Christopher J. MacLellan

Research Scientist, Soar Technology, Inc.
3600 Green Ct #600, Ann Arbor, MI 48105
Homepage: http://www.soartech.com/
Fax: (734) 913-8537

Email: maclellan.christopher@gmail.com
Personal Page: https://chrismaclellan.com/
Phone: (307) 220-2425
Citizenship: USA, Active Secret Clearance

Work Experience

Soar Technology, Inc., Research Scientist, 2017-Present

Education

Carnegie Mellon University, M.S./Ph.D. in Human-Computer Interaction, 2017.
Advisor: Ken Koedinger

Arizona State University, Ph.D. Student in Computer Science, 2010-2012.
Concentration: Artificial Intelligence, *Advisor*: Pat Langley
(Transferred to Carnegie Mellon University August 2012)

University of Wyoming, B.S. in Computer Science and Mathematics, 2010.
Honors: Most Outstanding 2010 Graduate, Cum Laude.

Grants and Contracts

Defense Advanced Research Projects Agency (DARPA), Cloud-based Learning by Unsupervised Exploration (CLUE), $3,324,180, Oct 2018 - July, 2020. (Co-investigator, PI E. Martisonson)

Office of Naval Research (ONR), MineApprentice: Learning Performance Models and Tactical Knowledge for Continuous Mission Planning, N68335-18-C-0401, $124,865, May 2018 - November 2018. (PI)

Soar Technology, Apprentice: An Architecture for Building Agents that Learn from Natural Training Interactions, Internal Research and Development (IRAD), $60,275, April, 2018 - January, 2019. (PI)

National Science Foundation (NSF), Conference: A Proposal to the National Science Foundation for Support of the Seventh Annual Inter-Science of Learning Centers (iSLC) Student / Postdoctoral Scholar Conference, Award Number SMA-1430662, $99,999, April 2014 - March 2016. (Lead writer and conference co-chair with C. Tenison, PI K. Koedinger)

Honors and Awards

Post Doctoral Research Fellowship (declined), National Research Council, 2017.
Exemplary Paper Award, Educational Data Mining, 2016.
Program for Interdisciplinary Education Research Fellowship, Carnegie Mellon University, 2012-2015.
Conference Travel Grants, ACS 2016, NSF 2015, ACM 2015, AAAI 2011.
Fulton Fellowship, Arizona State University, 2010-2011.
Deans Fellowship Award, Arizona State University, 2010-2014.
Space Grant Fellowship, University of Wyoming, 2010.
Most Outstanding 2010 Graduate Award, University of Wyoming, 2010.
College of Engineering Excellent Academic Achievement Award, University of Wyoming, 2007-2009.

NASA Space Grant, NASA Jet Propulsion Laboratory, 2009.
Arts and Sciences Board of Visitors Student Service Award, University of Wyoming, 2008.
Arts and Sciences Catherine Gibbs Shaw Award, University of Wyoming, 2008.
Summer EPSCoR Research Fellowship, University of Wyoming, 2008.
Spring EPSCoR Research Fellowship, University of Wyoming, 2008.
Undergraduate Research Fellowship, National Science Foundation, 2007–2008.

Thesis

Maclellan, C. J. (2017). Computational models of human learning: Applications for tutor development, behavior prediction, and theory testing. Doctoral Dissertation, Human-Computer Interaction Institute, Carnegie Mellon University, Pittsburg, PA.

Journal Publications

J5 **MacLellan, C.J.**, Harpstead, E., Marinier III, R. P., Koedinger, K.R. (2018). A Framework for Natural Cognitive System Training Interactions. *Advances in Cognitive Systems*, 6, 177-192.

J4 **MacLellan, C.J.**, Harpstead, E., Aleven, V. Koedinger, K.R. (2016). TRESTLE: A Model of Concept Formation in Structured Domains. *Advances in Cognitive Systems*, 4, 131-150.

J3 Unger, L., Fisher, A. V., Nugent, R., Ventura, S. L., **MacLellan, C.J.** (2016). Developmental Changes in the Semantic Organization. *Journal of Experimental Child Psychology*, 146. doi: 10.1016/j.jecp.2016.01.005

J2 Dinar, M., Danielescu, A., **MacLellan, C.J.**, Shah, J., Langley, P. (2015). Problem Map: An ontological framework for a computational study of problem formulation in engineering design. *Journal of Computing and Information Science in Engineering*, 15(3). doi: 10.1115/1.4030076

J1 **MacLellan, C.J.**, Langley, P., Shah, J., Dinar, M. (2013). A Computational Aid for Problem Formulation in Early Conceptual Design. *Journal of Computing and Information Science in Engineering*,13(3). doi: 10.1115/1.4024714

Peer-Reviewed Conference Publications

C12 **MacLellan, C.J.**, Harpstead, E., Patel, R., Koedinger, K.R. (2016). The Apprentice Learner Architecture: Closing the loop between learning theory and educational data. In *Proceedings of the 9th International Conference on Educational Data Mining*. (Winner of Exemplary Paper Award).

C11 **MacLellan, C.J.**, Koedinger, K.R., Dow, S.P. (2015). Assessing the Creativity of Designs at Scale. In E. Y. Do (Ed.), *Proceedings of the 2015 ACM SIGCHI Conference on Creativity and Cognition* (pp. 339-340). New York: ACM Press. doi: 10.1145/2757226.2764770

C10 **MacLellan, C.J.**, Harpstead, E., Aleven, V., Koedinger, K.R. (2015). TRESTLE: Incremental Learning in Structured Domains using Partial Matching and Categorization. In *Proceedings of the Third Annual Conference on Advances in Cognitive Systems*. Atlanta, GA: Cognitive Systems Foundation.

C9 **MacLellan, C.J.**, Liu, R., Koedinger, K.R. (2015). Accounting for Slipping and Other False Negatives in Logistic Models of Student Learning. In O.C. Santos et al. (Eds.), *Proceedings of the 8th International Conference on Educational Data Mining*. Madrid, Spain: International Educational Data Mining Society.

C8 **MacLellan, C.J.**, Koedinger, K.R., Matsuda, N. (2014). Authoring Tutors with SimStudent: An Evaluation of Efficiency and Model Quality. In S. Trausan-Matu, K. E. Boyer, M. Crosby,

K. Panourgia (Eds.), *Proceedings of the 12th International Conference on Intelligent Tutoring Systems* (pp. 551-560). Switzerland: Springer International. doi: 10.1007/978-3-319-07221-0

C7 Harpstead, E., **MacLellan, C.J.**, Aleven, V., Myers, B.A. (2014) Using Extracted Features to Inform Alignment-Driven Design Ideas in an Educational Game. In A. Schmidt, T. Grossman (Eds.), *Proceedings of the 32nd Annual SIGCHI Conference on Human Factors in Computing Systems - CHI '14* (pp. 3329-3338). New York: ACM Press. doi: 10.1145/2556288.2557393

C6 Tenison, C., **MacLellan, C.J.** (2014). Modeling Strategy Use in an Intelligent Tutoring System: Implications for Strategic Flexibility. In S. Trausan-Matu, K. E. Boyer, M. Crosby, K. Panourgia (Eds.), *Proceedings of the 12th International Conference on Intelligent Tutoring Systems* (pp. 466-475). Switzerland: Springer International. doi: 10.1007/978-3-319-07221-0

C5 Unger, L., Fisher, A. V., **MacLellan, C.J.** (2014). Developmental Changes in the Semantic Organization of Living Kinds. In P. Bello, M. Guarini, M. McShane, B. Scassellati (Eds.), *Proceedings of the 36th Annual Meeting of the Cognitive Science Society* (pp. 1646-1651). Quebec City: Cognitive Science Society.

C4 Harpstead, E., **MacLellan, C.J.**, Koedinger, K.R., Aleven, V., Dow, S.P., Myers, B.A. (2013). Investigating the Solution Space of an Open-Ended Educational Game Using Conceptual Feature Extraction. In S.K. D'Mello, R.A. Calvo, A. Olney (Eds.), *Proceedings of the 6th International Conference on Educational Data Mining* (pp. 51-58). Memphis, TN: International Educational Data Mining Society

C3 Danielescu, A., Dinar, M., **MacLellan, C.J.**, Shah, J., Langley, P. (2012). The structure of creative design: what problem maps can tell us about problem formulation and creative designers. *Proceedings of the ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference* (pp. 437-446). Chicago, Illinois: ASME. doi: 10.1115/DETC2012-70325

C2 Dinar, M., **MacLellan, C.J.**, Danielescu, A., Shah, J. (2012). Beyond Function-Behavior-Structure. In J. Gero (Ed.), *Design Computing and Cognition '12* (pp. 511-527). Netherlands: Springer. doi: 10.1007/978-94-017-9112-0

C1 Wiederrecht, M., **MacLellan, C.J.**, Gamboa, R. (2010). Reasoning about DrScheme Programs in ACL2. In R. Page, Z. Horvath, V. Zsk (Eds.), *Trends in Functional Programming* (pp. 276-283). Berlin: Springer-Verlag. doi: 10.1007/978-3-642-22941-1

Book Chapters

B1 Harpstead, E. , **MacLellan, C.J.**, Aleven, V., Myers, B. A. (2015). Replay analysis in open-ended educational games. In C. S. Loh, Y. Sheng, and D. Ifenthaler (Eds.), *Serious Game Analytics: Methodologies for Performance Measurement, Assessment, and Improvement*, 381-399. Switzerland: Springer International. doi: 10.1007/978-3-319-05834-4_17

Symposia and Workshop Papers

W12 Harpstead, E., **MacLellan, C.J.**, Koedinger K.R. (2018). Towards Natural Cognitive System Training Interactions: A Preliminary Framework. In *Proceedings of the AAAI 2018 Spring Symposium on the User Experience of Artificial Intelligence*.

W11 **MacLellan, C.J.**, (2016). Apprentice Learner Architecture: A framework for modeling human learning from demonstrations and feedback in digital environments. *Proceedings of the Students of Cognitive Systems Workshop at the Fourth Annual Conference on Advances in Cognitive Systems*. Evanston, IL: Advances in Cognitive Systems.

W10 **MacLellan, C.J.**, (2016). Investigating the Impact of Slipping Parameters on Addative Factors Model Parameter Estimates. *Proceedings of the 9th International Conference on Educational Data Mining*. Raleigh, NC: International Educational Data Mining Society.

W9 **MacLellan, C.J.**, Harpstead, E., Wiese, E.S., Zou, M., Matsuda, N., Aleven, V., Koedinger, K.R. (2015). Authoring Tutors with Complex Solutions: A Comparative Analysis of Example Tracing and SimStudent. In J. Boticario K. Muldner (Eds.), *Proceedings of the Workshops at the 17th International Conference on Artificial Intelligence in Education AIED 2015* (Vol. 5, pp. 35-44). Aachen: CEUR-WS.org.

W8 Harpstead, E., **MacLellan, C.J.**, Aleven, V. (2015). Discovering Knowledge Models in an Open-Ended Educational Game using Concept Formation. In J. Boticario, K. Muldner (Eds.), *Proceedings of the Workshops at the 17th International Conference on Artificial Intelligence in Education AIED 2015* (Vol. 2, pp. 9-16). Aachen: CEUR-WS.org.

W7 Koedinger, K.R., Matsuda, N., **MacLellan, C.J.**, McLaughlin, E.A. (2015). Methods for Evaluating Simulated Learners: Examples from SimStudent. In J. Boticario, K. Muldner (Eds.), *Proceedings of the Workshops at the 17th International Conference on Artificial Intelligence in Education AIED 2015* (Vol. 5, pp. 45-54). Aachen: CEUR-WS.org.

W6 **MacLellan, C.J.**, Wiese, E.S., Matsuda, N., Koedinger, K.R. (2014). SimStudent: Authoring Expert Models by Tutoring. In R. Sottilare (Ed.), *Proceedings of the Second Annual GIFT Users Symposium* (pp. 25-32). Orlando, FL: US Army Research Laboratory.

W5 **MacLellan, C.J.**, Wiese, E.S., Matsuda, N., Koedinger, K.R. (2014). SimStudent: Improving Tutor Quality and Reducing Authoring Costs. In *Workshop Proceedings of the 12th International Conference on Intelligent Tutoring Systems*.

W4 Harpstead, E., **MacLellan, C.J.**, Aleven, V., Koedinger, K.R. (2014). Using Data to Explore the Differences between Instructional Vision and Student Performance. In *Learning Innovations at Scale CHI 2014 Workshop*.

W3 **MacLellan, C.J.**, Matsuda, N., Koedinger, K. R. (2013). Toward a reflective SimStudent: Using experience to avoid generalization errors. In E. Walker, C. Looi (Eds.), *Proceedings of the Workshops at the 16th International Conference on Artificial Intelligence in Education AIED 2013* (Vol. 4). Aachen: CEUR-WS.org.

W2 Langley, P., Emery, M., Barley, M., **MacLellan, C.J.** (2013). An Architecture for Flexible Problem Solving. In *Annual Conference on Advances in Cognitive Systems: Workshop on Metacognition in Situated Agents*.

W1 Langley, P., Emery, M., Barley, M., **MacLellan, C.J.** (2013). An Architecture for Flexible Problem Solving. In *Proceedings of the Annual Conference on Advances in Cognitive Systems: Workshop on Metacognition in Situated Agents*.

Papers Presented as Posters

P4 Sheline, R., **MacLellan., C.J.** (2018). Investigating Machine-Learning Interaction with Wizard-of-Oz Experiments. In Proceedings of the NeurIPS 2018 Workshop on Learning by Instruction.

P3 Tenison, C., **MacLellan, C.J.** (2015). The Impact of Instructional Intervention and Practice on Help-Seeking Strategies within an ITS. In O.C. Santos et al. (Eds.), *Proceedings of the 8th International Conference on Educational Data Mining*. International Educational Data Mining Society.

P2 **MacLellan, C.J.**, Langley, P., Walker, C. (2012). A Generative Theory of Problem Solving. In *Proceedings of the First Conference on Advances in Cognitive Systems: Poster Collection*.

Cognitive Systems Foundation.

P1 **MacLellan, C.J.** (2011). An elaboration account of insight. In *Proceedings of the 2011 AAAI Fall Symposium on Advances in Cognitive Systems* (pp. 194-201). Arlington, VA: AAAI Press.

Students and Engineers Supervised

Rob Sheline, Engineer, September 2017 – Present.
Developed Natural Training Interaction (NTI) testbed.

Amrith Deepak, Independent Study, September 2016 – December 2016
Modeled human behavior in Stoichiometry Tutor.

Anant Dadu, Independent Study, May 2016 – August 2016
Created interface between Scikit-learn toolkit and Apprentice Learner Architecture.

Zach Halle, Independent Study, May 2015 – August 2015
Created a framework to train and test simulated agents using existing cognitive models.

Aohan Lin, Independent Study, May 2014 – August 2014
Developed a web-based, drag-and-drop tool for interface design.

Mengfan Zou, Independent Study, May 2014 – August 2014
Developed a computational model of Experimental Design using SimStudent.

Aditya Kothari, Independent Study, May 2014 – August 2014
Conducted a reliability analysis of a new crowd-based creativity assessment tool.

Steven Dang, Independent Study, August 2013 – May 2014
Developed and launched online creativity study.

Chiddu Bhat, Independent Study, May 2013 – August 2013
Conducted pilots for creativity study and developed prompt and instructional materials.

Collin Walker, Independent Study, May 2012 – August 2012
Developed GTPS (generative theory of problem solving) architecture.

Teaching Experience

Carnegie Mellon University, Human-Computer Interaction Institute

Teaching Assistant, Software Structures for User Interfaces, Jen Mankoff, Fall 2016.
Teaching Assistant, User-Centered Research and Evaluation, Amy Ogan & Jim Morris, Fall 2015.

Arizona State University, Computer Science and Informatics

Teaching Assistant, Decision Making and Problem Solving, Pat Langley, Spring 2012.

University of Wyoming, Department of Mathematics

Teaching Assistant, Business Calculus, Cynthia Vadnais, Spring 2007 - Spring 2010.
Program Instructor, Acing Algebra, Cynthia Vadnais, Summer 2008.

Invited Talks

Towards Natural Cognitive System Training Interactions: A Preliminary Framework. AFCEA 2018 C4I and Cyber Symposium, 2018.

Computational Models of Learning: Applications for Tutor Development and Theory Testing, University of Rochester, 2016.

Computational Models of Learning: Applications for Tutor Development and Theory Testing, Illinois Institute of Technology, 2016.

Computational Models of Learning: Applications for Tutor Development and Theory Testing, Air Force Research Laboratory, 2016.

Computational Models of Learning: Applications for Tutor Development and Theory Testing, University of Kentucky, 2016.

Towards a Computational Model of Human Learning from Interactive Training, University of Pittsburgh, 2016.

Cryptography and Code Breaking, Thyra Thomson Honors Convocation, University of Wyoming, 2009.

Service

Reviewer, Cognitive Science, IAAI, ACS, AAAI, EDM, L@S, ACM CHI, AIED, IEEE TLT, 2012–Present.
Organizer, Students of Cognitive Systems Workshop at Advances in Cognitive Systems, 2016.
Organizer, Program for Interdisciplinary Education Research EdBag Lunch Seminar, 2015.
Student Host, Carnegie Mellon University Fusion Forum, 2015.
Chair, Seventh Annual Inter-Science of Learning Center Student / Postdoc Conference, 2014.
Member, Pittsburgh Science of Learning Executive Committee, 2013.
Language Editor, Central European Journal of Computer Science, 2011–2014.
Member, Graduate Student Professional Society, Arizona State University, 2011–2012.
Chapter Councilor, Sigma Phi Epsilon, Arizona State University, 2011–2012.
Member, College of Arts and Sciences Grade Appeal Committee, University of Wyoming, 2010.
President, Sigma Phi Epsilon Fraternity, University of Wyoming, 2008–2009.
Student Senator, Associated Students of the University of Wyoming, 2008–2009.
Vice President, Association for Computing Machinery, University of Wyoming, 2008.
Vice President of Recruitment, Sigma Phi Epsilon Fraternity, University of Wyoming, 2007–2008.
President of the Student Math Association of Wyoming, University of Wyoming, 2006–2007.

Last updated: January 6, 2019
`https://chrismaclellan.com/`