Introduction to the AAAI Magazine Special Issue on AI Education

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For the last several years, AAAI has organized an annual symposium on Educational Advances in AI co-located with the AAAI conference. Other conference series such as FLAIRS too have organized AI Education tracks in past. Other landmark events in the past twenty or so years that looked at the challenges of AI Education have included the "AI Education Workshop" held at the 2008 AAAI conference and the 1994 AAAI Fall Symposium workshop entitled "Improving Instruction of Introductory Artificial Intelligence."

To quote Marti Hearst, the organizer of the 1994 symposium (Hearst 1994): "This symposium was motivated by the desire to address an oft-voiced complaint that introductory artificial intelligence is a notoriously difficult course to teach well." With the regular progression of the field and recent successes such as autonomous cars, deep learning and IBM's Watson system, this situation has not become easier. At the same time, recent innovations in pedagogical technologies, such as MOOCs, smartphones, and smart classrooms, have revolutionized how we view the art of teaching. We believe that now is a good time to take stock of the state-of-the-art practices in the teaching of AI, as well as propose a vision for AI Education in the future.

This special issue includes five articles at the cutting edge of AI Education. Each covers a subject of current concern to the AI Education community. We note that the subject area expertise of the authors covers a wide range including robotics, knowledge-based systems, ethics, machine learning and game theory.

The article entitled "Ask me Anything about MOOCs," by Douglas Fisher, Charles Isbell and Michael Littman was a unique project in which we crowd-sourced ten questions about MOOCs from the recipients of the AAAI and SIGCSE mailing lists and posed them to educators with unique, relevant experiences to lend their perspective on those issues.

In "Teaching Integrated AI through Interdisciplinary Project-Driven Courses," Eric Eaton presents his work on an advanced robotics course that takes an interdisciplinary project driven approach towards teaching AI. Interdisciplinary courses and project based learning are on the rise at the K12 level (Zubrzyck 2016) and a recent survey of AI practitioners (Wollowski, Selkowitz, Brown, Goel, Luger, Marshall, Neel, Neller & Norvig 2016) found that 41% of the respondents suggest systems engineering as a learning outcome. Eric's course fits this mold by providing for challenging problems that require the integration of multiple AI methods.

The article "Ethical Considerations in Artificial Intelligence Courses" by Emanuelle Burton, Judy Goldsmith, Sven Koenig, Benjamin Kuipers, Nicholas Mattei and Toby Walsh is concerned with providing students learning opportunities about ethical theories, something that recently came to the forefront of public attention though remarks by high-profile entrepreneurs and prominent AI researchers through efforts such as the "Future of Life Institute," (http://futureoflife.org/) the "Allen Institute for Artificial Intelligence" (http://allenai.org/) and the recent "Partnership on AI" (https://www.partnershiponai.org/). The authors are interested in challenging students to probe their own ethical perspectives and make them explicit. In the context of an AI course, students investigate how their ethical theories may inform the design of intelligent

systems. The authors hold that as educators we have a responsibility to train students to recognize the larger ethical issues and responsibilities that their work as technologists may encounter.

The article "Keeping it Real: Using Real-World Problems to Teach AI to Diverse Audiences" by Nicole Sintov, Debarun Kar, Thanh Nguyen, Fei Fang, Kevin Hoffman, Arnaud Lyet, and Milind Tambe is an exemplar of using projects from the real world to introduce AI to diverse audiences inside and outside of academia. This article is in keeping with a recent survey of current practice and teaching of AI (Wollowski, Selkowitz, Brown, Goel, Luger, Marshall, Neel, Neller & Norvig 2016). which found a desire for exposing students to solving real-world problems. This article too provides a fine example of how to broaden AI expertise, a goal stated in the "Artificial Intelligence and Life in 2030" report (Stone, Brooks, Brynjolfsson, Calo, Etzioni, Hager, Hirschberg, Kalyanakrishnan, Kamar, Kraus, Leyton-Brown, Parkes, Press, Saxenian, Shah, Tambe & Teller 2016).

In the article "Using AI to Teach AI: Lessons from an Online AI Class," Ashok Goel and David Joyner describe details of the very successful online version of their course on knowledge-based AI. A key challenge that they address is how to keep students engaged in online courses. Ashok and David explain how they were able to rise to this challenge. They supplement traditional forms of communication with an innovative use of intelligent tutoring agents and video lessons. The online version of their course facilitates a unique and promising way in which students develop a learning community. An additional benefit is that their online version is effective in extending the AI classroom experience to non-traditional students. This article is also an exemplar of how to broaden AI expertise.

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Michael Wollowski is an Associate Professor in the Computer Science department at Rose-Hulman Institute of Technology. He obtained his Ph.D. from Indiana University, developing a complete and diagrammatic logic for planning in the blocks world. Michael's research interests focus on AI education, reasoning in NLP and the Internet of Things.

Todd W. Neller is a Professor of Computer Science at Gettysburg College. A Cornell University Merrill Presidential Scholar, he received a B.S. in Computer Science with distinction in 1993. In 2000, he received his Ph.D. with distinction in teaching at Stanford University, where he was awarded a Stanford University Lieberman Fellowship, and the George E. Forsythe Memorial Award for excellence in teaching. A game enthusiast, Neller has in recent years enjoyed pursuing game AI challenges, computing optimal play for jeopardy dice games such as Pass the Pigs and bluffing dice games such as Dudo, creating new reasoning algorithms for Clue/Cluedo, analyzing optimal Risk attack and defense policies, and designing logic mazes.

Jim Boerkoel is an Assistant Professor in the Computer Science Department at Harvey Mudd College where he leads the Human Experience & Agent Teamwork Lab. Boerkoel received his B.S. from Hope College (2006), and his M.S. (2008) and Ph.D. (2012) in Computer Science and Engineering from the University of Michigan under the supervision of Ed Durfee. Prior to joining HMC, Boerkoel worked as a Postdoctoral Associate with Julie Shah of the Interactive Robotics Group at MIT. In 2017, Boerkoel was recognized with an NSF CAREER award for his project "Robust and Reliable Multiagent Scheduling under Uncertainty." More broadly, his research interests include automated planning and scheduling, multi-robot coordination, human-robot interaction, and AI education. research scientist in the Institute for Systems Research at the University of Maryland College Park and also a guest researcher at the National Institute for Standards and Technology (NIST). His current research focuses on the design and formal characterization of ontologies and their application to problems in manufacturing and enterprise engineering.