

ANDREW LOVETT

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Research Interests

I am interested in **visual perception**, **visual comparison**, and **spatial problem-solving**. I study these processes in humans using behavioral experiments and computational models. The models, which generate representations and solve problems autonomously, are useful for refining psychological theories and developing novel, testable predictions. In the past, I've focused on basic ability tests like mental rotation and larger-scale problem-solving tasks like geometric analogy and Raven's Matrices.

Education

Northwestern University, M.S., Ph.D. in Computer Science June 2012
Advisor: Kenneth D. Forbus

Yale University, B.A. in Cognitive Science June 2004
Advisor: Brian Scassellati
Magna Cum Laude, with *Distinction in the Major*

Research Experience

Postdoctoral Researcher 2014 – Present
Visual Cognition Lab, Northwestern University

Postdoctoral Researcher 2013 – 2014
SFB/TR 8 Spatial Cognition, Universität Bremen

Postdoctoral Researcher 2012–2013
Qualitative Reasoning Group, Northwestern University

Graduate Research Assistant 2004–2012
Qualitative Reasoning Group, Northwestern University
Advisor: Kenneth D. Forbus

Undergraduate Research Assistant 2002–2004
Social Robotics Lab, Yale University
Advisor: Brian Scassellati

Summer Research Assistant 2001
Yale University
Advisor: Drew McDermott

Summer Research Assistant 2000
Institute for Environmental Modeling, University of Tennessee
Advisor: Lou Gross

Teaching Experience

Teaching Assistant Spring 2007, Spring 2009
Northwestern University
Computer Game Design

Teaching Assistant Fall 2007
Northwestern University
Introduction to Cognitive Modeling

Awards & Honors

Institutional Research Training Grant (T32), National Institute of Health, 2014.

Robert J. Glushko Dissertation Prize, Cognitive Science Society, 2013.

Junior Fellowship, Hanse-Wissenschaftskolleg Institute for Advanced Study, 2013.

Best Paper Award, International Conference on Development & Learning, 2004.

Cognitive Science Fellowship, Northwestern University, 2004.

Magna Cum Laude, Yale University, 2004.

National Merit Scholarship, 2000.

Societies & Service

Member, Cognitive Science Society, 2005–2014.

Member, Association for the Advancement of Artificial Intelligence, 2007–2010.

Reviewer, *Cognitive Science*, 2013.

Reviewer, *Journal of Experimental & Theoretical Artificial Intelligence*, 2012.

Reviewer, *International Conference on Neural Information Processing*, 2012.

Reviewer, *International Workshop on Similarity and Analogy-based AI*, 2012.

Reviewer, *International Workshop on Spatio-Temporal Dynamics*, 2012.

Reviewer, *Spatial Cognition Conference*, 2012.

Reviewer, *Cognitive Systems Research*, 2011.

Reviewer, *Cognitive Processing*, 2010.

Reviewer, *International Analogy Conference*, 2009.

Reviewer, *IEEE Transactions on Knowledge and Data Engineering*, 2008.

Reviewer, *Annual Conference of the Cognitive Science Society*, 2007–2009, 2013.

Publications

Journal Papers & Book Chapters

1. Lovett, A., & Forbus, K. (in prep). Modeling comparison and abstraction during visual problem-solving.
2. Sagi, E., Gentner, D., & Lovett, A. (2012). What difference reveals about similarity. *Cognitive Science*, 36(6), 1019-1050.
3. Lovett, A., & Forbus, K. (2011). Cultural commonalities and differences in spatial problem-solving: A computational analysis. *Cognition*, 121(2), 281-287.
4. Forbus, K., Usher, J., Lovett, A., Lockwood, K., & Wetzel, J. (2011). CogSketch: Sketch understanding for cognitive science research and for education. *Topics in Cognitive Science*, 3(4), 648-666.
5. Lovett, A., Tomai, E., Forbus, K., & Usher, J. (2009). Solving geometric analogy problems through two-stage analogical mapping. *Cognitive Science*, 33(7), 1192-1231.
6. Lovett, A., Gentner, D., Forbus, K., & Sagi, E. (2009). Using analogical mapping to simulate time-course phenomena in perceptual similarity. *Cognitive Systems Research*, 10(3): Special Issue on Analogies - Integrating Cognitive Abilities, 216-228.
7. Striegnitz, K., Tepper, P., Lovett, A., & Cassell, J. (2009). Knowledge representation for generating locating gestures in route directions. In K. R. Coventry, T. Tenbrink, & J. Bateman (Eds.), *Spatial Language and Dialogue (Explorations in Language and Space)*. Oxford: Oxford University Press.

Peer-Reviewed Conference Publications

1. Lovett, A., & Schultheis, H. (2014). Modeling spatial abstraction during mental rotation. *Proceedings of the 36th Annual Conference of the Cognitive Science Society*. Quebec City, Canada.
2. Lovett, A., & Forbus, K. (2013). Modeling spatial ability in mental rotation and paper-folding. *Proceedings of the 35th Annual Conference of the Cognitive Science Society*. Berlin, Germany, 930-935.

3. Lovett, A., & Forbus, K. (2012). Modeling multiple strategies for solving geometric analogy problems. *Proceedings of the 34th Annual Conference of the Cognitive Science Society*. Sapporo, Japan, 701-707.
4. Lovett, A., Forbus, K., & Usher, J. (2010). A structure-mapping model of Raven's Progressive Matrices. *Proceedings of the 32nd Annual Conference of the Cognitive Science Society*. Portland, OR, 2761-2766.
5. Lovett, A., Sagi, E., Gentner, D., & Forbus, K. (2009). Modeling perceptual similarity as analogy resolves the paradox of difference detection. *Proceedings of the 2nd International Analogy Conference*. Sofia, Bulgaria, 320-329.
6. Lovett, A., & Forbus, K. (2009). Using a visual routine to model the computation of positional relations. *Proceedings of the 31st Annual Conference of the Cognitive Science Society*. Amsterdam, The Netherlands, 1882-1887.
7. Lovett, A., Lockwood, K., & Forbus, K. (2008). A computational model of the visual oddity task. *Proceedings of the 30th Annual Conference of the Cognitive Science Society*. Washington, D.C., 631-636.
8. Lovett, A., Lockwood, K., & Forbus, K. (2008). Modeling cross-cultural performance on the visual oddity task. *Proceedings of Spatial Cognition 2008*. Freiburg, Germany, 378-393.
9. Lockwood, K., Lovett, A., & Forbus, K. (2008). Automatic classification of containment and support spatial relations in English and Dutch. *Proceedings of Spatial Cognition 2008*. Freiburg, Germany, 283-294.
10. Lovett, A., Dehghani, M., & Forbus, K. (2007). Incremental learning of perceptual categories for open-domain sketch recognition. *Proceedings of the International Joint Conference on Artificial Intelligence*. Hyderabad, India, 447-452.
11. Lovett, A., Forbus, K., & Usher, J. (2007). Analogy with qualitative spatial representations can simulate solving Raven's Progressive Matrices. *Proceedings of the 29th Annual Conference of the Cognitive Science Society*. Nashville, TN, 449-454.
12. Dehghani, M., & Lovett, A. (2006). Efficient genre classification using qualitative representations. *Proceedings of the 7th International Conference on Music Information Retrieval*. Vancouver, Canada.
13. Lovett, A., Gentner, D., & Forbus, K. (2006). Simulating time-course phenomena in perceptual similarity via incremental encoding. *Proceedings of the 28th Annual Conference of the Cognitive Science Society*. Vancouver, Canada, 1723-1728.
14. Tomai, E., Lovett, A., Forbus, K., & Usher, J. (2005). A structure mapping model for solving geometric analogy problems. *Proceedings of the 27th Annual Conference of the Cognitive Science Society*. Stressa, Italy, 2190-2195.

15. Lovett, A., & Scassellati, B. (2004). Using a robot to reexamine looking time experiments. *Proceedings of the 4th International Conference on Development and Learning (ICDL)*. San Diego, CA. [Best Paper Award]

Peer-Reviewed Workshop & Symposium Papers

1. Lovett, A., Kandaswamy, S., McLure, M., & Forbus, K. (2012). Evaluating qualitative models of shape representation. *Proceedings of the 26th International Workshop on Qualitative Reasoning*. Los Angeles, CA.
2. Lovett, A. & Forbus, K. (2011). Organizing and representing space for visual problem-solving. *Proceedings of the 25th International Workshop on Qualitative Reasoning*. Barcelona, Spain, 92-99.
3. Lovett, A. & Forbus, K. (2010). Shape is like space: Modeling shape representation as a set of qualitative spatial relations. *Proceedings of the AAAI Spring Symposium on Cognitive Shape Processing*. Palo Alto, CA.
4. Lovett, A., & Forbus, K. (2009). Computing human-like qualitative topological relations via visual routines. *Proceedings of the 23rd International Qualitative Reasoning Workshop*. Ljubljana, Slovenia, 76-83.
5. Lovett, A., Dehghani, M., & Forbus, K. (2008). Building and comparing qualitative descriptions of three-dimensional design sketches. *Proceedings of the 22nd International Qualitative Reasoning Workshop*. Boulder, CO, 95-101.
6. Forbus, K., Usher, J., Lovett, A., Lockwood, K., & Wetzel, J. (2008). CogSketch: Open-domain sketch understanding for cognitive science research and for education. *Proceedings of the Fifth Eurographics Workshop on Sketch-Based Interfaces and Modeling*. Annecy, France, 159-166.
7. Lovett, A., Lockwood, K., Dehghani, M., & Forbus, K. (2007). Modeling human-like rates of learning via analogical generalization. *Proceedings of Analogies: Integrating Multiple Cognitive Abilities*. Nashville, TN.
8. Lovett, A., Sagi, E., & Gentner, D. (2007). Analogy as a mechanism for comparison. *Proceedings of Analogies: Integrating Multiple Cognitive Abilities*. Nashville, TN.
9. Lovett, A., Dehghani, M., & Forbus, K. (2007). Constructing spatial representations of variable detail for sketch recognition. *AAAI Spring Symposium on Control Mechanisms for Spatial Knowledge Processing in Cognitive / Intelligent Systems*. Stanford University, CA.
10. Lovett, A., Forbus, K., & Usher, J. (2007). Using qualitative representations and analogical mapping to solve problems from a spatial intelligence test. *Proceedings of the 21st International Qualitative Reasoning Workshop*. Aberystwyth, U.K., 79-86.
11. Dehghani, M., Unsworth, S., Lovett, A., & Forbus, K. (2007). Capturing and categorizing mental models of food webs using QCM. *Proceedings of the 21st International Qualitative Reasoning Workshop*. Aberystwyth, U.K., 25-30.

12. Lovett, A., Dehghani, M., & Forbus, K. (2006). Efficient learning of qualitative descriptions for sketch recognition. *Proceedings of the 20th International Qualitative Reasoning Workshop*. Hanover, New Hampshire.