



The University of Georgia

AI Newsletter

Institute for Artificial Intelligence
The University of Georgia
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News: Doshi Wins Creative Research Medal

AI Faculty Member Prashant Doshi, associate professor of computer science, has been awarded a University of Georgia Creative Research Medal for his work on a new computational framework for decision-making in situations with multiple agents that don't know much about each other. Called the interactive partially observable Markov decision process (or I-POMDP), the framework combines aspects of game and decision theories. It fills an important gap in computer science about how to control agents in multi-agent settings.

Dr. Doshi developed new algorithms to model the processes that drive individual decision making. I-POMDP was recently used by researchers at the Lawrence Livermore National Laboratory to model the problem of terrorism-related money laundering, and by researchers in the Air Force to identify trust levels of agents with hidden agendas.



Creative Research Medals acknowledge exceptional accomplishments in creativity and research. Criteria include the principal direction and focus of the project occurring within the past five years and identification with the University of Georgia. A total of six were awarded for 2011.

Research Spotlight: Making a Computer Think Faster

With the help of IAI Associate Director Michael Covington and graduate students Tyler Carlson, Eli Holt, and Tony Snodgrass, the University of Maryland's ALFRED inference engine thinks 50 times faster than before.

The goal of ALFRED is to build a self-aware, learning-capable inference engine that can understand human language, learn new words, make plans, and be aware whether or not it has understood things. ALFRED is written in a logic programming language called Alma which is interpreted by a Prolog program running under Red Hat Enterprise Linux.



With a research subcontract from Maryland in the winter of 2010-11, the University of Georgia team worked over the Prolog program, removing unnecessary data manipulations and simplifying the code. The result, so far, is a factor-of-50 speedup. Work on the project is expected to continue later in 2011.

Research Spotlight: Analyzing the Speech of a Parrot

Until now, computational linguistics has dealt only with human speakers – but not any more. New research by UGA scientists has shown that an African Grey parrot can develop a deeper understanding of speech than was previously thought. The findings were recently published in the *Journal of Comparative Psychology*, and IAI computers played a role.



The team analyzed videotapes of Cosmo, a parrot that belongs to Betty Jean Craige, Professor of Comparative Literature. "Most of the information we have had about parrot speech has been anecdotal," explains the lead author, psychology Ph.D. candidate Erin Colbert-White.

"What we found out in this work, though, is that the speech and nonwords of the bird vary with social context, indicating a level of understanding that goes beyond vocal imitation." In other words, the bird isn't just an audio recorder that plays things back at random. Colbert-White's research was directed by Dorothy Fragaszy, Professor of Psychology.

Co-author Michael Covington, of the IAI, explains the point of the experiments: "We can't presume the parrot's words mean what they would mean in English. They sound like human words, but we have to experiment to find out what they actually mean to the parrot." So computers were used to find the contexts in which the words occur.

From a previously published news story by Phil Williams, UGA. Photo courtesy of Dr. Betty Jean Craige.

News: Acosta, Chandler visit IAI

Industrial associates Mark Acosta (of BlackRidge Technology, a network security firm) and Brent Chandler (of FormFree, a new real-time financial analysis company headquartered in Athens, Georgia, and serving banks nationwide) recently visited the IAI to meet faculty and students. We encourage all of our industry friends to do the same.

Letter from the Associate Director

The public is finally becoming aware of AI. When IBM's "Watson" computer played *Jeopardy* back in February, we gathered around the TV to watch, and then the press peppered us with questions. The growth of the Web has everyone thinking about information retrieval and management, and the proliferation of pocket computers and smartphones leads to an immediate need for "apps" that integrate computing with everyday decision-making.

Meanwhile, the economy is picking back up, but University funding and external research funding are not back to their previous levels. We appreciate our industrial supporters, and we need you now more than ever.

Michael A. Covington
Associate Director
Institute for Artificial Intelligence

Research Spotlight: Combining Different Web Services

Everything's on the Web – but different web pages and services think differently, and it's hard to combine them. That problem is addressed by new AI M.S. graduate Nithya Vembu in her thesis, *A Translator Web Service for Data Mediation in Web Service Compositions*, directed by Dr. Prashant Doshi.



The key is to model the grammar of messages – that is, to develop a formal model for data mediation that considers the names and types of the message elements. Once the grammar is defined in an XML-based notation, exact methods for translating between differently organized web services can be formulated and implemented.

News: Raymond Woller retires

AI Faculty Fellow Raymond Woller, of the Department of Philosophy, has retired after a 17-year career at UGA, preceded by a career in business management and computer programming. He has served as the coordinator of our undergraduate Cognitive Science program. We wish him success!

Recent Theses

Nithya Vembu, *A Translator Web Service for Data Mediation in Web Service Compositions*

Soumya Shivakumar, *Segmentation and 3D Visualization of Intravascular Ultrasound Images*

For a copy of any thesis, e-mail shbrooks@uga.edu.

Recent Publications and Presentations

Bogle, S. A. and W. D. Potter, "Using Robot Based Learning To Enhance CS Curriculum Delivery," proceedings of the 11th IEEE International Conference on Advanced Learning Technologies, ICALT-2011, Athens, GA, July 6-8, 2011 (to appear).

Brooks, P. W. and W. D. Potter, "Forest Planning Using Particle Swarm Optimization with a Priority Representation," proceedings of the 24th International Conference on Industrial, Engineering & Other Applications of Applied Intelligent Systems (IEA/AIE-2011), Syracuse, NY, June 28-July 1, 2011 (to appear).

Covington, Michael A., Roberto Bagnara, Richard A. O'Keefe, Jan Wielemaker, and Simon Price. Coding guidelines for Prolog. Theory and Practice of Logic Programming, in press.

Chandrasekaran, Muthukumar, Karthik Nadig and Khaled Rasheed, "Evolving Efficient Sensor Arrangement and Obstacle Avoidance Control Logic for a Miniature Robot," to appear in the Twenty-fourth International Conference on Industrial, Engineering and Other Applications of Applied Intelligent Systems (IEA/AIE 2011).

Griffin, J. D. and W. D. Potter, "Pruning the Search Space for the Snake-In-The-Box Problem," in Trends in Applied Intelligent Systems, Lecture Notes in Computer Science, 2010, Vol. 6098/2010, pp. 528-537, 2010, DOI: 10.1007/978-3-642-13033-5_54.

Hollingsworth, Charles, Stefaan Van Liefferinge, Rebecca A. Smith, Michael A. Covington, and Walter D. Potter. The ARC Project: Creating Logical Models of Gothic Cathedrals Using Natural Language Processing. Proceedings, ACL Workshop on Language Technology for Cultural Heritage, Social Sciences, and Humanities (LaTeCH) 2011.

Liefferinge, Stefaan Van, Charles Hollingsworth, Rebecca A. Smith, Michael A. Covington, and Walter D. Potter. Artificial Intelligence Techniques for Understanding Gothic Cathedrals. Proceedings, ICAI 2011.

ManChon U, Chiahsun Ho, Shelby Funk and Khaled Rasheed, "GART: A Genetic Algorithm based Real Time System Scheduler," to appear in Proceedings of the IEEE Congress on Evolutionary Computation (CEC'2011), 2011.

Nute, Donald. A logical hole the Chinese Room avoids. Minds and Machines, in press.

Oliwa, Tomasz and Khaled Rasheed, "A Surrogate-assisted Linkage Inference Approach in Genetic Algorithms," to appear in Proceedings of the Genetic and Evolutionary Computation Conference (GECCO'2011).

Qu, Y., S. Pandhiti, K. S. Bullard, W. D. Potter, and K. F. Fezer, "Development of a Genetic Fuzzy Controller for an Unmanned Aerial Vehicle," proceedings of the 24th International Conference on Industrial, Engineering & Other Applications of Applied Intelligent Systems, (IEA/AIE-2011), Syracuse, NY, June 28-July 1, 2011 (to appear).

Sonu, Ekhlas and Prashant Doshi. Identifying and Exploiting Weak Information Inducing Actions in Solving POMDPs. Short paper in 10th International Conference on Autonomous Agents and Multi-agent Systems, 2011.

Wimpey, B. J. and W. D. Potter, "Using Visual Fingerprints of Places for Robotic Localization," to appear in the Proceedings of the International Conference on Artificial Intelligence, (ICAI-2011), Las Vegas, NV, June, 2011.

Wright, Sarah. "Partitioning virtuously." American Philosophical Association, Central Division, 2011.

Wright, Sarah. "Justification and truth: a virtue account." Southern Society for Philosophy and Psychology, New Orleans, March 2011.

Zeng, Yifeng, Prashant Doshi, and Yingke Chen. Approximating Behavioral Equivalence of Models Using Top-K Policy Paths. Short paper in 10th International Conference on Autonomous Agents and Multi-agent Systems, 2011.

Zeng, Yifeng, Prashant Doshi, Yinghui Pan, Hua Mao, Muthukumar Chandrasekaran, and Jian Luo. Utilizing Partial Policies for Identifying Equivalence of Behavioral Models. Proceedings, AAAI 2011.

How to Sponsor Research

As an industrial partner or associate of the IAI, you can be involved in our research four ways:

Collaboration, especially student projects. It doesn't necessarily cost anything to work with us. We are always looking for good research topics, especially for master's theses.

Sponsored research. You can contract with us through the University of Georgia Research Foundation (UGARF) to do research for your company. *We are always looking for research sponsors.*

Donations. If you don't need confidentiality or a specific deliverable, you can simply make a gift to the IAI designated to support a particular research program. Donations are made through the Arch Foundation and are fully tax-deductible; contact us to make arrangements, or click on the "Support" button on www.ai.uga.edu.

Consulting. You can hire faculty members or advanced graduate students to work for you part-time as independent contractors. The University encourages this, within reasonable limits. It's a good way to do a small project with a high level of confidentiality, but the consultant works privately, and you don't get access to University facilities. Consulting projects often grow into sponsored research.

We also invite all industrial partners and associates to **come and visit us** and speak with groups of students. This is your "inside track" to recruiting.



The AI Newsletter is published twice a year. For more information about the Institute's activities, e-mail shbrooks@uga.edu or look at www.ai.uga.edu. Thanks for your interest!