

*Curriculum Vitae*

# Daniel R. Herber

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## Education

- 8/2014–12/2017 *Ph.D. in Systems and Entrepreneurial Engineering*, University of Illinois at Urbana-Champaign, GPA 3.83/4.00, Adviser—James T. Allison  
Dissertation Title: *Advances in combined architecture, plant, and control design*
- 8/2012–5/2014 *M.S. in Systems and Entrepreneurial Engineering*, University of Illinois at Urbana-Champaign, GPA 3.79/4.00, Adviser—James T. Allison
- 8/2008–12/2011 *B.S. in General Engineering*, Highest Honors, University of Illinois at Urbana-Champaign, GPA 3.81/4.00, Physics minor, Applied Statistics secondary field of concentration

## Research Interests

- Methodology combined plant and control design (co-design) · co-design optimality conditions · scaling of dynamic optimization formulations · direct transcription · pseudospectral methods · modeling and simulation of dynamic systems · engineering design optimization · data-driven design optimization · multidisciplinary dynamic system design optimization · architecture design · graph enumeration
- Applications ocean wave energy conversion · strain-actuated solar arrays · vehicle suspensions · electronic analog filter circuits · thermal management networks

## Research Experience

- 1/2018–Present *Postdoctoral Research Associate*, Center for Power Optimization of Electro-Thermal Systems (PO-ETS), UIUC, developing methods for architecture generation and evaluation for aircraft power and thermal systems in collaboration with the Air Force Research Laboratory.
- 1/2018–Present *Postdoctoral Research Associate*, Center for Power Optimization of Electro-Thermal Systems (PO-ETS), UIUC, investigating methods for electromagnetic interference (EMI) mitigation in DC-AC converters through structured topological design exploration.
- 12/2011–Present *Member*, Engineering System Design Lab, UIUC.
- 5/2016–7/2016 *Simulation & Analysis Intern*, Deere & Company, focusing on battery modeling and systems engineering projects.
- 5/2015–8/2015 *Simulation & Analysis Intern*, Deere & Company, researched methods to solve complex system architecture design problems focusing on hybrid powertrains and active suspensions.
- 1/2013–12/2017 *Graduate Research Assistant*, Dept. of Industrial and Enterprise Systems Engineering, UIUC, appointment to work on various research projects.
- 1/2012–1/2014 *Research Intern*, John Deere Technology Innovation Center, Champaign, IL, developed a discrete event simulation of large-scale agricultural operations using MATLAB, SIMULINK, and R linked with agricultural environment simulations.
- 9/2011–12/2011 *Undergraduate Researcher*, Engineering System Design Lab, UIUC, researched data-driven models of electric motors for use in engineering design optimization.

## Teaching Experience

SP2015, SP2017	<i>GE 598—Guest Lecturer, Assistant</i> , Dept. of Industrial and Enterprise Systems Engineering, UIUC, duties included lecturing on select days, curriculum development, and grading.
FA2012, SP2016	<i>GE 312—Graduate Teaching Assistant</i> , Dept. of Industrial and Enterprise Systems Engineering, UIUC, duties included leading small groups on how to use the laboratory equipment, lecturing, and grading.
SP2014	<i>GE 413—Graduate Teaching Assistant</i> , Dept. of Industrial and Enterprise Systems Engineering, UIUC, duties included holding office hours, preparing course materials, and lecturing on select days.
FA2013	<i>GE 410—Graduate Teaching Assistant</i> , Dept. of Industrial and Enterprise Systems Engineering, UIUC, duties included holding office hours and lecturing on select days.
FA2011	<i>GE 410—Grader</i> , Dept. of Industrial and Enterprise Systems Engineering, UIUC, graded assignments and projects for the senior level mechanical component design course.
Various	<i>Undergraduate Project Adviser</i> , multiple student projects related to architectures with structured components, wave energy converters, hybrid powertrains, strain-actuated solar arrays, and trebuchets. See links for some projects: <a href="http://tinyurl.com/Niu13a">http://tinyurl.com/Niu13a</a> and <a href="https://tinyurl.com/SLi17a">https://tinyurl.com/SLi17a</a>

## Honors and Awards

8/2016	<i>List of Teachers Ranked as Excellent by Their Students Spring 2016</i> , based on student evaluations for position as a GE 312 teaching assistant.
5/2015	<i>JPL Research Poster Conference Award</i> , co-author on poster titled “Strain Actuation & Sensing of SC Structures for Payload Jitter Suppression and Momentum Dumping” presented at the Jet Propulsion Laboratory Research and Development poster session on Nov. 12, 2014.
4/2015	<i>Mavis Future Faculty Fellow</i> , selected as a MF3 Fellow for 2015–2016 whose program is designed to help doctoral students in the College of Engineering become the next generation of great engineering faculty.
3/2014	<i>Honorable Mention</i> , NSF Graduate Research Fellowship Program.
4/2013	<i>ISE Service Award</i> , given to recognize students who demonstrate leadership and commitment to the Dept. of Industrial and Enterprise Systems Engineering, UIUC.
3/2013	<i>Honorable Mention</i> , NSF Graduate Research Fellowship Program.
8/2012	<i>Best Technological Innovation</i> , given to an intern for the best technological innovation at the Research Park at UIUC, project with John Deere Technology Innovation Center.
1/2009–1/2012	<i>Dean’s List</i> , top 20% GPA in UIUC College of Engineering for all undergraduate semesters.
1/2009–12/2011	<i>James Scholar</i> , completion of UIUC College of Engineering honors program.

## Service and Leadership

7/2014	<i>College for Kids Kamp Kaboom—Mechanics of Trebuchets</i> , helped organize and run a 6 hour event demonstrating engineering principles to elementary school students.
4/2013–2017	<i>Junior Scientist Day—Mechanics of Trebuchets</i> , helped organize and run a science fair-like exhibit demonstrating engineering principles to elementary school students using trebuchets.
3/2013–2014	<i>Engineering Open House—Mechanics of Trebuchets</i> , helped organize and run a science fair exhibit demonstrating engineering principles to K-12 students.
Fall 2012–2014	<i>GE 100—Student Helper</i> , Dept. of Industrial and Enterprise Systems Engineering, UIUC, assisted with the design and instruction of trebuchet introductory project.

4/2012–Present     *Peer Reviewer*, reviewed various journal articles and conference proceedings.

## Professional Memberships

3/2012–Present     American Society of Mechanical Engineers, member

8/2012–Present     American Institute of Aeronautics and Astronautics, member

## Select Coursework

IE513: Optimal System Design · GE598: Compliant Mechanism Design · GE524: Data-Based Systems Modeling · GE423: Mechatronics · IE400: Design & Analysis of Experiments · IE431: Quality Engineering · GE598: Engineering Design Science · IE598: Advanced Topics in Continuous Optimization

ECE515 Control System Theory & Design · ECE553 Optimum Control Systems · GE525: Control of Complex Systems · ECE528: Analysis of Nonlinear Systems · ECE517: Nonlinear and Adaptive Control · ME561: Convex Methods in Control

CS450: Numerical Analysis · MATH558: Methods of Applied Mathematics · GE400: Engineering Law · STAT420: Methods of Applied Statistics · ENG598: Creativity, Innovation, Vision

## Programming Languages

Advanced            matlab · simscape ·  $\LaTeX$  · markdown

Dabbled            python · C · R · php · html/css

## Profiles

- Google Scholar, 158 citations. <http://tinyurl.com/DRHgooglescholar>
- ResearchGate. [https://www.researchgate.net/profile/Daniel\\_Herber](https://www.researchgate.net/profile/Daniel_Herber)
- Publons <https://publons.com/author/1441590>
- GitHub. <http://tinyurl.com/DRHgithub>
- Matlab Central. <http://tinyurl.com/DRHmatlabcentral>
- LinkedIn. <http://tinyurl.com/DRHlinkedin>
- Engineering System Design Lab. <http://tinyurl.com/DRHesdl>
- ORCID (0000-0003-4995-7375) <https://orcid.org/0000-0003-4995-7375>

## Media





- CAPSat: Undergrad students prepare to launch a satellite (<http://ise.illinois.edu/newsroom/article/capsat>)
- Dan Herber wins Mavis Future Faculty Fellow (<http://ise.illinois.edu/newsroom/article/dan-herber-wins-mavis-future-faculty-fellow>)
- Interns have much to gain at Research Park (<https://dailyillini.com/uncategorized/2012/08/23/interns-have-much-to-gain-at-research-park/>)
- Research Park honors most valuable interns of 2012 (<http://www.researchpark.illinois.edu/news/research-park-honors-most-valuable-interns-2012>)

## Publications—Unpublished







- \* [DR Herber](#) and JT Allison, *Nested and simultaneous solution strategies for general combined plant and control design problems*, (to appear) ASME Journal of Mechanical Design. doi: 10.1115/1.4040705
- \* [DR Herber](#) and JT Allison, *A problem class with combined architecture, plant, and control design applied to vehicle suspensions*, (to appear) ASME International Design Engineering Technical Conferences, no. DETC2018-86213, Aug. 2018






- \* T Guo, DR Herber, and JT Allison, *Reducing evaluation cost for circuit synthesis using active learning*, (to appear) ASME International Design Engineering Technical Conferences, no. DETC2018-85654, Aug. 2018
- \* SRT Peddada, DR Herber, HC Pangborn, AG Alleyne, and JT Allison, *Optimal flow control and single split architecture exploration for fluid-based thermal management*, (to appear) ASME International Design Engineering Technical Conferences, no. DETC2018-86148, Aug. 2018

## Publications—Journal Articles






- $\mathcal{J}4$  CM Chilan, DR Herber, YK Nakka, SJ Chung, JT Allison, JB Aldrich, and OS Alvarez-Salazar, “Co-design of strain-actuated solar arrays for spacecraft precision pointing and jitter reduction,” *AIAA Journal*, vol. 55, no. 9, pp. 3180–3195, Sep. 2017. doi: 10.2514/1.J055748,  
 <http://systemdesign.illinois.edu/publications/Chilan2017a.pdf>
- $\mathcal{J}3$  DR Herber, T Guo, and JT Allison, “Enumeration of architectures with perfect matchings,” *ASME Journal of Mechanical Design*, vol. 139, no. 5, p. 051403, May 2017. doi: 10.1115/1.4036132,  
 <http://systemdesign.illinois.edu/publications/Her17a.pdf>
- $\mathcal{J}2$  DR Herber, AP Deshmukh, ME Mitchell, and JT Allison, “Project-based curriculum for teaching analytical design to freshman engineering students via reconfigurable trebuchets,” *Education Sciences*, vol. 6, no. 1, Feb. 2016. doi: 10.3390/educsci6010007,  
 <http://systemdesign.illinois.edu/publications/Her16a.pdf>
- $\mathcal{J}1$  JT Allison and DR Herber, “Multidisciplinary design optimization of dynamic engineering systems,” *AIAA Journal*, vol. 52, no. 4, pp. 691–710, Apr. 2014. doi: 10.2514/1.J052182,  
 <http://systemdesign.illinois.edu/publications/All14a.pdf>  
 —Special Section on Multidisciplinary Design Optimization—

## Publications—Conference Proceedings

- $\mathcal{C}11$  C Lin, DR Herber, Vedant, YH Lee, A Ghosh, RH Ewoldt, and JT Allison, “Attitude control system complexity reduction via tailored viscoelastic damping co-design,” in *AAS Guidance & Control Conference*, Breckenridge, CO, USA, Feb. 2018,  
 <http://systemdesign.illinois.edu/publications/Lin2018a.pdf>
- $\mathcal{C}10$  DR Herber and JT Allison, “Unified scaling of dynamic optimization design formulations,” in *ASME International Design Engineering Technical Conferences*, Cleveland, OH, USA, Aug. 2017, V02AT03A003. doi: 10.1115/DETC2017-67676,  
 <http://systemdesign.illinois.edu/publications/Her17c.pdf>
- $\mathcal{C}9$  DR Herber and JT Allison, “Nested and simultaneous solution strategies for general combined plant and controller design problems,” in *ASME International Design Engineering Technical Conferences*, Cleveland, OH, USA, Aug. 2017, V02AT03A002. doi: 10.1115/DETC2017-67668,  
 <http://systemdesign.illinois.edu/publications/Her17b.pdf>
- $\mathcal{C}8$  DR Herber, T Guo, and JT Allison, “Enumeration of architectures with perfect matchings,” in *ASME International Design Engineering Technical Conferences*, Charlotte, NC, USA, Aug. 2016, V02AT03A005. doi: 10.1115/DETC2016-60212,  
 <http://systemdesign.illinois.edu/publications/Her16b.pdf>
- $\mathcal{C}7$  CM Chilan, DR Herber, YK Nakka, SJ Chung, JT Allison, JB Aldrich, and OS Alvarez-Salazar, “Co-design of strain-actuated solar arrays for precision pointing and jitter reduction,” in *AIAA Science and Technology Forum and Exposition*, San Diego, CA, USA, Jan. 2016. doi: 10.2514/6.2016-0162,  
 <http://systemdesign.illinois.edu/publications/Chi16a.pdf>
- $\mathcal{C}6$  JT Allison, DR Herber, and AP Deshmukh, “Integrated design of dynamic sustainable energy systems,” in *International Conference on Engineering Design*, vol. 1, Milan, Italy, Jul. 2015, pp. 299–308,  
 <http://systemdesign.illinois.edu/publications/All15a.pdf>

- C5 AP Deshmukh, DR Herber, and JT Allison, “Bridging the gap between open-loop and closed-loop control in co-design: A framework for complete optimal plant and control architecture design,” in *American Control Conference*, Chicago, IL, USA, Jul. 2015, pp. 4916–4922. doi: 10.1109/ACC.2015.7172104,  
 <http://systemdesign.illinois.edu/publications/Des15a.pdf>
- C4 DR Herber, JW McDonald, OS Alvarez-Salazar, G Krishnan, and JT Allison, “Reducing spacecraft jitter during satellite reorientation maneuvers via solar array dynamics,” in *AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Atlanta, GA, USA, Jun. 2014, pp. 1–17. doi: 10.2514/6.2014-3278,  
 <http://systemdesign.illinois.edu/publications/Her14c.pdf>
- C3 DR Herber and JT Allison, “Wave energy extraction maximization in irregular ocean waves using pseudospectral methods,” in *ASME International Design Engineering Technical Conferences*, Portland, OR, USA, Aug. 2013, V03AT03A018. doi: 10.1115/DETC2013-12600,  
 <http://systemdesign.illinois.edu/publications/Her13a.pdf>  
 —Nominated for the Design Automation Committee Best Paper Award—
- C2 JT Allison and DR Herber, “Multidisciplinary design optimization of dynamic engineering systems,” in *AIAA Multidisciplinary Design Optimization Specialist Conference*, Boston, MA, USA, Apr. 2013, pp. 1–30. doi: 10.2514/6.2013-1462,  
 <http://systemdesign.illinois.edu/publications/All13a.pdf>
- C1 JT Allison, A Kaitharath, and DR Herber, “Wave energy extraction maximization using direct transcription,” in *ASME International Mechanical Engineering Congress and Exposition*, Houston, TX, USA, Nov. 2012, pp. 485–495. doi: 10.1115/IMECE2012-86619,  
 <http://systemdesign.illinois.edu/publications/All12c.pdf>

## Publications—Other

- O5 DR Herber, “Advances in combined architecture, plant, and control design,” Ph.D. Dissertation, University of Illinois at Urbana-Champaign, Urbana, IL, USA, Dec. 2017,  
 <http://systemdesign.illinois.edu/publications/Her17e.pdf>
- O4 DR Herber and JT Allison, “Enhancements to the perfect matching-based tree algorithm for generating architectures,” Engineering System Design Lab, Urbana, IL, USA, Tech. Rep. UIUC-ESDL-2017-02, Dec. 2017,  
 <http://systemdesign.illinois.edu/publications/Her17d.pdf>
- O3 DR Herber, “Basic implementation of multiple-interval pseudospectral methods to solve optimal control problems,” Engineering System Design Lab, Urbana, IL, USA, Technical Report UIUC-ESDL-2015-01, Jun. 2015. url: <http://hdl.handle.net/2142/77888>,  
 <http://systemdesign.illinois.edu/publications/Her15a.pdf>
- O2 DR Herber, “Solving optimal control problems using simscape models for state derivatives,” Engineering System Design Lab, Urbana, IL, USA, Technical Report UIUC-ESDL-2014-01, Jul. 2014. url: <http://hdl.handle.net/2142/50015>,  
 <http://systemdesign.illinois.edu/publications/Her14b.pdf>
- O1 DR Herber, “Dynamic system design optimization of wave energy converters utilizing direct transcription,” M.S. Thesis, University of Illinois at Urbana-Champaign, Urbana, IL, USA, May 2014. url: <http://hdl.handle.net/2142/49463>,  
 <http://systemdesign.illinois.edu/publications/Her14a.pdf>

## Presentations

- P7 Presenting author for C10 at the ASME International Design Engineering Technical Conference, Cleveland, OH, USA, Aug. 6–9, 2017.

- $\mathcal{P}6$  Presenting author for  $\mathcal{C}9$  at the ASME International Design Engineering Technical Conference, Cleveland, OH, USA, Aug. 6–9, 2017.
- $\mathcal{P}5$  Presenting author for  $\mathcal{C}8$  at the ASME International Design Engineering Technical Conference, Charlotte, NC, USA, Aug. 21–24, 2016.
- $\mathcal{P}4$  Presenting author for  $\mathcal{C}5$  at the American Control Conference, Chicago, IL, USA, July 1–3, 2015.
- $\mathcal{P}3$  Presenting author for  $\mathcal{C}4$  at the AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Atlanta, GA, USA, June 16–20, 2014.
- $\mathcal{P}2$  Presenting author for  $\mathcal{C}3$  at the ASME International Design Engineering Technical Conference, Portland, OR, USA, Aug. 4–7, 2013.
- $\mathcal{P}1$  Presenting author for  $\mathcal{C}1$  at the ASME International Mechanical Engineering Congress & Exposition, Houston, TX, USA, Nov. 9–15, 2012.

Champaign, Illinois. July 5, 2018