

# Shiwali Mohan

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## CONTACT INFORMATION

Bob & Betty Beyster Building, #3844  
Computer Science and Engineering  
University of Michigan  
Ann Arbor, MI 48109 USA

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## RESEARCH INTERESTS

Cognitive systems and agents, situated language for agents, learning with human-agent interaction, natural language semantics, knowledge representation and reasoning, interactive knowledge acquisition, cognitive robotics.

## EDUCATION

**University of Michigan**, Ann Arbor, MI USA  
Ph.D., Computer Science and Engineering 2008 - 2014 (expected)  
Thesis (in progress): *Learning Tasks and Verbs from Situated Interactive Instruction*  
Thesis Advisor: John Laird  
Thesis Committee: Edmund Durfee, Richard Lewis, Edwin Olson, Andrea Thomaz

**University of Michigan**, Ann Arbor, MI USA  
M.S.E., Computer Science and Engineering 2008 - 2009

**University of Delhi**, New Delhi, India  
*Netaji Subhas Institute of Technology*  
B.E., Instrumentation and Control Engineering 2003 - 2007  
Senior Thesis: *Extraction-based Single Document Summarization*

## RESEARCH EXPERIENCE

**University of Michigan**, Ann Arbor, MI USA  
Graduate Student Research Assistant to John E. Laird August 2010 - present  
*Learning tasks with situated interactive instruction*  
Studying representations and knowledge-intensive learning algorithms that are useful in learning goal-oriented, hierarchical tasks from mixed-initiative task-oriented dialog. Developing paradigms to learn with task-oriented dialog.

*Situated language for embodied agents*  
Developing the Indexical model of situated comprehension that translates abstract linguistic symbols to grounded perceptual, spatial, and task knowledge. Investigating the role of non-linguistic context and domain knowledge in linguistic comprehension.

**University of Michigan**, Ann Arbor, MI USA  
Graduate Student Research Assistant to John E. Laird January 2009 - August 2010  
*Reinforcement learning in Soar cognitive architecture*  
Designed, implemented, and analyzed reinforcement learning agents for Infinite Mario. Formulated and implemented modular reinforcement learning for the Soar cognitive architecture to simultaneously learning multiple markov decision processes.

**Indian Institute of Technology**, New Delhi, India  
Research Assistant to Niladri Chatterjee May 2007 - July 2007

*Sense disambiguation, distributional semantics*

Developed and analyzed a Random Indexing based algorithm for sense disambiguation of homonyms.

**University of Delhi**, New Delhi, India

Thesis with Shampa Chakravarty, Niladri Chatterjee

December 2006 - May 2007

*Single document summarization, distributional semantics*

Developed and analyzed an algorithm for single-document summarization using PageRank and Random Indexing.

## PUBLICATIONS

### Journal Articles

- [J1] **Shiwali Mohan**, Aaron Mininger, and John Laird. Towards an indexical model of situated comprehension for real-world cognitive agents. *Advances in Cognitive Systems 3* (in print), ACS 2014.
- [J2] John Laird and **Shiwali Mohan**. A case study of knowledge integration across multiple memories in Soar. *Biologically Inspired Cognitive Architectures* (invited, in print), BICA 2014.
- [J3] **Shiwali Mohan**, Aaron Mininger, James Kirk, and John Laird. Acquiring grounded representations of words with situated interactive instruction. *Advances in Cognitive Systems 2*, ACS 2012.

### Conference Proceedings

- [C1] **Shiwali Mohan** and John Laird. Learning goal-oriented hierarchical tasks from situated interactive instruction. *To appear in the Proceedings of the 28th AAAI Conference*, AAAI 2014.
- [C2] **Shiwali Mohan**, Aaron Mininger, and John Laird. Towards an indexical model of situated comprehension for real-world cognitive agents. *In Proceedings of the 2nd Conference on Advances in Cognitive Systems*, ACS 2013.
- [C3] **Shiwali Mohan**, James Kirk, and John Laird. A computational model of situated task learning with interactive instruction. *In Proceedings of the 17th International Conference on Computational Modeling*, ICCM 2013.
- [C4] Mandar Joshi, Rakesh Khobragade, Saurabh Sarda, Umesh Deshpande, and **Shiwali Mohan**. Object-oriented representation and hierarchical reinforcement learning in Infinite Mario. *In Proceedings of the 24th IEEE International Conference on Tools with Artificial Intelligence*, ICTAI 2012.
- [C5] **Shiwali Mohan** and John Laird. An Object-Oriented approach to reinforcement learning in an action game. *In Proceedings of the 7th Artificial Intelligence for Interactive Digital Entertainment Conference*, AIIDE 2011.
- [C6] Niladri Chatterjee and **Shiwali Mohan**. Discovering word senses from text using random indexing. *In Proceedings of the 9th International Conference on Computational linguistics and Intelligent Text Processing*, CICLing 2008. Best Paper Award.
- [C7] Niladri Chatterjee and **Shiwali Mohan**. Extraction-based single-document summarization using random indexing. *In Proceeding of the 19th IEEE International Conference on Tools with Artificial Intelligence*, ICTAI 2007.

### Refereed Symposia/Workshop Proceedings

- [W1]: John E. Laird and **Shiwali Mohan**. A case study of knowledge integration across multiple memories in Soar. *In Papers from the AAAI Fall Symposium Series on Integrated Cognition*, 2013.

- [W2]: **Shiwali Mohan\***, Aaron Mininger\*, James Kirk\*, and John Laird. Learning grounded language through situated interactive instruction. *In Papers from the AAAI Fall Symposium Series on Robots Learning Interactively from Human Teachers*, 2012.
- [W3]: John Laird, Keegan Kinkade, **Shiwali Mohan**, and Joseph Xu. Cognitive robotics using the soar cognitive architecture. *In Proceedings of the 8th International Cognitive Robotics Workshop*, 2012.
- [W4]: **Shiwali Mohan** and John Laird. Situated comprehension of imperative sentences in embodied, cognitive agents. *In Papers from the AAAI Workshop on Grounding Language for Physical Systems*, 2012.
- [W5]: **Shiwali Mohan** and John Laird. Towards situated, interactive, instructable agents in a cognitive architecture. *In Papers from the AAAI Fall Symposium Series on Advances in Cognitive Systems*, 2011.

#### Refereed Extended Abstracts

- [A1] **Shiwali Mohan**, and John E. Laird. Learning new tasks for situated interactive instruction. *In the 2014 HRI Pioneers Workshop at Human-Robot Interaction*, 2014.
- [A2] Mandar Joshi, Rakesh Khobragade, Saurabh Sarda, Umesh Deshpande, and **Shiwali Mohan**. Hierarchical action selection for reinforcement learning in Infinite Mario. *In Proceedings of the 6th Starting Artificial Intelligence Research Symposium at European Conference on Artificial Intelligence*, STAIRS 2012.
- [A3] **Shiwali Mohan** and John Laird. Learning actions and action verbs from human-agent interaction. *In Proceedings of the 26th AAAI Conference on Artificial Intelligence*, AAAI 2012.
- [A4] **Shiwali Mohan** and John Laird. Exploring mixed-initiative interaction for learning with situated instruction in cognitive agents. *In Proceedings of the 26th AAAI Conference on Artificial Intelligence*, AAAI 2012.
- [A5] **Shiwali Mohan** and John Laird. Relational reinforcement learning in Infinite Mario. *In Proceedings of the 24th AAAI Conference on Artificial Intelligence*, AAAI 2010.

#### TEACHING EXPERIENCE

**University of Michigan**, Ann Arbor, MI, USA  
*Graduate Student Instructor*  
 EECS 492: Introduction to Artificial Intelligence

January 2012 - April 2012

**University of Michigan**, Ann Arbor, MI, USA  
*Student*  
 EECS 580: Teaching Engineering

September 2011 - December 2011

#### ADVISING EXPERIENCE

**Bharati Vidyapeeth College of Engineering**, New Delhi, India  
 Senior thesis: *Designing Soar agents for planet wars*  
 Students: Anant Mittal, Anmol Gupta

September 2012 - Present

**Visvesvaraya National Institute of Technology**, Nagpur, India  
 Senior thesis: *Reinforcement learning agents for Infinite Mario*  
 Students: Mandar Joshi, Rakesh Khobragade, Saurabh Sarda

September 2011 - May 2012

TALKS	<b>Learning Hierarchical Tasks with Situated Interactive Instruction</b> Center for Vision, Cognition, Learning, and Art, UCLA USC Institute for Creative Technologies. Interaction Lab, Computer Science and Engineering, USC Information Sciences Institute, Los Angeles	November 2013 November 2013 December 2013 December 2013
SERVICE	<i>Co-Chair</i> , Special Interest Group - Faculty, University of Michigan <i>Co-Chair</i> , Special Interest Group - Faculty, University of Michigan <i>Vice-President</i> , CSE Graduate Organization, University of Michigan <i>Social Chair</i> , Indian Students Association, University of Michigan <i>DCO Representative</i> , CSE Graduate Organization, University of Michigan <i>Social Chair</i> , Indian Students Association, University of Michigan	2013 2012 2011 2011 2010 2010
HONORS AND AWARDS	HRI Pioneers Scholarship, 2014 AAAI Travel Grant, AAAI Fall Symposium Series: 2013 Doctoral Consortium Scholarship, AAAI: 2012 Rackham Travel Grant: 2011, 2012, 2013 Best Paper Award, CICLing: 2008 Scholarship for Academic Excellence at the University of Delhi: 2003 - 2007	
SKILLS	Experience in intelligent agent design and cognitive architectures - Soar, ACT-R Experience in Java, C/C++, Perl, Python	
INDUSTRY EXPERIENCE	<b>Yahoo! Research and Development</b> , Bangalore, India <i>Software Engineer</i> with Strategic Data Services <b>Bharat Electronics Limited</b> , Ghaziabad, India <i>Software Intern</i> <b>Central Research Laboratory</b> , Ghaziabad, India <i>Software Intern</i>	July 2007 - July 2008  May 2006 - July 2006  May 2005 - July 2006
REFERENCES	<ul style="list-style-type: none"><li>• <b>John E. Laird</b> <i>John L. Tishman Professor of Engineering</i> Computer Science and Engineering University of Michigan 2260 Hayward Street Ann Arbor, MI 48109 <a href="mailto:laird@umich.edu">laird@umich.edu</a></li><li>• <b>Edwin Olson</b> <i>Assistant Professor</i> Computer Science and Engineering University of Michigan 2260 Hayward Street Ann Arbor, MI 48109 <a href="mailto:ebolson@umich.edu">ebolson@umich.edu</a></li></ul>	<ul style="list-style-type: none"><li>• <b>Richard Lewis</b> <i>Professor of Psychology and Linguistics</i> Department of Psychology University of Michigan 530 Church Street Ann Arbor, MI 48109 <a href="mailto:rickl@umich.edu">rickl@umich.edu</a></li><li>• <b>Matthias Scheutz</b> <i>Bernard M. Gordon Senior Faculty Fellow</i> Department of Computer Science Tufts University 200 Boston Avenue Medford, MA 02155 <a href="mailto:mscheutz@cs.tufts.edu">mscheutz@cs.tufts.edu</a></li></ul>