilization Award on NASA's Space Shuttle Program for Quantization and Hysteresis Modeling Program (SID 19883, Sept 29, 1976)*
- *1977 Rockwell International Technology Utilization Award on NASA's Space Shuttle Program for Maximum Likelihood Error Sampling Program (MLESP) (SID 19986, mar 9, 1977)*

- *1977 Rockwell International Technology Utilization Award on NASA's Space Shuttle Program for Barometric Altimeter Error Model (SID 20095, October 3, 1977)*
- *Listed in Marquis Who's Who in Science and Engineering, Who's Who in Industry and Finance, and Who's Who in America*

**Notable Ph.D. Students**

Dr. Douglas Orellana, Vice-President, Intelligent Systems Engineering, ManTech Int'l, El Segundo, CA
Dr. Lucy Hoag, Senior Technical Program Manager, Amazon, San Francisco, CA
Dr. Anthony Shao, Systems Engineer, NASA Jet Propulsion Laboratory, Pasadena, CA
Dr. Phan Phan, Captain USN (retired), Senior Software Engineer, Boeing, adjunct lecturer, USC
Dr. Alejandro Trujillo, Senior Scientist, The Aerospace Corporation, El Segundo, CA
Dr. Edwin Ordoukhanian, Senior Systems Engineer, Crane Engineering, Burbank, CA

## SERVICE

**University of Southern California (2009-present)**

- Executive Director, Systems Architecting and Engineering Program, 2009-present.
- Director, Distributed Autonomy and Intelligent Systems Laboratory, 2019-present.
- Viterbi School's Center for Engineering Diversity, 2009-2013
- ASTE representative on Viterbi Curriculum Committee from 2016-2017
- ASTE representative for Honors and Awards, 2016 -present
- Viterbi centers: Center for Cyber-Physical Systems and Internet of Things; Center for Systems & Software Engineering; Center for Advanced Manufacturing, Center for Intelligent Environment, Technology and Society
- USC Viterbi representative on Smart Manufacturing Leadership Coalition
- USC representative on Clean Energy Smart Manufacturing Innovation Institute
- 2016 Steering Committee of USC STEM Consortium
- Viterbi School of Engineering Research Committee (2010-2012)
- Steering Committee of Center for Technology in Pediatrics (CTIP) from 2010 to 2015
- Faculty Affiliate, USC Keck's Ginsberg Institute for Biomedical Therapeutics, 2021-present

**General Professional (2012-present)**

- NAE Search Committee for Section 12
- NAE Peer Committee for Section 12
- Research Council Member of DoD Systems Engineering Research Center
- Research Council Member of DoD Acquisition Innovation Research Center
- Proposal Reviewer for National Science Foundation and Israel Science Foundation
- Member of Governing Board of Institute of Industrial and Systems Engineering (IISE) Body of Knowledge
- Administrative Committee of IEEE SMC (Institute of Electrical and Electronics Engineers, Systems, Man, and Cybernetics Society), 1985-1987
- General/Program Chair of 1990 IEEE Int'l Conference on Systems, Man, and Cybernetics
- IEEE Computer Society Fellows Selection Committee, 2013
- Co-Founder and Chair of IEEE SMC Society's MBSE Technical Committee (2013-present)
- INCOSE's Fellow Selection Committee, 2006-2011
- INCOSE's Corporate Advisory Board (CAB), 2009-present

- INCOSE *Systems Engineering* Journal Strategic Advisor and Associate Editor (2013-2018)
- Editor-in-Chief of Journal of Integrated Design and Process Science, 2006-2011
- President, SDPS (Society for Design and Process Science) 2006-2008
- Editorial Board of Human Factors and Ergonomics in Manufacturing (2009-2011)
- Editorial Board for Human-Intelligent Systems Integration Journal (2018-present)
- Affiliate of USC Center for Systems and Software Engineering (CSSE) (2006-present)
- Past Editorial Board member and/or Reviewer of books, journal papers and proposals: INCOSE SE Journal; Human Factors and Ergonomics in Manufacturing and Service Industries Journal; AUTOSOFT Journal; Rand Corporation Research Reports; IEEE Trans. of Systems, Man, and Cybernetics; IEEE Systems Journal; IEEE Computers; CSER; Journal of Integrated Design and Process Science; National Science Foundation and Israel Science Foundation