

Curriculum Vitae

James T. Allison

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Academic Appointments

- 8/2011–Present Assistant Professor, University of Illinois at Urbana-Champaign, Department of Industrial and Enterprise Systems Engineering
- 10/2013–Present Faculty Affiliate, University of Illinois at Urbana-Champaign, Computational Science and Engineering
- 5/2013–Present Faculty Affiliate, University of Illinois at Urbana-Champaign, Institute for Genomic Biology (Biosystems Design)
- 5/2010–7/2011 Lecturer, Tufts University, Department of Mechanical Engineering
- 2/2008–7/2008 Postdoctoral Research Fellow, University of Michigan Optimal Design Laboratory

Industry Experience

- 7/2008–5/2011 Senior Applications Engineer, Advanced Support Group, MathWorks Inc., Natick MA
- 2/2008–7/2008 Consulting Engineer, V Engine Design, Ford Motor Co., Dearborn, MI
- 1/2005–2/2006 Research Assistant, Hybrid Powertrain Systems, General Motors, Troy MI
- 4/2003–8/2003 Contract Mechanical Designer, Univ. of Utah Environmental Fluid Dynamics Laboratory
- 9/2000–6/2003 Mechanical Designer, Assistant Lab Engineer, Univ. of Utah Dept. of Chemical Engineering
- 9/1999–9/2000 Quality Assurance Manager, Petersen Motor Co., Ogden Utah
- 2/1999–9/1999 Assistant Service Manager, Petersen Motor Co., Ogden Utah
- 6/1994–6/1996 Automotive Technician, Kaysville and Ogden Utah

Education

- Ph.D. Mechanical Engineering, University of Michigan, April 2008.
Dissertation Title: *Optimal Partitioning and Coordination Decisions in Decomposition-based Design Optimization.*
- M.S.E. Industrial and Operations Engineering, University of Michigan, December 2005.
- M.S.E. Mechanical Engineering, University of Michigan, December 2004.
- B.S. Mechanical Engineering (rank 1 in dept.), Magna Cum Laude, University of Utah, May 2003.
- A.A.S. Automotive Technology (rank 1 in college), High Honors, Weber State University, December 1998.

Research Interests

Design optimization of engineering systems; dynamic system design; integrated physical and control system design; design for energy efficiency; multidisciplinary design optimization; large-scale optimization; electric and hybrid electric vehicle design; renewable energy systems (wind and wave energy); robotic system design; materials design; genetic regulatory circuit design; heterogeneous system topology design optimization.

Teaching Experience

GE 413	Engineering Design Optimization (UIUC). Senior-level design optimization course, including an introduction to nonlinear programming, modeling of engineering design problems, and an in-depth semester project.
GE 100	Introduction to Industrial and Enterprise Systems Engineering (UIUC). Transformed this freshman-level course from a seminar-based course into a project-based course where students learn to connect hands-on activities with physics-based system models and design processes.
ENG 198	Grand Challenges (UIUC). Student projects are focused on the NAE grand challenge topic of <i>Engineering the Tools of Scientific Discovery</i> .
GE 598	Dynamic System Modeling and Design (UIUC). Graduate-level course where students learn the complete process for integrated design of actively controlled dynamic systems.
GE 410	Component Design (UIUC). Covers both machine design and structural steel design.
ME 149	Engineering System Design Optimization (Tufts University). Graduate level course in design optimization, including coverage of multidisciplinary design optimization and distributed optimization methods.
ME 555	Design Optimization (University of Michigan). Guest Lecturer.

Grant Funding

1/2014–12/2014	PI: “Development of Generative Algorithm-Based Strategies for System Architecture Design Optimization with Large-Scale Capabilities”, \$100,000, Deere & Co.
2/2013–2/2017	Co-PI: “A Proposal to Establish a New IGB Research Theme in Synthetic Biology”, \$2,000,000, Roy J. Carver Charitable Trust.
7/2013–6/2014	Co-PI: “Linking and Integration of Civil and Engineering Systems Design Courses”, \$50,000 UIUC College of Engineering.
5/2013–12/2014	PI: “Advancing Undergraduate Design Learning Through Extensive Use of Hands-On Model-Based Design Projects”, \$40,000, MathWorks, Inc., \$5,000 in cost matching from the UIUC College of Engineering, and \$17,300 through the Grants for the Advancement of Teaching Engineering program at UIUC.
1/2013–6/2013	PI: “Active Automotive Suspension Testbed with Adjustable Physical Design”, \$13,350, UIUC College of Engineering.
1/2013–1/2014	PI: “Development of Generative Algorithm-Based Strategies for System Architecture Design Optimization with Large-Scale Capabilities”, \$100,000, Deere & Co.

Service and Leadership

8/2013–Present	Member of the <i>Safety Committee</i> , ISE Department, UIUC
4/2013	Invited speaker, Draper Laboratories, Cambridge MA. ‘Toward Integrated Design Methods for Mechatronic Systems’.
4/2013	K-12 outreach: Physics and Design of Trebuchets, Junior Scientist Day, Urbana, IL School District.
3/2013	K-12 outreach: Physics and Design of Trebuchets, Engineering Open House, UIUC.
11/2012	Keynote speaker at the Deere & Co. Model-Based Systems Design and Systems Engineering Conference.
11/2012–Present	Member of the Scientific Committee, International Conference on Engineering Design.
10/2012	K-12 outreach: Speaker and panelist for “Dream to Inspire Your Vision in Engineering (DIVE)”, an engineering outreach event at UIUC for underrepresented minorities.

8/2012–Present	Member of the Scientific Advisory Committee, special session organizer, and session chair, World Congress on Structural and Multidisciplinary Optimization.
8/2012–8/2013	Member of the <i>Seminars Committee</i> , ISE Department, UIUC
1/2012–Present	Member of the <i>GE 100 Steering Committee</i> , UIUC
1/2012–8/2013	Member of the <i>Scholarships and Awards Committee</i> , ISE Department, UIUC
8/2011–Present	Member of the <i>Courses and Curriculum Committee</i> , ISE Department, UIUC
2010–Present	NSF grant review panelist
8/2008–Present	Review coordinator and session chair for <i>Design for Energy Efficiency</i> , <i>Multidisciplinary Design Optimization</i> , <i>Design and Optimization of Sustainable Energy Systems</i> , <i>Design of Complex Systems</i> , and <i>Risk, Reliability, and Robustness</i> topics, ASME International Design Engineering Technical Conferences.
3/2010–8/2010	Sponsor speaker and technical judge, mechanisms and robotics competition, 2010 ASME International Design Engineering Technical Conferences, Montreal, Quebec, Canada
1/2010–5/2011	Technical Lead, MathWorks sponsorship of the American Solar Challenge
1/2010–5/2011	Industrial Advisory Board Member, Benjamin Franklin Inst. of Tech., Boston MA
7/2007–11/2007	Co-chair of engineering design technical session, University of Michigan College of Engineering Graduate Student Symposium
1/2004–Present	Peer reviewer for the ASME Journal of Mechanical Design, Mechatronics, Engineering Optimization, Structural and Multidisciplinary Optimization, International Journal for Numerical Methods in Engineering, Mathematics and Computers in Simulation, European Journal of Operational Research, International Journal of Production Economics, Management Science, Mathematics and Computers in Simulation, International Journal of Vehicle Design.
1/2002–7/2003	President and Founder of the Utah Solar Vehicle Design Team
9/1999–9/2000	Analyzed business practices and developed and implemented the total quality management program at Petersen Motor Co., Ogden Utah.

Honors and Awards

2013	ASME Design Automation Young Investigator Award
2012	UIUC Engineering Council Award for Excellence in Advising
2012	Nominated for the Illinois Student Senate Teaching Excellence Award (Official Voice of the Student Body)
2007	1 st place oral presentation and 2 nd place poster, University of Michigan College of Engineering Graduate Student Symposium (engineering design session)
2007	Nominated for the ISSMO/Springer Prize, young investigator award
2004–2007	National Science Foundation Graduate Research Fellow
2002	Member Tau Beta Pi, Engineering Honor Society
2001	Member Pi Tau Sigma, Mechanical Engineering Honor Society
1999	Member Phi Kappa Phi, Collegiate Honor Society

Professional Memberships

- American Society of Mechanical Engineers
- American Institute of Aeronautics and Astronautics

- Society of Automotive Engineers
- International Society for Structural and Multidisciplinary Optimization
- American Society for Engineering Education
- Society for Industrial and Applied Mathematics

Advising

Current Graduate Students:

Jeff Arena, M.S. Candidate in SEE.

Anand Deshmukh, Ph.D. Pre-candidate in SEE.

Tinghao Guo, M.S. Candidate in IE.

Daniel Herber, M.S. Candidate in SEE.

Ashish Khetan, M.S. Candidate in IE.

Jason McDonald, M.S. Candidate in SEE.

Lakshmi Rao, M.S. Candidate in IE.

MS Graduates:

- 1 Anand Deshmukh, M.S. in IE, May 2013. “Multidisciplinary Design Optimization of Dynamic Systems Using Surrogate Modeling Approach.” Continuing for Ph.D.

Current Undergraduate Students Conducting Research:

Varun Berry, B.S. Candidate in Computer Science.

Tuganai Borina, B.S. Candidate in IE.

Gabriela Chuchro, B.S. Candidate in Computer Science.

Adam Cornell, B.S. Candidate in GE.

Andrew Cui, B.S. Candidate in IE.

Chen Ge, B.S. Candidate in IE.

Mike Guevara, B.S. Candidate in GE.

Danny Lohan, B.S. Candidate in GE.

Yashu Madhavan, B.S. Candidate in GE.

Xin Niu, B.S. Candidate in IE.

Past Undergraduate Advisees:

- 1 Allen Kaitharath, B.S. GE May 2012. Pursuing an MS in Aerospace Engineering at UIUC.
- 2 Ethan Garner, B.S. GE May 2013. Continuing graduate school at Georgia Tech.

Ph.D. Preliminary and Final Exam Committees:

Yerkin Abdildin (prelim June 2012).

Media and Press Releases

- “James Allison wins Design Automation Young Investigator Award”: UIUC news brief, June 4, 2013. <http://tinyurl.com/Allison-DAYI>

- “ISE Professor James Allison Evolves Hands-On Learning Project”: UIUC news brief, May 2, 2013. <http://tinyurl.com/hands-on-2013-2>
- “Transmission Disassembly Makes For Interesting GE 410 Class”: UIUC news brief, April 22, 2013. <http://tinyurl.com/hands-on-2013-1>
- “Pumpkin Tossing at U of I”: WCIA News Broadcast (video), December 3, 2012. <http://tinyurl.com/trebuchet2012b>
- “Engineering intro class stages mini-pumpkin chuckin on the Bardeen Quad”: UIUC news brief, November 28, 2012. <http://tinyurl.com/trebuchet2012a>

Publications—Journal Articles

E. MacDonald, K.S. Whitefoot, P. Du, P.Y. Papalambros, R. Gonzalez, J.T. Allison. *Sustainability, Preference, and Profitability in Design Optimization*. ASME Journal of Mechanical Design, conditionally accepted.

- J10 J.T. Allison, T. Guo, Z. Han. *Co-Design of an Active Suspension Using Simultaneous Dynamic Optimization*. ASME Journal of Mechanical Design, conditionally accepted.
- J9 J.T. Allison. *Plant-Limited Co-Design of an Energy-Efficient Counterbalanced Robotic Manipulator*. ASME Journal of Mechanical Design, Vol. 135, No. 10, pp. 101003-1-9. <http://systemdesign.illinois.edu/publications/All13d.pdf>
- J8 J.T. Allison, D.R. Herber. *Multidisciplinary Design Optimization for Dynamic Engineering Systems*. AIAA Journal, **Special Section on Multidisciplinary Design Optimization**, to appear. <http://systemdesign.illinois.edu/publications/All13p1.pdf>
- J7 J.T. Allison. *Engineering System Co-Design with Limited Plant Redesign*. Engineering Optimization, published online April 2013, to appear in print. <http://systemdesign.illinois.edu/publications/All13b.pdf>
- J6 M.J. Alexander, J.T. Allison, P.Y. Papalambros, and D.J. Gorsich. *Constraint Management of Reduced Representation Variables in Decomposition-Based Design Optimization*. ASME Journal of Mechanical Design, **Special Issue on Designing Complex Engineered Systems**, Vol. 133, No. 10, pp. 101014-1-10, 2011. <http://www.systemdesign.illinois.edu/publications/Ale11c.pdf>
- J5 M.J. Alexander, J.T. Allison, and P.Y. Papalambros. *Decomposition-based Design Optimization of Electric Vehicle Powertrains Using Proper Orthogonal Decomposition*. **Invited Article**, International Journal of Powertrains, Vol. 1, No. 1, pp. 72-92, 2012. <http://www.systemdesign.illinois.edu/publications/Ale11b.pdf>
- J4 M.J. Alexander, J.T. Allison, and P.Y. Papalambros. *Reduced Representations of Vector-Valued Coupling Variables in Decomposition-based Design Optimization*. Structural and Multidisciplinary Optimization, Vol. 44, No. 3, pp. 379-391, 2011. <http://www.systemdesign.illinois.edu/publications/Ale11a.pdf>
- J3 J.T. Allison and P.Y. Papalambros. *Consistency Constraint Allocation in Augmented Lagrangian Coordination*. ASME Journal of Mechanical Design, Vol. 132, No. 7, 2010, pp. 071007-1-8. <http://www.systemdesign.illinois.edu/publications/All10a.pdf>
- J2 J.T. Allison, M. Kokkolaras, and P.Y. Papalambros. *Optimal Partitioning and Coordination Decisions in Decomposition-based Design Optimization*. ASME Journal of Mechanical Design, Vol. 131, No. 8, 2009, pp. 081008-1-8. <http://www.systemdesign.illinois.edu/publications/All09a.pdf>
- J1 J.T. Allison, M. Kokkolaras, and P.Y. Papalambros. *On Selection of Single-Level Formulations for Complex System Design Optimization*. ASME Journal of Mechanical Design, Vol. 129, No. 9, 2007, pp. 898-906.

<http://www.systemdesign.illinois.edu/publications/All07b.pdf>

Publications—Conference Proceedings

- C23 A.P. Deshmukh, J.T. Allison. *Design of Nonlinear Dynamic Systems using Surrogate Models of Derivative Functions*. In the proceedings of the 2013 ASME International Design Engineering Technical Conference, DETC2013-12262. Aug. 4–7 2013.
<http://systemdesign.illinois.edu/publications/Des13c.pdf>
- C22 D.R. Herber, J.T. Allison. *Wave Energy Extraction Maximization in Irregular Ocean Waves using Pseudospectral Methods*. In the proceedings of the 2013 ASME International Design Engineering Technical Conference, DETC2013-12600. Aug. 4–7 2013.
—**Finalist for the ASME Design Automation Committee Best Paper Award**—
<http://systemdesign.illinois.edu/publications/Her13a.pdf>
- C21 N.A. Bharadwaj, J.T. Allison, R.H. Ewoldt. *Early-Stage Design of Rheologically Complex Materials via Material Function Design Targets*. In the proceedings of the 2013 ASME International Design Engineering Technical Conference, DETC2013-12262. ASME, Aug. 4–7 2013. <http://systemdesign.illinois.edu/publications/Bhar13a.pdf>
- C20 J.T. Allison, A. Khetan, D. Lohan. *Managing Variable-Dimension Structural Optimization Problems using Generative Algorithms*. In the Proceedings of the 10th World Congress on Structural and Multidisciplinary Optimization. May 19–24 2013.
<http://systemdesign.illinois.edu/publications/All13c.pdf>
- C19 T. Guo, J.T. Allison. *On the Use of MPCCs in Combined Topological and Parametric Design of Genetic Regulatory Circuits*. In the Proceedings of the 10th World Congress on Structural and Multidisciplinary Optimization. May 19–24 2013.
<http://systemdesign.illinois.edu/publications/Guo13a.pdf>
- C18 A.P. Deshmukh, J.T. Allison. *Simultaneous Structural and Control System Design for Horizontal Axis Wind Turbines*. In the Proceedings of the 9th AIAA Multidisciplinary Design Optimization Specialist Conference. Apr. 8–11 2013.
<http://systemdesign.illinois.edu/publications/Des13a.pdf>
- C17 J.T. Allison, D.R. Herber. *Multidisciplinary Design Optimization of Dynamic Engineering Systems*. In the Proceedings of the 9th AIAA Multidisciplinary Design Optimization Specialist Conference. Apr. 8–11 2013. See also journal publication J8 above.
<http://systemdesign.illinois.edu/publications/All13a.pdf>
- C16 J.T. Allison, A. Kaitharath, D.R. Herber. *Wave Energy Extraction Maximization Using Direct Transcription*. In the Proceedings of the ASME 2012 International Mechanical Engineering Congress & Exposition, IMECE2012-86619. Nov. 9–15 2012.
<http://systemdesign.illinois.edu/publications/All12c.pdf>
- C15 J.T. Allison. *Plant-Limited Co-Design of an Energy Efficient Counterbalanced Robotic Manipulator*. In the Proceedings of the 2012 ASME International Design Engineering Technical Conference, DETC2012-71108. Aug. 12–15 2012. See also the journal publication J9.
<http://systemdesign.illinois.edu/publications/All12b.pdf>
- C14 J.T. Allison. *Engineering System Co-Design with Limited Plant Redesign*. In the Proceedings of the 8th AIAA Multidisciplinary Design Optimization Specialist Conference. Apr. 23–26 2012. See also journal publication J7 above.
<http://systemdesign.illinois.edu/publications/All12a.pdf>
- C13 J.T. Allison and Z. Han. *Co-Design of an Active Suspension Using Simultaneous Dynamic Optimization*. In the Proceedings of the 2011 ASME International Design Engineering Technical Conference DETC2011-48521. Aug. 28–31 2011. See also the corresponding journal submission.

- <http://www.systemdesign.illinois.edu/publications/All11a.pdf>
- C12 J.T. Allison and S. Nazari. *Combined Plant and Controller Design Using Decomposition-Based Design Optimization and the Minimum Principle*. In the Proceedings of the 2010 International ASME Design Engineering Technical Conference DETC2010-28887. Aug. 15-18 2010.
<http://www.systemdesign.illinois.edu/publications/All10b.pdf>
- C11 E. MacDonald, K. Whitefoot, J.T. Allison, P.Y. Papalambros, and R. Gonzalez. *An Investigation of Sustainability, Preference, and Profitability in Design Optimization*. In the Proceedings of the 2010 ASME International Design Engineering Technical Conference DETC2010-28887. Aug. 15-18 2010. See also the corresponding journal submission.
<http://www.systemdesign.illinois.edu/publications/Mac10a.pdf>
- C10 M.J. Alexander, J.T. Allison, P.Y. Papalambros, and D.J. Gorsich. *Constraint Management of Reduced Representation Variables in Decomposition-Based Design Optimization*. In the Proceedings of the 2010 ASME International Design Engineering Technical Conference DETC2010-28887. ASME, Aug. 15-18 2010. See also journal publication J6 above.
<http://www.systemdesign.illinois.edu/publications/Ale10a.pdf>
- C9 M.J. Alexander, J.T. Allison, and P.Y. Papalambros. *Reduced Representations of Vector-Valued Coupling Variables in Decomposition-Based Design Optimization*. In the Proceedings of the 8th World Congress on Structural and Multidisciplinary Optimization, Lisbon, Portugal, June 1-5, 2009. See also journal publication J4 above.
<http://www.systemdesign.illinois.edu/publications/Ale09.pdf>
- C8 J.T. Allison and P.Y. Papalambros. *Consistency Constraint Allocation in Augmented Lagrangian Coordination*. In the Proceedings of the 2008 ASME International Design Engineering Technical Conference DETC2008-49823. ASME, Aug. 3-6 2008. See also journal publication J3 above.
<http://www.systemdesign.illinois.edu/publications/All08.pdf>
- C7 J.T. Allison, M. Kokkolaras, and P.Y. Papalambros. *Optimal Partitioning and Coordination Decisions in Decomposition-Based Design Optimization*. In the Proceedings of the 2007 International Design Engineering Technical Conference DETC2007-34698. ASME, Sept. 4-7 2007. See also journal publication J2 above.
<http://www.systemdesign.illinois.edu/publications/All07c.pdf>
- C6 J.T. Allison and P.Y. Papalambros. *Optimal Partitioning and Coordination Decisions in System Design Using an Evolutionary Algorithm*. In the Proceedings of the 7th World Conference on Structural and Multidisciplinary Optimization, May 21-25 2007.
<http://www.systemdesign.illinois.edu/publications/All07a.pdf>
- C5 B. Sohns, J.T. Allison, H. Fathy, and J.L. Stein. *Efficient Parameterization of Large-Scale Dynamic Models Through the Use of Activity Analysis*. In the Proceedings of the 2006 ASME International Mechanical Engineering Congress and Exposition, Chicago, IL, Nov. 5-10 2006.
<http://www.systemdesign.illinois.edu/publications/Soh06.pdf>
- C4 J.T. Allison, B. Roth, M. Kokkolaras, I. Kroo, and P.Y. Papalambros. *Aircraft Family Design Using Decomposition-Based Methods*. In the Proceedings of the 11th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Portsmouth, Virginia, Sept. 6-8 2006. <http://www.systemdesign.illinois.edu/publications/All06c.pdf>
- C3 J.T. Allison, D. Walsh, M. Kokkolaras, P.Y. Papalambros, and M. Cartmell. *Analytical Target Cascading in Aircraft Design*. In the Proceedings of the 44th AIAA Aerospace Sciences Meeting and Exhibit AIAA-2006-1326. January 9-12 2006.
<http://www.systemdesign.illinois.edu/publications/All06.pdf>
- C2 J.T. Allison, M. Kokkolaras, and P.Y. Papalambros. *On the Impact of Coupling Strength on Complex System Optimization for Single-Level Formulations*. In the Proceedings of the ASME

International Design Engineering Technical Conference DETC2005-84790. Sept. 24-28 2005. See also journal publication J1 above.

<http://www.systemdesign.illinois.edu/publications/All105b.pdf>

- C1 J.T. Allison, M. Kokkolaras, M. Zawislak, and P.Y. Papalambros. *On the Use of Analytical Target Cascading and Collaborative Optimization for Complex System Design*. In the Proceedings of the 6th World Conference on Structural and Multidisciplinary Optimization, May 30-June 3 2005. <http://www.systemdesign.illinois.edu/publications/All105a.pdf>

Other Publications

- 6 X. Niu (Undergraduate advisee). *Modeling and Design Analysis of a Permanent Magnet Linear Synchronous Generator*. Technical Report UIUC-ESDL-2013-01, August 2013. <http://systemdesign.illinois.edu/publications/Niu13a.pdf>
- 5 J.T. Allison. *Optimal Partitioning and Coordination Decisions in Decomposition-based Design Optimization*. Ph.D. dissertation, Department of Mechanical Engineering, University of Michigan, 2008.
- 4 J.T. Allison *Design Optimization Model for an Automotive Electric Water Pump*. Technical Report, University of Michigan, Optimal Design Laboratory, 2007. <http://ode.engin.umich.edu/repository/TR2007.Allison.pdf>
- 3 B. Sohns, J.T. Allison, H. Fathy, and J.L. Stein. *Parameterization of a HMMWV Model Through the Use of Model Validation Techniques*. In the Society of Automotive Engineers World Congress, Detroit, MI, April 3-7, 2006. (presentation only)
- 2 J.T. Allison, P.Y. Papalambros. *Practical Advances in Optimal System Design*. Graduate Student Symposium, University of Michigan, October 29th 2005, Ann Arbor, MI, USA. (poster and presentation)
- 1 J.T. Allison. *Complex System Optimization: A Review of Analytical Target Cascading, Collaborative Optimization, and Other Formulations*. Masters thesis, Department of Mechanical Engineering, University of Michigan, 2004.

Urbana Illinois, October 15, 2013