

*Introduction to the Special Issue*

# Innovative Applications of Artificial Intelligence 2011

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■ *This special issue of AI Magazine contains expanded versions of five papers that describe deployed applications and two papers that discuss emergent applications from IAAI-11 (the article by Warrick and colleagues is from IAAI-10). We selected them for significance, novelty, and (in several cases) common task focus.*

Every year, *AI Magazine* devotes one fourth of its annual production to a special issue based on the Innovative Applications of Artificial Intelligence (IAAI) conference. Because IAAI is the premier venue for documenting the transition of AI technology into application, these special issues provide a snapshot of the state of the art in AI with the practical syllogism in mind; they present work that has value because it delivers value in use.

As a result, it is good to read these articles from a practical perspective. Papers that document deployed systems clarify the motivating application constraints, the match (and mismatch) between problems and technology, the innovations required to surmount barriers to deployment, and the impact of technology on application through practical measures of cost and benefit. Other articles describe applications that are almost feasible, drawn from papers in the IAAI emergent applications track. These papers provide a window into the search for viable applications at an earlier stage in the process of mating task with technology. All of the articles supply insight into the core question of what is feasible and why, which is a useful lens for us, as readers, to employ in viewing our own work.

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task focus. The issue begins with Learning by Demonstration for a Collaborative Planning Environment by Karen Myers, Jake Kolojejchick, Carl Angiolillo, Tim Cummings, Tom Garvey, Matt Gaston, Melinda Gervasio, Will Haines, Chris Jones, Kellie Keifer, Janette Knittel, David Morley, William Ommert, and Scott Potter. This article describes the application of learning by demonstration to support user creation of automated procedures in a deployed military planning system. It also describes the transition of technology developed for the DARPA Personalized Assistant That Learns (PAL) program into application, complete with issues, lessons learned, and subsequent revisions.

Two articles describe systems for delivering personalized news. Design and Deployment of a Personalized News Service by Mark Stefik and Lance Good pursues a “pull” model that supports topic creation by curators and information foraging by users. NewsFinder: Automating an AI News Service by Joshua Eckroth, Liang Dong, Reid G. Smith, and Bruce G. Buchanan, describes a deployed “push” service that tailors digests to predicted reader interest given a set of predefined categories. It has a recursive flavor, in that it employs AI to find AI-related articles.

This special issue contains three articles on medical applications. Machine Learning and Sensor Fusion for Estimating Continuous Energy Expenditure by Nisarg Vyas, Jonathan Farrington, David Andre, and John (Ivo) Stivoric describes the use of the BodyMedia armband system for activity classification and energy management. It provides a thorough discussion of barriers to deployment that present as calibration issues, with specific solutions. The issues include disparate data sources, intersubject variation for the same data source, and violations of the fundamental machine-learning assumption that training and testing data are drawn from the same distribution. Emerging Applications for Intelligent Diabetes Management by Cindy Marling, Matthew Wiley, Razvan Bunescu, Jay Shubrook, and Frank Schwartz describes three pilot studies that illustrate the potential of AI to help some 20 million people with type I diabetes: decision support for diabetes management; classification of blood glucose plots; and blood glucose prediction. The article clearly illustrates an application-driven search for the right pairing of task and technology. A Machine-Learning Approach to the Detection of Fetal Hypoxia during Labor and Delivery by Philip A. Warrick, Emily F. Hamilton, Robert E. Kearney, and Doina Precup describes an emergent application that employs novel classification technology on commonly available data to detect fetal oxygen deprivation. The system does so with enough advance notice, and with sufficient accuracy to support a decision

to deliver the fetus by Cesarean section. Simply put, this wonderful work employs AI to save babies.

The issue closes with The Glass Infrastructure—Using Common Sense to Create a Dynamic, Place-Based Social-Information System by Catherine Havasi, Richard Borovoy, Boris Kizelshteyn, Polychronis Ypodimatopoulos, Jon Ferguson, Henry Holtzman, Andrew Lippman, Dan Schultz, Matthew Blackshaw, and Greg Elliott. This article describes an innovative application that combines interests in media and social networking with AI technology to produce a physically situated information kiosk for guiding visitors to the MIT media lab. The approach is similarly unusual, as the technology merges commonsense reasoning, social recommendation, and unsupervised classification methods.

As a whole, this special issue describes deployed applications that benefit a wide array of users (including readers of this issue that subscribe to AI Alerts) and emergent applications that have the potential to improve the health and well-being of many people’s lives. We hope you enjoy them, and that they expand your sense of what is feasible. We also invite you to submit a description of your next AI application to IAAI.

**Daniel Shapiro** is the executive director of the Institute for the Study of Learning and Expertise (ISLE), where he conducts research on cognitive architectures, machine learning, and value-driven cognitive systems. Shapiro is the chair for the Innovative Applications of Artificial Intelligence conference in 2011 and a member of the board of directors of the Value Driven Design Institute (VDDI). He received his PhD in management science and engineering from Stanford University in 2001.

**Markus Fromherz** is the chief Innovation officer, health care, at Xerox, where he is responsible for innovation across the payer, provider, government, and employer health-care businesses in the Xerox Services group. Until 2010, Fromherz was a vice president at the Palo Alto Research Center, where he directed PARC’s Intelligent Systems Laboratory, which develops advanced information and automation systems based on intelligent user interfaces, language and image understanding, and reasoning algorithms. Applications range from business software to embedded systems to clean technology applications. Fromherz also was a principal engineer at PARC, where he has led and contributed to several research, development, and technology transfer efforts in intelligent control systems for Xerox products. Fromherz’s research interests were in the domain of intelligent embedded software include constraint-based modeling; model-based planning, scheduling, and control; and model-based design analysis and optimization. He has published widely and spoken internationally and has more than 40 issued and pending patents. Fromherz joined PARC in 1992. He received his Ph.D. in computer science from the University of Zurich, Switzerland, and his M.S. in computer science from ETH Zurich.