

# MATTHEW L. BOLTON

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## I. Research Interests

System safety, human performance modeling, erroneous human behavior, systems engineering, formal methods, model checking, human-automation interaction, complex system failure, situational and spatial awareness measurement, psychophysics, cyber security.

## II. Education

- Ph.D., Systems Engineering, University of Virginia, Charlottesville, with distinction. August 2010.  
Dissertation: Using Task Analytic Behavior Modeling, Erroneous Human Behavior Generation, and Formal Methods to Evaluate the Role of Human-automation Interaction in System Failure. Advisor: Dr. Ellen Bass.
- M.S., Systems Engineering, University of Virginia, Charlottesville, with distinction. January 2006.  
Thesis: An investigation of the effects of texture and field of view on spatial awareness in synthetic vision head-down displays. Advisor: Dr. Ellen Bass.
- B.S., Computer Science, Minor in Applied Mathematics, University of Virginia, Charlottesville. May 2003.

## III. Employment History

### Current Appointments

- Assistant Professor, Department of Industrial and Systems Engineering, University at Buffalo, State University of New York, 01/2014 – Present.

### Past Professional Experience

- Adjunct Assistant Professor, Department of Mechanical and Industrial Engineering, University of Illinois at Chicago, 01/2014 – 05/2016.
- Assistant Professor, Department of Mechanical and Industrial Engineering, University of Illinois at Chicago, 08/2012 – 01/2014.
- Courtesy Appointment, Assistant Professor, Department of Computer Science, University of Illinois at Chicago, 10/2012 – 01/2014.
- Senior Research Associate, San José State University Research Foundation, NASA Ames Research Center, Moffett Field, CA, 08/2010 – 08/2012.
- Adjunct Assistant Professor, San José State University, Department of Industrial and Systems Engineering, San José, CA, 01/2012 – 08/2012.
- Independent Consultant for the University of Virginia, 02/2011 – 10/2011.
- Graduate Research Assistant, Department of Systems and Information Engineering, University of Virginia, Charlottesville, 08/2003 – 08/2010.
- Visiting Scholar, NASA Ames Research Center, Moffett Field, 09/2009.
- Visiting Scholar, National Institute of Aerospace, Hampton, 05/2009.
- Rising Star Fellow / Intern, NASA Langley Research Center, Hampton, 07/2004 – 08/2005.
- Research Assistant, Center for Applied Biomechanics, University of Virginia, Charlottesville, 05/2000 – 08/2003.

## IV. Honors and Awards

### Awards

- William C. Howell Young Investigator Award, Human Factors and Ergonomics Society, 2018.
- Army Young Investigator Award Recipient, 2015-2017.
- Selected as a Senior Member of the IEEE Society, 2015.
- Franklin V. Taylor Memorial Award for the Best Conference Paper (out of 612 accepted papers) at the 2011 IEEE International Conference on Systems Man and Cybernetics.
- Best paper award (out of 24 accepted papers) at the 20<sup>th</sup> Annual Conference on Behavior Representation in Modeling and Simulation (2011).
- Louis T. Rader Outstanding Graduate Student Award, University of Virginia, Department of Systems and Information Engineering, 2010/2011.
- University of Virginia Award for Excellence in Scholarship in the Sciences & Engineering, 2008.
- Student Member with Honors in the Human Factors and Ergonomics Society, 2007-2010.
- Louis T. Rader Outstanding Masters Student Award, University of Virginia, Department of Systems and information Engineering, 2005/2006.
- Best paper in the Human Computer Interaction track at the 2006 IEEE Systems and Information Engineering Design Symposium.

### Fellowships

- National Library of Medicine medical informatics trainee fellowship, 2007–2010.
- Governor’s Fellowship, spring 2007.
- ARCS Scholarship, 2006–2007.
- National Institute of Aerospace’s Rising Star Fellowship, 2004–2006.

### Advisee and Mentored Student Awards

- Kylie Moliaro (advisee) won Best Poster at the 2017 Human Factors Engineering Inter-University Workshop.
- Xi Zheng (advisee) won 2<sup>nd</sup> Best Student Paper in Human Performance Modeling at the 2017 HFES Annual Meeting.
- Xi Zheng (advisee) won 2<sup>nd</sup> place at the 2016 UB ISE Poster Competition.
- Adam Houser (advisee) won 2<sup>nd</sup> place at the 2015 UB ISE Poster Competition.
- Meng Li (advisee) won Best Poster at the 15th Annual Human Factors Engineering Inter-University Workshop.
- Judith Tiferes (mentee and coauthor) was a finalist for the HFES Alphonse Chapanis Student Paper Award.

## V. Media Coverage

- My medical alarm research was profiled in the in the Buffalo Engineering 2018 magazine.
- My formal method for human task behavior modeling and system safety analysis was highlighted in the NASA report titled “Assessment of the State-of-the-Art of System-Wide Safety and Assurance Technologies”  
<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20170011193.pdf>
- WIVB, the local Buffalo CBS affiliate did a television news story on my medical alarm research which aired on March 28, 2017, at 5:41 pm: <https://goo.gl/rzWj2F>
- My medical alarm research was featured as the cover story on UBNow (the online magazine at the University at Buffalo) on March 20, 2017: <https://goo.gl/hEuemM>
- UB issued a press release covering my medical alarm research: <https://goo.gl/cuUpLG>

- Army Research Office Young Investigator Program Award covered in the Buffalo Engineering 2016 magazine.
- Medical alarm research profiled on the M&A Malpractice blog: <http://goo.gl/qVnpJw> and <http://goo.gl/Jjk7sr>
- Medical alarm research profiled on NetworkWorld's *Mobile Cloud Blog*, <https://goo.gl/UJtnVH>
- Interviewed for ARCTrends, the official blog of Arcadia Healthcare Solutions, <http://tinyurl.com/q4j4oeb>
- Lab profiled in Volume 20, No. 3, Fall 2014 of *Cognitia*, the newsletter of the Cognitive Engineering and Decision Making Technical Group of the Human Factors and Ergonomics Society
- Work profiled in the December 2013 issue of *Aerospace America* (see the 2<sup>nd</sup> and 3<sup>rd</sup> paragraphs on page 43), <http://tinyurl.com/AADec2013>
- Work profiled in the AIAA ISTC Fall 2013 Newsletter.
- Work profiled in the 2007 University of Virginia President's Report, <https://goo.gl/N6xa6F>

## VI. Publications

In the below, my name is in **bold**. Mentored students are underlined. Corresponding author has a <sup>C</sup>. A product with <sup>+</sup> was written prior to UB. A product with <sup>A</sup> was written with my dissertation adviser.

### Summary Statistics

Edited Volumes:	1	Book Chapters:	5	Journal Articles:	25
Refereed Conference Papers:	30	Other Conference Papers:	5	Refereed Abstracts:	4
Invited Talks:	27	Posters:	15		

### Citation Indices (as of 7/20/2018)

**Google Scholar** (See <http://tinyurl.com/mlbpubs>)

Total Citations: 812 (633 since 2013)    h-index: 16 (13 since 2013)    i10-index: 22 (19 since 2013)

### Web of Science

Total Citations: 241    h-index: 9    Average Cites: 7.77

### Edited Volumes

E1 <sup>+</sup> **Bolton, M. L.**<sup>C</sup>, Degani, A., & Palanque, P., eds. (2012). *Proceeding of the Workshop on Formal Methods in Human-Machine Interaction (Formal H)*, 47 pages. London: Imperial College.

### Book Chapters

- B1 <sup>A</sup> **Bolton, M. L.**<sup>C</sup> & Bass, E. J. (2017). Enhanced Operator Function Model (EOFM): A Task Analytic Modeling Formalism for Including Human Behavior in the Verification of Complex Systems. In Weyers, B., Bowen, J., Dix, A., & Palanque, P. (Eds.), *The Handbook of Formal Methods in Human-Computer Interaction* (pp. 343-377). Gewerbestrasse: Springer International.
- B2 <sup>+</sup> **Bolton, M. L.**<sup>C</sup> & Bass, E. J. (2011). Comparing perceptual judgment and subjective measures of spatial awareness. In E. Salas & A. S. Dietz (Eds.), *Situational Awareness: Critical Essays on Human Factors in Aviation* (pp. 211–221). Surrey: Ashgate.  
This is a reprint of: Bolton, M. L. & Bass, E. J. (2009). Comparing perceptual judgment and subjective measures of spatial awareness. *Applied Ergonomics*, 40, 597–607.
- B3 <sup>+</sup> **Bolton, M. L.**<sup>C</sup>, Klein, K. A., & Göknur, S. C. (2006). Navigation. In Strunk, E. A. & Knight, J. C. (Eds.), *Digital Avionics: A Computing Perspective* (pp. 15–26). Los Alamitos: IEEE Computer Society.
- B4 <sup>+</sup> Göknur, S. C.<sup>C</sup>, Klein, K. A., & **Bolton, M. L.** (2006). Flight management systems. In Strunk, E. A. & Knight, J. C. (Eds.), *Digital Avionics: A Computing Perspective* (pp. 53–61). Los Alamitos: IEEE Computer Society.
- B5 <sup>+</sup> Klein, K. A.<sup>C</sup>, Göknur, S. C., & **Bolton, M. L.** (2006). Autopilot flight director systems. In Strunk, E. A. & Knight, J. C. (Eds.), *Digital Avionics: A Computing Perspective* (pp. 45–52). Los Alamitos: IEEE Computer Society.

<b>Journal Articles</b>		Impact Factor		
Impact factors updated on 4/2/2018. JCR is from Thomas and Reuters. Cites/Doc and SJR are from Scimago. JCR and Cites/Doc use the same algorithm but different data.		JCR	Cites/Doc	SJR
J1	Edworthy, J. R. <sup>C</sup> , McNeer, R. R., Bennett, C. L., Dudaryk, R., McDougall, S. J. P., Schlesinger, J. J., <b>Bolton, M. L.</b> , Edworthy, J. D., Vieira, E. O., Boyd, A. D., Reid, S. K. J., Rayo, M. F., Wright, M. C., & Osborn, D. (ND). Getting alarm sounds into a global standard: A case study with reflections. Accepted to <i>Ergonomics in Design</i> , 21 manuscript pages.	--	0.44	0.25
J2	<b>Bolton, M. L.</b> <sup>C</sup> , Edworthy, J., Boyd, A. D., <u>Wei, J.</u> , & <u>Zheng, X.</u> (2018). A computationally efficient formal method for discovering masking in concurrently sounding medical alarms. Accepted to <i>Applied Acoustics</i> , 141. 403-415.	1.921	2.16	0.82
J3	<u>Molinaro, K.</u> , & <b>Bolton, M. L.</b> <sup>C</sup> (2018). Evaluating the applicability of the double system lens model to the analysis of phishing email judgments. <i>Computers and Security</i> , 17, 128-137.	2.849	3.50	0.87
J4	<u>Houser, A.</u> , Ma, L. M., Feigh, K., & <b>Bolton, M. L.</b> <sup>C</sup> (2018). Using formal methods to reason about taskload and resource conflicts in simulated air traffic scenarios. <i>Innovations in Systems and Software Engineering</i> , 14(1), 1-14.	--	1.12	0.37
J5	<u>Pan, D.</u> , & <b>Bolton, M. L.</b> <sup>C</sup> (2018). Properties for formally assessing the performance level of human-human collaborative procedures with miscommunications and erroneous human behavior. <i>International Journal of Industrial Ergonomics</i> , 63, 75-88.	1.415	1.51	0.56
J6	<u>Yoon, J. M.</u> , He, D. & <b>Bolton, M. L.</b> <sup>C</sup> (2017). A LAMSTAR network-based human judgment analysis. <i>IEEE Transactions on Human-Machine Systems</i> , 47(6), 951-957.	2.493	3.50	0.88
J7	<u>Li, M.</u> , <u>Wei, J.</u> , <u>Zheng, X.</u> & <b>Bolton, M. L.</b> <sup>C</sup> (2017). A formal machine learning approach to generating human-machine interfaces from task models. <i>IEEE Transactions on Human-Machine Systems</i> , 47(6), 822-833.	2.493	3.50	0.88
J8	<u>Wei, J.</u> & <b>Bolton, M. L.</b> <sup>C</sup> (2017). Compression rates and spatial judgment biases made from synthetic vision perspective displays. <i>Journal of Aerospace Information Systems</i> , 14(10), 523-532.	0.892	1.34	0.39
J9	<b>Bolton, M. L.</b> <sup>C</sup> (2017). A task-based taxonomy of erroneous human behavior. <i>International Journal of Human-Computer Studies</i> , 108, 105-121.	2.863	3.35	0.62
J10	<b>Bolton, M. L.</b> <sup>C</sup> , <u>Zehng, X.</u> , <u>Molinaro, K.</u> , <u>Houser, A.</u> , & <u>Li, M.</u> (2017). Improving the scalability of formal human-automation interaction verification analyses that use task analytic models. <i>Innovation in Systems and Software Engineering</i> , 13(1), 1-17.	--	1.12	0.37
J11	<u>Hasanain, B.</u> , Boyd, A. D., & <b>Bolton, M. L.</b> <sup>C</sup> (2017). A formal approach to discovering simultaneous additive masking between auditory medical alarms. <i>Applied Ergonomics</i> , 58, 500-514.	1.866	2.11	0.87
J12	<u>Hasanain, B.</u> , Boyd, A. D., & <b>Bolton, M. L.</b> <sup>C</sup> (2016). Using model checking to detect simultaneous masking in medical alarms. <i>IEEE Transactions on Human-Machine Systems</i> , 46(2), 174 - 185.	2.493	3.50	0.88
J13	<b>Bolton, M. L.</b> <sup>C</sup> (2015). Model checking human-human communication protocols using task models and miscommunication generation. <i>Journal of Aerospace Information Systems</i> , 12, 476-489.	0.892	1.34	0.39
J14 +	<b>Bolton, M. L.</b> <sup>C</sup> , Jimenez, N., van Paassen, M. M., & Trujillo, M. (2014). Automatically generating specification properties from task models for the formal verification of human-automation interaction. <i>IEEE Transactions on Human-Machine Systems</i> , 44(5), 561-575.	2.493	3.50	0.88
J15 +A	<b>Bolton, M. L.</b> , Gökür, S., & Bass, E.J. <sup>C</sup> (2013). Framework to support scenario development for human-centered alerting system evaluation. <i>IEEE Transactions on Human-machine Systems</i> , 43(6), 595-606.	2.493	3.50	0.88

J16	<sup>+A</sup> <b>Bolton, M. L.<sup>C</sup></b> & Bass, E. J. (2013). Generating erroneous human behavior from strategic knowledge in task models and evaluating its impact on system safety with model checking. <i>IEEE Transactions on Systems, Man and Cybernetics: Systems</i> , 43(6), 1314-1327.	2.350	6.02	1.30
J17	<sup>+</sup> <b>Bolton, M. L.<sup>C</sup></b> (2013). Automatic validation and failure diagnosis of human-device interfaces using task analytic models and model checking. <i>Computational and Mathematical Organization Theory</i> , 19(3), 288-312.	0.769	0.80	0.37
J18	<sup>+A</sup> <b>Bolton, M. L.</b> , Bass, E. J. <sup>C</sup> , & Siminiceanu, R. I. (2013). Using formal verification to evaluate human-automation interaction in safety critical systems, a review. <i>IEEE Transactions on Systems, Man and Cybernetics: Systems</i> , 43(3), 488-503.	2.350	6.02	1.30
J19	<sup>+A</sup> <b>Bolton, M. L.<sup>C</sup></b> , & Bass, E. J. (2012). Using model checking to explore checklist-guided pilot behavior. <i>International Journal of Aviation Psychology</i> , 22(4), 343-366.	0.950	0.33	0.20
J20	<sup>+A</sup> <b>Bolton, M. L.<sup>C</sup></b> , Bass, E. J., & Siminiceanu, R. I. (2012). Generating phenotypical erroneous human behavior to evaluate human-automation interaction using model checking. <i>International Journal of Human-Computer Studies</i> , 70(11), 888-906.	2.863	3.35	0.62
J21	<sup>+A</sup> <b>Bolton, M. L.<sup>C</sup></b> , Siminiceanu, R. I., & Bass, E. J. (2011). A systematic approach to model checking human-automation interaction using task analytic models. <i>IEEE Transactions on Systems, Man and Cybernetics, Part A: Systems and Humans</i> , 41(5), 961-976.	2.123	3.75	1.13
J22	<sup>+A</sup> <b>Bolton, M. L.<sup>C</sup></b> , & Bass, E. J. (2010). Formally verifying human-automation interaction as part of a system model: Limitations and tradeoffs. <i>Innovations in Systems and Software Engineering</i> , 6(3), 219-231.	--	1.12	0.37
J23	<sup>+A</sup> <b>Bolton, M. L.<sup>C</sup></b> & Bass, E. J. (2009). Comparing perceptual judgment and subjective measures of spatial awareness. <i>Applied Ergonomics</i> , 40, 597-607.  Reprinted (invited) as: Bolton, M. L., & Bass, E. J. (2011). Comparing perceptual judgment and subjective measures of spatial awareness. In E. Salas & A. S. Dietz (Eds.), <i>Situational Awareness: Critical Essays on Human Factors in Aviation</i> (pp. 211-221). Surrey: Ashgate.	1.866	2.11	0.87
J24	<sup>+A</sup> <b>Bolton, M. L.<sup>C</sup></b> & Bass, E. J. (2008). Using relative position and temporal judgments to identify biases in spatial awareness for synthetic vision systems. <i>International Journal of Aviation Psychology</i> , 18(2), 183-206.	0.950	0.33	0.20
J25	<sup>+A</sup> <b>Bolton, M. L.<sup>C</sup></b> , Bass, E. J., & Comstock, J. R. (2007). Spatial awareness in synthetic vision systems: Using spatial and temporal judgments to evaluate texture and field of view. <i>Human Factors</i> , 49, 961-974.  One of the 10 most cited papers published in <i>Human Factors</i> in 2006-2007.	2.219	2.13	0.80

### Journal Articles Under Review

- JR1 Ma, L. M., Houser, A., Feigh, K., & **Bolton, M. L.<sup>C</sup>** (ND). An analysis of air traffic management concepts of operation using simulation and formal verification. Under review in the *Journal of Air Transportation*. 13 pages.
- JR2 Li, M., & **Bolton, M. L.<sup>C</sup>** (ND). Automated test case generation for human-machine interaction. Under review in the *IEEE Transactions on Human Machine Systems*. 10 pages.
- JR3 **Bolton, M. L.<sup>C</sup>**, Houser, A., & Molinaro, K. (ND). A formal method for assessing the impact of task-based erroneous human behavior on system safety. Under review in the *Reliability Engineering and System Safety*. 13 pages.

### Journal Articles in Preparation

- JP1 Li, M., & **Bolton, M. L.** (ND). Accounting for usability properties when generating human-machine interfaces from task models. Planned submission in Fall 2018
- JP2 **Bolton, M. L.<sup>C</sup>**, Edworthy, J., Boyd, A. D., Li, M., & Zheng, X. (ND). Experimental validation of formal medical alarm masking predictions. Planned submission in Fall 2018.

- JP3 **Bolton, M. L.<sup>C</sup>**, Edworthy, J., Boyd, A. D., & **Zheng, X.** (ND). A systematic formal analysis of masking between the reserved sounds of the IEC 60601-1-8 international medical alarm standard. Planned submission in Fall 2018.
- JP4 **Houser, A.**, & **Bolton, M. L.<sup>C</sup>** (ND). A formal mode confusion analysis for cybersecurity. Planned submission in Fall 2018.

### Peer Reviewed Conference Papers

In the below, a \* indicates the presenting author.

- C1 **Li, M.**, Behdad, Sara, & **Bolton, M. L.\*<sup>C</sup>** (2018). A formal methods approach to predicting how users will utilize system features. Accepted to the *Proceedings of the 2018 International Annual Meeting of the Human Factors and Ergonomics Society* (5 pages). Santa Monica: Human Factors and Ergonomics Society.
- C2 **Bolton, M. L.\*<sup>C</sup>**, Edworthy, J., & Boyd, A. D. (2018). A formal analysis of masking between reserved alarm sounds of the IEC 60601-1-8 international medical alarm standard. Accepted to the *Proceedings of the 2018 International Annual Meeting of the Human Factors and Ergonomics Society* (5 pages). Santa Monica: Human Factors and Ergonomics Society.
- C3 **Zheng, X.\***, **Bolton, M. L.<sup>C</sup>**, Daly, C., & Feng, L. (2017). A formal human reliability analysis of a community pharmacy dispensing procedure. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (pp. 728-732). Santa Monica: HFES.  
Winner of 2<sup>nd</sup> Best Student Paper in Human Performance Modeling.
- C4 **Bolton, M. L.\*<sup>C</sup>** (2017). Novel developments in formal methods for human factors engineering. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (pp. 715-717). Santa Monica: HFES.
- C5 **Houser, A.\*** & **Bolton, M. L.<sup>C</sup>** (2017). Formal mental models for inclusive privacy and security. *Proceedings of the Symposium on Usable Privacy and Security (SOUPS)* (3 pages). Santa Clara: USENIX.
- C6 Tiferes, J.\*, Bisantz, A. M.<sup>C</sup>, **Bolton, M. L.**, Higginbotham, D. J., O'Hara, R. P., Wawrzyniak, N. K., Kozlowski, J. D., Ahmad, B., Hussein, A. A., & Guru, K. A. (2016). Multimodal team interactions in robot-assisted surgery. *Proceedings of the 2016 International Annual Meeting of the Human Factors and Ergonomics Society* (pp. 518-522). Santa Monica: Human Factors and Ergonomics Society.  
Finalist for the Alphonse Chapanis Student Paper Award.
- C7 **Bolton, M. L.\*<sup>C</sup>**, **Hasanain, B.**, Boyd, A. D., & Edwothy, J. (2016). Using model checking to detect masking in IEC 60601-1-8-compliant alarm configurations. *Proceedings of the 2016 International Annual Meeting of the Human Factors and Ergonomics Society* (pp. 636-640). Santa Monica: Human Factors and Ergonomics Society.
- C8 **Houser, A.**, Ma, L. M., Feigh, K., & **Bolton, M. L.\*<sup>C</sup>** (2015). A formal approach to modeling and analyzing human taskload in simulated air traffic scenarios. In *Proceedings of the IEEE International Conference on Complex Systems Engineering* (6 pages). Piscataway: IEEE.
- C9 **Li, M.**, **Molinaro, K.**, & **Bolton, M. L.\*<sup>C</sup>** (2015). Learning formal human-machine interface designs from task analytic models. In *Proceedings of the HFES Annual Meeting* (pp. 652-656). Santa Monica: HFES.
- C10 van Paassen\*<sup>C</sup>, M. M., **Bolton, M. L.**, Jimenez, N. (2014). Checking formal verification models for human-automation interaction. In *Proceedings of the IEEE International Conference on Systems Man and Cybernetics* (pp. 3709-3714). Piscataway: IEEE.
- C11 **Hasanain, B.**, Boyd, A. D., & **Bolton, M. L.\*<sup>C</sup>** (2014). An approach to model checking the perceptual interactions of medical alarms. In *Proceedings of the 2014 International Annual Meeting of the Human Factors and Ergonomics Society* (pp. 822-826). Santa Monica: Human Factors and Ergonomics Society.
- C12 **Bolton, M. L.\*<sup>C</sup>**, **Ebrahimi, S.** (2014). An approach to generating human-computer interfaces from task models. In *Proceedings of AAAI 2014 Symposium on Modeling in Human-machine Systems: Challenges for Formal Verification* (pp. 92-97). Palo Alto: AAAI.
- C13<sup>+A</sup> Bass, E. J.\*<sup>C</sup>, Brantley, K., Perez, T., **Bolton, M. L.**, Helms, A., Bartel, L. (2013). Information, data entry, and reporting requirements for a resident handoff of care support tool. In *Proceedings of the IEEE International Conference on Systems Man and Cybernetics* (pp. 675-680). Piscataway: IEEE.

- C14<sup>+</sup> **Bolton, M. L.\*<sup>C</sup>**, Jimenez, N., van Paassen, M. M., & Trujillo, M. (2013). Formally verifying human-automation interaction with specification properties generated from task analytic models. In *Proceedings of the Sixth IAASS Conference* (8 pages). Noordwijk: ESA Communications.
- C15<sup>+</sup> **Bolton, M. L.\*<sup>C</sup>**, & Bass, E. J. (2013). Evaluating human-human communication protocols with miscommunication generation and model checking. In *Proceedings of the Fifth NASA Formal Methods Symposium* (pp. 48–62). Moffett Field: NASA Ames Research Center.
- C16<sup>+</sup> **Bolton, M. L.<sup>C</sup>**, Wallace, C. M., & Zuck, L. D.\* (2012). On policies and intents. In *Proceedings of the Eighth International Conference on Information Systems Security* (pp. 104–118). Berlin: Springer.
- C17<sup>+A</sup> Bass, E. J.<sup>C</sup>, **Bolton, M. L.**, Feigh, K., Griffith, D.\*<sup>C</sup>, Gunter, E., Mansky, W., & Rushby, J. (2011). Toward a multi-method approach to formalizing human-automation interaction and human-human communications. In *Proceedings of the IEEE International Conference on Systems Man and Cybernetics* (pp. 1817–1824). Piscataway: IEEE.
- C18<sup>+A</sup> **Bolton, M. L.\*<sup>C</sup>** & Bass, E. J. (2011). Using task analytic behavior models, strategic knowledge-based erroneous human behavior generation, and model checking to evaluate human-automation interaction. In *Proceedings of the IEEE International Conference on Systems Man and Cybernetics* (pp. 1788–1794). Piscataway: IEEE.  
Winner of the Franklin V. Taylor Memorial Award for the Best Conference Paper (out of 612 accepted papers).
- C19<sup>+A</sup> **Bolton, M. L.\*<sup>C</sup>** (2011). Validating human-device interfaces with model checking and temporal logic properties automatically generated from task analytic models. In *Proceedings of the 20th Behavior Representation in Modeling and Simulation Conference* (pp. 130–137). Sundance: The BRIMS Society.  
Winner of a best paper award (out of 24 accepted papers).
- C20<sup>+A</sup> **Bolton, M. L.\*<sup>C</sup>**, & Bass, E. J. (2010). Using task analytic models and phenotypes of erroneous human behavior to discover system failures using model checking. In *Proceedings of the 54<sup>th</sup> Annual Meeting of the Human Factors and Ergonomics Society* (pp. 992–996). Santa Monica: Human Factors and Ergonomics Society.
- C21<sup>+A</sup> **Bolton, M. L.<sup>C</sup>**, & Bass, E. J.\* (2010). Using task analytic models to visualize model checker counterexamples. In *Proceedings of the IEEE International Conference on Systems Man and Cybernetics* (pp. 2069–2074). Piscataway: IEEE.
- C22<sup>+A</sup> **Bolton, M. L.\*<sup>C</sup>**, & Bass, E. J. (2009). A method for the formal verification of human interactive systems. In *Proceedings of the 53<sup>rd</sup> Annual Meeting of the Human Factors and Ergonomics Society* (pp. 764–768). Santa Monica: Human Factors and Ergonomics Society.
- C23<sup>+A</sup> **Bolton, M. L.**, & Bass, E. J.\*<sup>C</sup> (2009). Enhanced operator function model: A generic human task behavior modeling language. In *Proceedings of the IEEE International Conference on Systems Man and Cybernetics* (pp. 2983–2990). Piscataway: IEEE.
- C24<sup>+A</sup> **Bolton, M. L.\*<sup>C</sup>**, & Bass, E. J. (2009). Building a formal model of a human-interactive system: Insights into the integration of formal methods and human factors engineering. In *Proceedings of the First NASA Formal Methods Symposium* (pp. 6–15). Moffett Field: NASA Ames Research Center.  
One of the 7 best papers (out of 22 accepted papers) invited to submit an extended manuscript as a journal article.
- C25<sup>+</sup> **Bolton, M. L.<sup>C</sup>** (2008). Modeling human perception: Could Stevens' power law be an emergent feature? In *Proceedings of IEEE the International Conference on Systems Man and Cybernetics* (pp. 1073–1078). Piscataway: IEEE.
- C26<sup>+A</sup> **Bolton, M. L.\*<sup>C</sup>** & Bass, E. J. (2007). Spatial awareness: Comparing judgment-based and subjective measures. In *Proceedings of IEEE the International Conference on Systems Man and Cybernetics* (pp. 2582–2587). Piscataway: IEEE.
- C27<sup>+A</sup> **Bolton, M. L.\*<sup>C</sup>**, Bass, E. J., & Comstock, J. R. (2006). Using relative position and temporal judgments to assess the effects of texture and field of view on spatial awareness in synthetic vision systems displays. In *Proceedings of the 50<sup>th</sup> Annual Meeting of the Human Factors and Ergonomics Society* (pp. 961–974). Santa Monica: Human Factors and Ergonomics Society.
- C28<sup>+A</sup> **Bolton, M. L.\*<sup>C</sup>**, Bass, E. J., & Comstock, J. R. (2006). Using videos derived from simulations to support the analysis of spatial awareness in synthetic vision displays. In *Proceedings of the IEEE International Conference on Systems Man and Cybernetics* (pp. 2582–2587). Piscataway: IEEE.

- C29<sup>+A</sup> **Bolton, M. L.\*<sup>C</sup>** & Bass, E. J. (2005). Cognitive Systems Engineering Educational Software (CSEES): Educational software addressing quantitative models of performance. In *Proceedings of the IEEE International Conference on Systems Man and Cybernetics* (pp. 3380–3386). Piscataway: IEEE.
- C30<sup>+A</sup> Göknur, S.\*<sup>C</sup>, **Bolton, M. L.**, & Bass, E. J. (2004). Adding a motor control component to the Operator Function Model Expert System to investigate air traffic management concepts using simulation. In *Proceedings of the IEEE International Conference on Systems Man and Cybernetics* (pp. 886–892). Piscataway: IEEE.

### Other Conference Papers

In the below, a \* indicates the presenting author.

- OC1 Pan, D.\*, **Bolton, M. L.<sup>C</sup>** (2015). A formal method for evaluating the performance level of human-human collaborative procedures. In *Proceedings of HCI International 2015* (pp. 186-197). Berlin: Springer.
- OC2 <sup>+A</sup>**Bolton, M. L.\*<sup>C</sup>**, Bass, & E. J., Siminiceanu, R. I. (2008). Using formal methods to predict human error and system failures. In *Proceedings of the Second International Conference on Applied Human Factors and Ergonomics* (10 pages). Las Vegas: Applied Human Factors and Ergonomics International.
- OC3 <sup>+A</sup>**Bolton, M. L.\*<sup>C</sup>** & Bass, E. J. (2007). Spatial awareness biases in synthetic vision systems displays. In *Proceedings of the 14<sup>th</sup> International Symposium on Aviation Psychology* (pp. 63–69). Dayton: Association for Aviation Psychology.
- OC4 <sup>+A</sup>**Bolton, M. L.\*<sup>C</sup>**, Bass, E. J., & Comstock, J. R. (2006). A toolset to support the development of spatial and temporal judgment experiments for synthetic vision systems. In *Proceedings of the IEEE Systems and Information Engineering Design Symposium* (pp. 55–60). Piscataway: IEEE.
- OC5 <sup>+A</sup>**Bolton, M. L.<sup>C</sup>**, Hagan, T.\*, Kustu, D.\*, LaChance, L.\*, Li, S.\*, & Bass, E. J. (2006). Assessment and enhancement of synthetic vision systems experimentation software. In *Proceedings of the IEEE Systems and Information Engineering Design Symposium* (pp. 61–66). Piscataway: IEEE.

Winner of the best paper award for the Human Computer Interface track.

### Peer Reviewed Abstracts

In the below, a \* indicates the presenting author.

- A1 **Bolton, M. L.\*<sup>C</sup>** (2015). Formal methods for human-systems engineering. In *Proceedings of the Industrial & Systems Engineering Research Conference* (1 page). Norcross: Institute of Industrial Engineers.
- A2<sup>+A</sup> Bass, E. J.\*<sup>C</sup>, **Bolton, M. L.**, Feigh, K. M., Gunter, E. L., & Rushby, J. (2012). Toward an integrated model checking, theorem proving and simulation framework for analyzing authority and autonomy. In *Proceeding of the Workshop on Formal Methods in Human-Machine Interaction (Formal H)* (pp. 1–4). London: Imperial College.
- A3<sup>+A</sup> **Bolton, M. L.\*<sup>C</sup>** & Bass, E. J. (2012). Model checking human-automation interaction with enhanced operator function model. In *Proceeding of the Workshop on Formal Methods in Human-Machine Interaction (Formal H)* (pp. 34–36). London: Imperial College.
- A4<sup>+A</sup> **Bolton, M. L.\*<sup>C</sup>**, & Bass, E. J. (2008). Formal modeling of erroneous human behavior and its implications for model checking. In *Proceedings of the Sixth NASA Langley Formal Methods Workshop* (pp. 62–64). Hampton: NASA Langley Research Center.

### Invited Talks and Presentations

- T1 **Bolton, M. L.**, **Wei, J.** (2018, July 17). *The Measurement Scales of Psychometric Ratings*. Presented at the Universal Technologies Corporation and AFRL Collaborative Research and Development for Innovative Aerospace Leadership (CRDInAL), Beavercreek, OH.
- T2 **Bolton, M. L.** (2018, Jan. 11). *Preventing Complex Failures of Human Interaction Systems*. Presented at the ARO Life Sciences Division Program Review, Cocoa Beach, FL.
- T3 **Bolton, M. L.** (2017, Nov. 14). *The Formal Human Systems Lab*. Presented at the Reliable Autonomy for Human-Cyber-Physical Systems NSF CPS PI Meeting Mini-Workshop, Alexandria, VA.



- T4 **Bolton, M. L.** (2017, Nov. 2). *Provably Safe: Using Formal Methods to Human-proof Complex Systems*. Presented at the STEM Forum (a venue for introducing local high school teachers to emerging STEM concepts), Buffalo, NY.
- T5 **Bolton, M. L.** (2017, Feb. 15). *Using Human Behavior Modeling and Model Checking to Discover Failures in Safety Critical Systems*. Presented at the Cognitive Science Colloquia Series, UB Center for Cognitive Science, University at Buffalo, State University of New York, Buffalo, NY.
- T6 **Bolton, M. L.** (2016, June 19). *A Formal Task-based Approach for Ensuring Trustworthy Human-Automation Interaction*. Presented at the workshop on Social Trust in Autonomous Robots, University of Michigan, Ann Arbor, MI.
- T7 **Bolton, M. L.** (2016, April 18). *The Formal Human Systems Lab*. Presented at the Workshop on the Integration of Control Theory, Formal Methods, Learning and Human Factors for Autonomous Systems, University of Texas at Austin, Austin, TX.
- T8 **Bolton, M. L.** & Topcu, U. (2016, April 18). *How do human factors, learning, and controls look from the perspective of formal methods?* Presented at the Workshop on the Integration of Control Theory, Formal Methods, Learning and Human Factors for Autonomous Systems, University of Texas at Austin, Austin, TX.
- T9 **Bolton, M. L.** (2015, June 2). *Formal Methods for Human-Systems Engineering*. Presented as part of an invited panel discussion on Current Issues and Future Trends in Human-Systems Engineering Research at the Industrial & Systems Engineering Research Conference at the IIE Annual Conference and Expo, Nashville, TN.
- T10 **Bolton, M. L.**, Jimenez, N., & van Paassen, M. M. (2014, April 9). *Verification models for advanced human-automation interaction*. Presented at ESTEC: European Space Research and Technology Centre, Noordwijk, NL.
- T11 + **Bolton, M. L.** (2013, July 12). *Using human behavior modeling and model checking to discover failures in safety critical systems*. Presented to the Department of Systems Design Engineering, University of Waterloo, Waterloo, ON, CA.
- T12 + **Bolton, M. L.** (2013, July 3). *Using human behavior modeling and model checking to discover failures in safety critical systems*. Presented to the Department of Industrial and Systems Engineering, State University of New York, Buffalo, NY.
- T13 + **Bolton, M. L.** (2013, February 25). *Using human behavior modeling and model checking to discover failures in safety critical systems*. Presented to the Biomedical and Health Informatics Colloquia, Center for Clinical and Translational Research, University of Illinois at Chicago, Chicago, IL.
- T14 + **Bolton, M. L.** (2012, October 31). *Using human behavior modeling and model checking to discover failures in safety critical systems*. Presented to the Electronic Visualization Laboratory, Department of Computer Science, University of Illinois at Chicago, Chicago, IL.
- T15 + **Bolton, M. L.** (2012, April 19). *Using human behavior modeling and model checking to discover failures in safety critical systems*. Presented to the Department of Mechanical and Industrial Engineering, University of Illinois at Chicago, Chicago, IL.
- T16 + **Bolton, M. L.** (2012, February 29). *Using human behavior modeling and model checking to discover failures in safety critical systems*. Presented to the Department of Engineering Management and Systems Engineering, George Washington University, Washington, D.C.
- T17 + **Bolton, M. L.** (2010, September 15). *Using task analytic models and phenotypes of erroneous human behavior to discover system failures using model checking*. Presented at the NASA Ames Research Center, Moffett Field, CA.
- T18 + **Bolton, M. L.** (2009, September 23). *A method for the formal verification of human-interactive systems*. Presented at the NASA Ames Research Center, Moffett Field, CA.
- T19 + **Bolton, M. L.** (2009, April 12). *Using formal methods to predict human error and system failures*. Presented at SRI International, Menlo Park, CA.
- T20 + **Bolton, M. L.** (2008, October 15). *Using formal methods to predict human error and system failures*. Presented at the Virginia Tech human factors research symposium, Blacksburg, VA.

- T21 + **Bolton, M. L.** (2008, July 9) *Using formal methods to predict human error and system failures*. Presented at The National Library of Medicine training conference, Bethesda, MD.
- T22 + **Bolton, M. L.** (2007, November 16). *Using formal methods to predict human error and system failures*. Presented at the NASA Langley Research Center, Hampton, VA.
- T23 + **Bolton, M. L.** (2007, September 21). *Using formal methods to predict human error and system failures*. Presented at the medical informatics colloquium, Charlottesville, VA.
- T24 + **Bolton, M. L.** (2007, April 16). *A framework for human centered systems evaluation*. Presented to Washington Metro ARCS, Charlottesville, VA.
- T25 + **Bolton, M. L.** (2007, January 16). *Using relative position and temporal judgments to assess spatial awareness for synthetic vision systems displays*. Presented at the NASA Langley Research Center, Hampton, VA.
- T26 + **Bolton, M. L.** (2006, April 15). *An investigation of the effects of texture and field of view on spatial awareness in synthetic vision head-down displays*. Presented to Washington Metro ARCS, Charlottesville, VA.
- T27 + **Bolton, M. L.** (2005, September 23). *Tools for supporting spatial and temporal judgment experiments for synthetic vision systems*. Presented at the National Institute of Aerospace, Hampton, VA.

## Posters

In the below, a \* indicates the presenting author.

- P1 Molinaro, K.\*, & **Bolton, M. L.** (2017, November 11). *Evaluating the Applicability of the Double System Lens Model to the Analysis of Phishing Email Judgments*. Presented at the 2017 Inter University Workshop. University at Buffalo, State University of New York, Buffalo, NY.  
Winner of the best poster award.
- P2 Biltekoff, E.\*, Zheng, X., Daly, C., & **Bolton, M. L.** (2017, November 11). *Survey Development for Formal Human Reliability*. Presented at the 2017 Inter University Workshop. University at Buffalo, State University of New York, Buffalo, NY.
- P3 Zheng, X.\*, **Bolton, M. L.**, Daly, C., & Feng, L. (2017, March 31). *A Formal Human Reliability Analysis of a Community Pharmacy Dispensing Procedure*. University at Buffalo, State University of New York, Department of Industrial and Systems Engineering Poster Competition, Buffalo, NY.  
Voted 2<sup>nd</sup> best poster.
- P4 **Bolton, M. L.**, Bisantz, A., Cavuoto, L., Wu, S., & Paquet, V. (2016, September 20) *Human Factors Engineering at UB*. Poster Session presented at the 2016 International Annual Meeting of the Human Factors and Ergonomics Society, Washington DC.
- P5 Houser, A.\*, Ma, L. M., Feigh, K., & **Bolton, M. L.** (2016). *A formal approach to modeling and analyzing human taskload in simulated air traffic scenarios*. University at Buffalo, State University of New York, Department of Industrial and Systems Engineering Poster Competition, Buffalo, NY.  
Voted 2<sup>nd</sup> best poster.
- P6 Jiajun, W. \* & **Bolton, M. L.** (2016). *Investigating the Relationship Between Compression Rates and Biases in Spatial Judgments in Perspective Displays*. University at Buffalo, State University of New York, Department of Industrial and Systems Engineering Poster Competition, Buffalo, NY.
- P7 **Bolton, M. L.**\*, Bisantz, A., Cavuoto, L.\* , Wu, S., & Paquet, V. (2015, October 29) *Human Factors Engineering at UB*. Poster Session presented at the 2015 International Annual Meeting of the Human Factors and Ergonomics Society, Chicago, IL.
- P8 Li, M.\* & Bolton, M. L. (2015, April 3) *An Approach to Generating Human-computer Interfaces from Task Models*. University at Buffalo, State University of New York, Department of Industrial and Systems Engineering Poster Competition, Buffalo, NY.
- P9 Li, M.\* & **Bolton, M. L.** (2014, November 15) *An Approach to Generating Human-computer Interfaces from Task Models*. Poster session presented at the 15<sup>th</sup> Annual Human Factors Engineering Inter-University Workshop, Buffalo, NY.  
Winner of the best poster award.

- P10 **Bolton, M. L.\***, Bisantz, A., Cavuoto, L., Wu, S., & Paquet, V. (2014, October 30) *Human Factors Engineering at UB*. Poster Session presented at the 2014 International Annual Meeting of the Human Factors and Ergonomics Society, Chicago, IL.
- P11 **Bolton, M. L.\***, Ebrahimi, S., & Li, M. (2014, March 23) *An Approach to Generating Human-computer Interfaces from Task Models*. Poster session presented at the AAAI 2014 Symposium on Modeling in Human-machine Systems: Challenges for Formal Verification, Stanford, CA.
- P12 **Bolton, M. L.\*** (2012, October 25) *The Systems Engineering and Human Performance Modeling Laboratory: University of Illinois at Chicago*. Poster session presented at the 56<sup>th</sup> Annual meeting of the Human Factors and Ergonomics Society, Boston, MA.
- P13 <sup>+</sup>A **Bolton, M. L.\*** & Bass, E.J. *A methodology for the formal verification of medical, human-interactive systems*. Poster session presented at:  
     (2009, June 5). The 2009 NLM Trainee-Mentor-Advisory Board Meeting, Charlottesville, VA.  
     (2009, July 23). The NLM Informatics Training Conference, Portland, OR.  
     (2010, May 28). The 2010 NLM Trainee-Mentor-Advisory Board Meeting, Charlottesville, VA.
- P14 <sup>+</sup>A **Bolton, M. L.\***, Guerlain, S., Gerling, G. J., & Bass, E. J. (2008, September 23). *University of Virginia: Human Factors*. Poster session presented at the 52<sup>nd</sup> Annual meeting of the Human Factors and Ergonomics Society, New York, NY.
- P15 <sup>+</sup>A **Bolton, M. L.\*** & Bass, E. J. (2008, May 6). *A formal methods approach to modeling the contribution of human error to system failure: A Therac-25 example*. Poster session presented at the 2008 NLM Trainee-Mentor-Advisory Board Meeting, Charlottesville, VA.

## VII. Grant Activity

Total Secured Funds (across all projects and institutions):	\$5,510,689
Total Secured External Funds (across all projects and institutions):	\$5,485,689
Total Secured External Funds as PI/Institutional PI:	\$1,750,814
Total Secured Internal Funds:	\$ 25,000

### Current External Grants

- GC1 The Measurement Scales of Psychometric Ratings: Are They on the Level?  
 Sponsor: Air Force Research Laboratory (federal pass through via Universal Technology Corporation)  
 PI: **Matthew L. Bolton**  
 Award Amount: \$320,000  
 Date: 1/2018-12/2020
- GC2 A Formal Approach to Detecting and Correcting Simultaneous Masking in the IEC 60601-1-8 International Medical Alarm Standard  
 Sponsor: AHRQ  
 PI: **Matthew L. Bolton**  
 Award Amount: \$711,671  
 Date: 9/30/2016-9/29/2019

### Current Internal Grants

- GI1 Building Ethical Artificial Intelligence  
 Sponsor: The University at Buffalo University at Buffalo, SUNY (Germination Space Program)  
 CoIs: **Matthew L. Bolton**, Varun Chandola, Kenny Joseph, Jonathan Manes, Atri Rudra, and Mark Shepard  
 Award Amount: \$25,000  
 Date: 8/2018 – 8/2019

## Grant Proposals Under Review

- GU1 CAREER: Formal Analysis for Reliable and Safe Systems (FARSS)  
 Sponsor: National Science Foundation / Engineering Design and Systems Engineering  
 PI: **Matthew L. Bolton**
- GU2 Predicting the Probability of Human Error Contributing to Cyber Vulnerabilities:  
 A Formal Methods Approach  
 Sponsor: The Minerva Research Initiative (under the DOD)  
 PI: **Matthew L. Bolton**

This proposal was invited for submission by the program directors following a white paper submission

## Completed Grants, Cooperative Agreements, and Contracts

- GP1 Young Investigator Program (8.5): Preventing Complex Failures of Human Interactive Systems with Erroneous Behavior Generation and Robust Human Task Behavior Patterns  
 Sponsor: Army Research Office  
 PI: **Matthew L. Bolton**  
 Award Amount: \$100,000  
 Date: 8/2015-8/2017
- GP2 Scenario development through computational and formal modeling for verification and validation of authority and autonomy constructs in aviation  
 Sponsor: NASA Ames Research Center  
 PI: Amy Pritchett (Georgia Institute of Technology)  
 Institutional PI: **Matthew L. Bolton**  
 Award Amount: \$1,392,454  
 Matthew's Amount: \$192,500  
 Date: 1/2014 – 12/2016  
 Credit: 100%
- GP3 EAGER: Automatically Generating Formal Human-computer Interface Designs from Task Analytic Models  
 Sponsor: National Science Foundation  
 PI: **Matthew L. Bolton**  
 Award Amount: \$149,997  
 Date: 8/15/2013 – 8/14/2016  
 Credit: 100%
- GP4 Verification models for advanced human-automation interaction in safety critical flight operations.  
 Sponsor: European Space Agency, subcontract from IXION Industry and Aerospace  
 PI: Francisco Barreiro (IXION Industry and Aerospace)  
 Institutional PI: **Matthew L. Bolton**  
 Total Amount: 150,000 € (approximately \$193,965)  
 Matthew's Amount: 34,771 € (approximately \$44,962)  
 Date: 10/15/2012 – 10/14/2013  
 Credit: 100%
- GP5 NextGenAA: Integrated model checking and simulation of NextGen authority and autonomy.  
 Sponsor: NASA Ames Research Center, subcontract from the University of Virginia  
 PI: Ellen J. Bass (University of Virginia / Drexel University)  
 Institutional PI: **Matthew L. Bolton**  
 Total Amount: \$2,533,574  
 Matthew's Amount: \$147,656  
 Date: 01/01/2011 – 10/31/2013  
 Credit: 100%
- GP6 Synthetic vision systems – NIA/NASA graduate research assistantship (**M. Bolton**)  
 Sponsor: NASA LaRC, subcontract from NIA UVA-03-01, Sub-Award 4817-VA  
 Total Amount: \$84,028  
 Date: 06/17/04 – 09/30/06  
 Credit: 100%

## VIII. Teaching and Advising

### University at Buffalo

#### Courses Taught

<u>Courses</u>	<u>School</u>	<u>Semester</u>	<u>Grads</u>	<u>Undergrads</u>	<u>Total</u>	<u>Evaluation</u> <sup>†</sup>
IE 441/541 - Human Factors in Safety	UB	Summer 18	6	5	11	Pending
IE 500 - Programming for Human Factors	UB	Spring 18	11	0	11	5/5
IE 441/541 - Human Factors in Safety	UB	Spring 18	21	27	48	4.97/5
IE 640 - Formal Methods for Human Factors	UB	Fall 16	5	0	5	5/5
IE 441/541 - Human Factors in Safety	UB	Summer 17	2	0	2	NA
IE 441/541 - Human Factors in Safety	UB	Spring 17	57	30	87	4.84/5
IE 640 - Formal Methods for Human Factors	UB	Fall 16	16	0	16	5/5
IE 441/541 - Human Factors in Safety	UB	Summer 16	2	4	6	NA
IE 441/541 - Human Factors in Safety	UB	Spring 16	68	23	91	4.69/5
IE 531 - Human Factor Research Methods	UB	Fall 15	15	0	15	4.70/5
IE 441/541 - Human Factors in Safety	UB	Summer 15	2	3	5	NA
IE 441/541 - Human Factors in Safety	UB	Spring 15	41	24	65	4.57/5
IE 632 B - Formal Methods for Human Factors	UB	Fall 14	9	0	9	4/4
IE 441/541 - Human Factors in Safety	UB	Spring 14	50	29	79	3.84/5

<sup>†</sup>Average rating of the instructor.

#### Independent Studies Supervised

<u>Courses</u>	<u>School</u>	<u>Semester</u>	<u>Grads</u>	<u>Undergrads</u>	<u>Total</u>
IE 502 – Individual Problems	UB	Spring 18	1	0	1
IE 499 – Independent Study	UB	Spring 18	0	1	1
IE 501 – Individual Problems	UB	Fall 17	4	0	4
IE 498 – Undergraduate Research	UB	Fall 17	0	1	1
IE 502 – Individual Problems	UB	Spring 17	1	1	2
IE 501 and IE 601 – Individual Problems	UB	Fall 16	1	0	1
IE 501 and IE 601 – Individual Problems	UB	Fall 15	3	0	3
IE 502 – Individual Problems	UB	Spring 15	3	0	3

#### Research Supervision

##### – Advising Highlights

- Adam Houser (advisee) successfully defended his dissertation on May 25<sup>th</sup>, 2018.
- Meng Li (advisee) successfully defended his dissertation on May 3<sup>rd</sup>, 2018.
- Kylie Moliaro (advisee) won Best Poster at the 2017 Human Factors Engineering Inter-University Workshop.
- Xi Zheng (advisee) won 2<sup>nd</sup> Best Student Paper in Human Performance Modeling at the 2017 HFES Annual Meeting.
- Former visiting student Dan Pan is working as a Postdoctoral Researcher / Lecturer at Tsinghua University
- Ph.D. student Xi Zheng received 2<sup>nd</sup> place in the 2017 ISE Student Poster Competition<sup>◊</sup>
- Ph.D. student Adam Houser received 2<sup>nd</sup> place in the 2016 ISE Student Poster Competition<sup>‡</sup>

- Ph.D. student Kylie Molinaro received an honorable mention for her NSF Graduate Fellowship application, 2016
  - Ph.D. student Meng Li won best poster at the 15th Annual Human Factors Engineering Inter-University Workshop, Buffalo NY, 2014
- Advising Ph.D. students:
1. Meng Li, January 2014 – Present, **Defense Passed May 3<sup>rd</sup>, 2018; Conferring Sept. 1<sup>st</sup>, 2018.**  
Thesis title: Formal Methods for User Experience Evaluation and Testing
  2. Adam Houser, January 2014 – Present, **Defense Passed May 25<sup>th</sup>, 2018; Conferring Sept. 1<sup>st</sup>, 2018.**  
Thesis title: Mental Models for Cybersecurity: A Formal Methods Approach
  3. Jiajun Wei, January 2015 – Present, expected graduation Spring 2019.
  4. Kylie Molinaro, July 2014 – Present, expected graduation Spring 2019.
  5. Xi Zehng, August 2015 – Present, expected graduation Spring 2020.
  6. Xiaomei Wang (co-advised with Dr. Bisantz), Spring 2017 – Present, expected graduation Spring 2019.
- Advising M.S. students:
1. Sade Singleton - **Defense Passed July 29, 2018; Conferring Sept. 1<sup>st</sup>, 2018.**  
Thesis title: An analysis of Simultaneous Masking between Reserved Alarm Sounds of the International Standard
  2. Jun Kim
- Previously sponsored visiting students:
1. Imane Mellouli, M.S. Student from ENSEEIHT, June 2015 – September 2015.
  2. Charly Rab, M.S. Student from ENSEEIHT, June 2015 – September 2015.
  3. Dan Pan, Ph.D. Student from Tsinghua University, March 2014 – September 2014.
  4. Victor Proto, M.S. Student from ENSEEIHT, June 2014 – August 2014.
- Mentored undergraduate student capstone projects
- Mentored two undergraduate students project for Evan Thielman and Maurice Ott, Spring 2016.
  - Mentored three undergraduate student projects (Charles Smith, Brett Nolan, and Aloysia Beaulieu) for improving work safety and efficiency at GM, Spring 2015.
  - Mentored a four-member undergraduate capstone team (Ran Huo, Sumeet Kumar, Giovanni Madejski, Jamie O’Neill, and Yongzhi Zhou) using six sigma techniques to improve the efficiency of the Buffalo City Hall print shop, Spring 2014.
- Ph.D. Committees:
1. Judith Tiferes, Department of Industrial and Systems Engineering, Graduated in Spring 2017.
  2. David Lavergne, Department of Industrial and Systems Engineering, Spring 2014 – Spring 2018.

## University of Illinois at Chicago

### Courses Taught

<u>Courses</u>	<u>School</u>	<u>Semester</u>	<u>Grads</u>	<u>Undergrads</u>	<u>Total</u>	<u>Evaluation</u>
IE 441/541 - Ergonomics and Human Factors	UIC	Fall 13	13	26	39	4.79/5
IE 584 - Human Performance Modeling	UIC	Spring 13	17	0	17	4.93/5
IE 441/541 - Ergonomics and Human Factors	UIC	Fall 12	10	17	27	4.63/5

**Research Supervision**

- Advising Highlights
  - Bassam Hasanain (advisee) was appointed as an Assistant Professor at the University of Business & Technology, Jeddah, Saudi Arabia.
- Advised Ph.D. Students
  - Bassam Hasanain, Fall 2012 – May 2016, **Graduated with a Ph.D. in Industrial Engineering in May 2016.**
    - Thesis title: A Formal Approach for Detecting Masking in Medical Alarms
    - Currently working as an Assistant Professor at the University of Business & Technology, Jeddah, Saudi Arabia
- Advised graduate research efforts with:
  1. Samaneh Ebrahimi, Fall 2013
  2. Jae Yoon, Summer and Fall 2013
- Ph.D. Committees:
  1. Sameh Alkam, Department of Mechanical and Industrial Engineering, Fall 2012 – Spring 2014.
  2. Yao Feng, Department of Electrical and Computer Engineering, Spring 2013 – Present.

**University of Virginia****Education Research**

- Designed and developed the Cognitive Systems Engineering Education Software (CSEES) package, an integrated toolset that facilitates curricula related to human performance modeling and evaluation of human judgment and decision-making by providing students with the means to generate and analyze performance data using multiple methods (<http://cog.sys.virginia.edu/csees/>).

**Courses Taught**

- Developed curriculum around CSEES for use in SYS 727, Quantitative Models of Human Performance
- Prepared and delivered guest lectures for:
  - SYS 623, Introduction to Cognitive Engineering;
  - SYS 727, Quantitative Models of Human Performance; and
  - SYS 681, Modeling Human Sensory Information Processing.
- Conducted instructional seminars on the use of the advanced features of Microsoft Word and LaTeX in the preparation of high quality scientific documents.

**Research Supervision**

- Co-advised graduate student Jackson Kwok in the Systems and Information Engineering Masters of Engineering program.
- Co-advised a 2005–2006 undergraduate capstone team.

**IX. Professional Membership and Activities****Professional Society Membership**

- Human Factors and Ergonomics Society (HFES), 2004 – Present.
- IEEE Systems Man and Cybernetics, 2005 – Present.

**Leadership Positions and Activities**

- Co-editing a special issue of IEEE Transitions on Human-Machine Systems on Computational Human Performance Modeling for Human-Machine Systems Design.

- Associate Editor, IEEE Transactions on Human-Machine Systems, 2016 – Present.
- TG Chair of the Human Factors and Ergonomics Society’s Human Performance Modeling Technical Group, 2016 – Present.
- TG Chair Elect of the Human Factors and Ergonomics Society’s Human Performance Modeling Technical Group, 2014 – s016.
- Program Chair of the Human Factors and Ergonomics Society’s Human Performance Modeling Technical Group, 2012 – 2014.
- Co-chair of the Technical Committee on Human-Computer Interaction for IEEE Systems Man and Cybernetics, 2011 – 2015.
- Program Chair-Elect of the Human Factors and Ergonomics Society’s Human Performance Modeling Technical Group, 2011 – 2012.
- Webmaster for the HFES Human Performance Modeling Technical Group, 2008 – 2014.
- President of the University of Virginia’s Human Factors and Ergonomics Society student chapter, 2007 – 2009.
- Coeditor of the winter edition of *Cognitia*, the newsletter of the Human Factors and Ergonomics Society’s Cognitive Engineering and Decision Making Technical Group, 2004.
- Organized events and prepared the application that got the University of Virginia’s Human Factors and Ergonomics Society student chapter gold status recognition from the national society, 2008.
- Organized the participation of the University of Virginia’s Human Factors and Ergonomics Society student chapter in the Virginia Tech human factors research symposium, 2008.
- Webmaster (<http://www.sys.virginia.edu/hfes/>) for the University of Virginia’s Human Factors and Ergonomics Society’s student chapter, 2003–2007.

### **Journal Paper Reviewer**

- Current Directions in Psychological Science
- Cognitive, Affective, and Behavioral Neuroscience.
- Transportation Research Part C.
- Computational and Mathematical Organization Theory.
- Human Factors.
- IEEE Transactions on Automation Science and Engineering.
- IEEE Transaction on Systems, Man, and Cybernetics: Systems.
- IEEE Transaction on Human Machine Systems.
- IEEE Transaction on Systems, Man, and Cybernetics: Part A, Systems and Humans (broken up into the previous two entries).
- Innovations in Systems and Software: A NASA Journal.
- Journal of Aerospace Information Systems.
- Journal of Cognitive Engineering and Decision Making.
- Journal of Trust Management.
- Industrial Ergonomics.
- Interacting with Computers.
- Theoretical Issues in Ergonomics Science.



## **Conference and Workshop Organization**

- Organized an invited symposium at the 2017 HFES annual meeting on Novel Developments in Formal Methods for Human Factors Engineering.
- Organized the program for the Human Performance Modeling Technical Group for the 2013 and 2014 HFES Annual Meetings.
- Chaired session at the 2015 IIE Annual Conference and Expo, Nashville, TN.
- Initiated and acquired IEEE Technical Co-sponsorship of the AAAI 2014 Symposium on Modeling in Human-Machine Systems: Challenges for Formal Verification.
- Co-organized the Midwest Verification Day 2013 (MVD'13), University of Illinois at Chicago.
- Jointly organized the 2012 workshop “Formal Methods in Human Machine Interaction (Formal H)”.
- Organized and chaired a special session on “Applications of Formal Methods to Human-automation Interaction” at the 2011 IEEE International Conference on Systems, Man, and Cybernetics.
- Chaired sessions at the 2008, 2009, 2010, 2011, 2013, 2014, 2015, and 2017 Human Factors and Ergonomics Society Annual Meetings.
- Helped prepare proceedings for the 2005 IEEE Systems and Information Engineering Design Symposium.
- Served as a judge for the 2004 student paper competition of the Human Factors and Ergonomics Society’s Cognitive Engineering and Decision Making Technical Group.

## **Program Committee Member / Conference Paper Reviewer**

- 7th International Workshop on Formal Methods for Interactive Systems, 2018.
- Software Challenges in Aerospace Symposium (SCiA) 2015
- International Conference on Model & Data Engineering (MEDI) 2014, 2016.
- Verified Software: Theories, Tools and Experiments 2013.
- Engineering Interactive Computing Systems 2013.
- Automation in Command and Control Systems (ATACCS) 2011, 2012.
- Behavior Representation in Modeling & Simulation 2011, 2012, 2013.
- Human Factors and Ergonomics Society Annual Meeting 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017.
- IEEE International Conference on Systems, Man, and Cybernetics 2006, 2007, 2008, 2009, 2011, 2012, 2013, 2014, 2016.
- INTERACT 2011.
- Tools and Algorithms for the Construction and Analysis of Systems (TACAS) 2011, 2012, 2013.
- The ACM SIGCHI Symposium on Engineering Interactive Computing Systems 2013, 2014, 2015, 2016.
- Formal Methods in Human Computer Interaction (FoMHCI) 2015, 2016.

## **Grant Proposal Reviewer**

- Served as a panelist for the National Science Foundation, 2018.
- Reviewed proposal for The Netherlands Organisation for Scientific Research, 2018.
- Reviewed proposals for the Army Research Lab Basic Research, 2017.
- Reviewed proposal for the Israel Science Foundation, 2014.

### **Professional Development Workshops Attended**

- UB Germination Space: A series of three workshops for developing transformative research questions, March, April, and May 2018.
- Artificial Intelligence: Institute for Human-Machine Partnerships workshop, August 2017.
- SEAS Faculty Workshop: Cultural Competence for Faculty in the Academy, November 2015.
- “NIH Grants Seminar: Insights and Strategies for Early and Mid-Career Scholars” at the University at Buffalo, State University of New York, August 24, 2015.
- “Transitioning to Autonomy: Changes in the Role of Humans in Air Transportation” at NASA Ames Research Center, Moffett Field, CA, March 10-12, 2015.
- “NSF Grants Conference” in Arlington, VA, October 6 – 7, 2014.
- “Home Health Innovations: Bridging Research and Practice” at the University at Buffalo, State University of New York, May 15, 2014.
- “Write Winning NSF Grant Proposals” at the University of Illinois at Chicago, October 17, 2012.
- “Cognitive Crash Dummies: Predictive Human Performance Modeling for Interactive System Design” at the 53<sup>rd</sup> Annual Meeting of Human Factors and Ergonomics Society, October 29, 2009.

## **X. Departmental, School, and University Service**

### **University at Buffalo, State University of New York**

#### **University**

- Volunteer for educational video production outreach to the Bennett High School in Buffalo, New York, 2016.

#### **School**

- Served as a judge for the 11th Annual CSTEP Research Poster Symposium & Luncheon
- Served as a committee member on an academic integrity hearing, spring 2017.
- Served as a marshal at the 2016 Graduation Ceremony.
- Served as the Club Advisor for the UB student chapter of the HFES, August 2015 - Present.
- Served as a judge for the 2015 and 2016 SEAS Graduate Poster Competition.
- Served on the SEAS Undergraduate Grievance Committee, January 2015 – Present

#### **Department**

- Served on the faculty search committee, Spring 2018.
- Served as the co-chair of the ISE Praxair Seminar Series, 2016/2017.
- Served as the faculty representative of the UB HFES student chapter, 2015– 2018.
- Served on the Graduate Committee for the Department of Industrial and Systems Engineering 2015 – 2018.
- Assisted in the selection and ranking of Ph.D. student applicants to the department’s human factors program in the 2014/2015 academic year.
- Presented a lecture for IE 101, a class designed to get students excited about industrial and systems engineering, Spring 2014, Spring 2015, Spring 2016, Spring 2017, and Spring 2018.
- Co-organized the 2014, 2015, 2016, 2017, and 2018 Department of Industrial and System Engineering student poster competition.
- Updated and presented a poster promoting UB’s Human Factors program at the 2014, 2015, and 2016 International Annual Meeting of the Human Factors and Ergonomics Society.
- Led the effort to renew the accreditation of our human factors education program for the HFES, January 2015
- Presented a lecture for the IIE Research Series on October 24, 2014.

## **University of Illinois at Chicago**

### **University**

- Served on the Goldwater Scholarship selection committee for the University of Illinois at Chicago in 2012 and 2013.

### **School**

- Conducted a video interview for ENGAGE (engaging students in engineering) in 2012:  
<https://www.youtube.com/watch?v=kOZVYmKV7Y0>

### **Department**

- Served on the Graduate Committee for the University of Illinois at Chicago's Department of Mechanical and Industrial Engineering 2012 – 2013.
- Served as the faculty meeting secretary for the University of Illinois at Chicago's Department of Mechanical and Industrial Engineering 2012 – 2013.

## **University of Virginia**

### **School**

- Presented at the 2004 and 2005 engineering open houses.
- Presented at the 2004 Science, Engineering, Communication, Mathematics Enhancement Program open house.
- Presented at the 2006, 2007, and 2008 Prospective Student Day.

### **Department**

- Designed the website for the UVA MINDSET program (<http://www.sys.virginia.edu/healthcare/>) in 2010.
- Represented the University of Virginia's Department of Systems and Information Engineering at the 2006 and 2008 HFES annual meeting's lab presentations.
- Represented the University of Virginia's Department of Systems and Information Engineering at the "Integration of Advanced Concepts and Vehicles into the Next Generation Air Transportation System" Pre-proposal Conference, August 9, 2007.
- Organized a weekly human factors research seminar series for the 2006 summer and fall terms.