



Letter to the Editor

The Case for Teamwork

Editor

We were delighted to see “No AI Is an Island: The Case for Teaming Intelligence” highlighted in the latest *AI Magazine* (Volume 40, Number 1, Spring 2019, doi.org/10.1609/aimag.v40i1.2842). The case for teamwork is, however, not new nor as neglected as this article suggests; it is a case we and many others have made for three decades. *AI Magazine* readers should be aware that there is a rich literature providing fundamental theories and computational models of teamwork and also empirical work demonstrating their usefulness. Articles making and supporting this case have appeared previously in *AI Magazine*. The publications in the following list provide entry points into earlier work and this literature.

Fundamental Theories and Models of Teamwork

Grosz, B. J., and Kraus, S. 1996. Collaborative Plans for Complex Group Action. *Artificial Intelligence* 86(2): 269–357. doi.org/10.1016/0004-3702(95)00103-4

Grosz, B. J., and Sidner, C. L. 1988. Plans for Discourse, Technical Report ADA192242. Cambridge, MA: BBN Labs.

Grosz, B. J., and Sidner, C. L. 1990. Plans for Discourse. In *Intentions in Communications*, edited by P. R. Cohen, J. Morgan, and M. E. Pollack, 417–44. Cambridge, MA: MIT Press.

Jennings, N. R. 1993. Commitments and Conventions: The Foundation of Coordination in Multi-Agent Systems. *Knowledge Engineering Review* 8(3): 223–50. doi.org/10.1017/S0269888900000205

Kinny, D.; Ljungberg, M.; Rao, A. S.; Sonenberg, E.; Tidhar, G.; and Werner, E. 1994. Planned Team Activity. In *Artificial Social Systems*, edited by C. Castelfranchi and E. Werner, 227–56. Vol. 830. Lecture Notes in Artificial Intelligence. Amsterdam: Springer-Verlag. doi.org/10.1007/3-540-58266-5_13

Lesser, V. 1998. Reflections on the Nature of Multi-Agent Coordination and Its Implications for an Agent Architecture. *Autonomous Agents and Multi-Agent Systems* 1(1): 89–111. doi.org/10.1023/A:1010046623013

Levesque, H. J.; Cohen, P. R.; and Nunes, J. H. T. 1990. On Acting Together. In *Proceedings of the Eighth National Conference on Artificial Intelligence*, 94–9. Palo Alto, CA: AAAI Press.

Rich, C., and Sidner, C. L. 1998. Collagen: A Collaboration Manager for a Collaborative Interface Agent. *User Modelling and User Assisted Interaction* 8(3-4): 315–50. doi.org/10.1023/A:1008204020038

Sycara, K. P.; Paolucci, M.; Van Velsen, M.; and Giampapa, J. A. 2003. The RETSINA MAS Infrastructure. *Autonomous Agents and Multi-Agent Systems* 7(1-2): 29–48. doi.org/10.1023/A:1024172719965

Tambe, M. 1997. Towards Flexible Teamwork. *Journal of Artificial Intelligence Research* 7: 83–124. doi.org/10.1613/jair.433

AI Magazine Past and Recent

Grosz, B. J. 1996. AAAI-94 Presidential Address: Collaborative Systems. *AI Magazine* 17(2): 67–85. doi.org/10.1609/aimag.v17i2.1223

Grosz, B. J. 2012. What Question Would Turing Pose Today? *AI Magazine* 33(4): 73–81. doi.org/10.1609/aimag.v33i4.2441

Rich, C.; Sidner, C.; and Lesh, N. 2001. Collagen: Applying Collaborative Discourse Theory to Human-Computer Interaction. *AI Magazine* 22(4): 15–25. doi.org/10.1609/aimag.v22i4.1589

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Authors' Reply

In response to the comments, the driver behind our writing this article was our observations of limited teaming capabilities of many of today's real-world systems. Our goal was to focus specifically on real-world applications and teaming capability outcomes where AI technologies were deployed. We are most certainly not claiming that research on team intelligence is new. Nor were we attempting a survey of teamwork research over the past three decades. Rather, we were continuing to carry the torch of



Human Computation and Crowdsourcing

28–30 October 2019

The Seventh AAAI Conference on Human Computation and Crowdsourcing (HCOMP 2019) will be held October 28–30, 2019 at the Skamania Lodge, located in the Columbia River Gorge National Scenic Area in the town of Stevenson, Washington, 45 minutes from Portland, Oregon. This year is the 10-year anniversary of the very first HCOMP workshop in Paris. To celebrate this anniversary, there will be special events, talks, and panels throughout the conference.

HCOMP is the premier venue for disseminating the latest research findings on crowdsourcing and human computation. While artificial intelligence (AI) and human-computer interaction (HCI) represent traditional mainstays of the conference, HCOMP believes strongly in inviting, fostering, and promoting broad, interdisciplinary research. This field is particularly unique in the diversity of disciplines it draws upon, and contributes to, ranging from human-centered

qualitative studies and HCI design, to computer science and artificial intelligence, economics and the social sciences, all the way to digital humanities, policy, and ethics. We promote the exchange of advances in human computation and crowdsourcing not only among researchers, but also engineers and practitioners, to encourage dialogue across disciplines and communities of practice.

HCOMP-19 will include technical talks, poster sessions, and a doctoral consortium. The conference will feature two keynote talks by Rumi Chunara (New York University) on Crowdsourced Data in Public Health and another by Been Kim (Google Brain). As in past years, HCOMP-19 will also include a Works-in-Progress program. The HCOMP-19 workshop program will be held on the day immediately preceding the main conference, October 28, and will include the following three meetings: CrowdCamp, Inclusive AI Literacy: Best Community Practices and Collaboration Structures, and Rigorous Evaluation of AI Systems.

Registration and Hotel Information

Registration and hotel information is available at the HCOMP-19 website (www.human-computation.com/attend.html). The late registration deadline is September 27, and onsite rates will apply after that date. The cut-off date for reservations at the reduced conference rate at Skamania is also September 27. For full details about the conference program, please visit the HCOMP-19 website (humancomputation.com) or write to hcomp19@aaai.org.

human-machine teaming started by such great work long ago. We were lamenting the fact that the relative neglect of the topic as an essential component in the design and engineering of intelligent systems has been a significant impediment to progress in many real-world applications. We are indeed restating a long-standing position that we feel continues to be lost on many.

This article is not a call to those who understand the importance of teaming and who are already working on it. It is a call to those who still do not get it (I am sure those working in this area have found that some communities outside of this domain do not

get it). There are many communities, in particular the AI community and the general engineering community, where such views are not broadly shared. We welcome developing a united front to help push the value of teaming by all communities working on it.

Your passion for the topic is much appreciated.

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