

AI for Advancing Scientific Discovery for a Sustainable Future

Carla P. Gomes
 Department of Computer Science
 Cornell University
 gomes@cs.cornell.edu

ABSTRACT

Artificial Intelligence (AI) is a rapidly advancing field. Novel machine learning methods combined with reasoning and search techniques have led us to reach new milestones: from computer vision, machine translation, and Go and Chess world-champion level play using pure self-training strategies, to self-driving cars. These ever-expanding AI capabilities open up new exciting avenues for advances in new domains. I will discuss our AI research for advancing scientific discovery for a sustainable future. In particular, I will talk about our research in a new interdisciplinary field, Computational Sustainability, which has the overarching goal of developing computational models and methods to help manage the balance between environmental, economic, and societal needs for a sustainable future. I will provide examples of computational sustainability problems, ranging from biodiversity and wildlife conservation, to multi-criteria strategic planning of hydropower dams in the Amazon basin and materials discovery for renewable energy materials. I will also highlight cross-cutting computational themes and challenges for AI at the intersection of constraint reasoning, optimization, machine learning, multi-agent reasoning, citizen science, and crowd-sourcing.

KEYWORDS

computational sustainability

ACM Reference Format:

Carla P. Gomes. 2020. AI for Advancing Scientific Discovery for a Sustainable Future. In *Proc. of the 19th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2020), Auckland, New Zealand, May 9–13, 2020*, IFAAMAS, 1 pages.

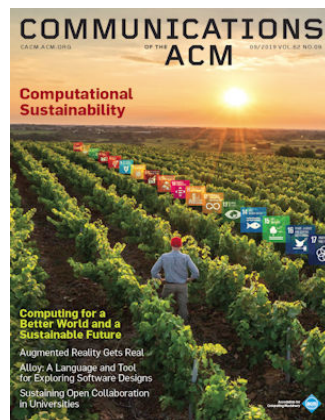
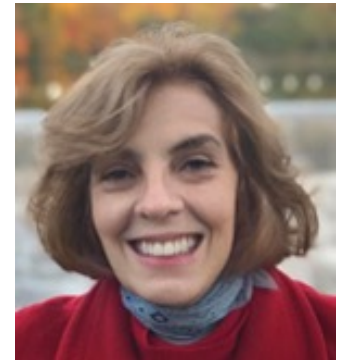


Figure 1: Computational Sustainability: Computing for a Better World and a Sustainable Future [1]

BIOGRAPHY

Carla Gomes is a Professor of Computer Science and the director of the Institute for Computational Sustainability at Cornell University. Gomes received a Ph.D. in computer science in the area of artificial intelligence from the University of Edinburgh. Her research area is Artificial Intelligence with a focus on large-scale constraint reasoning, optimization, and machine learning. Recently, Gomes has become deeply immersed in research on scientific discovery for a sustainable future and more generally in research in the new field of Computational Sustainability. Computational Sustainability aims to develop computational methods to help solve some of the key challenges concerning environmental, economic, and societal issues in order to help put us on a path towards a sustainable future. Gomes has (co-)authored over 150 publications, including five best paper awards, which have appeared in venues spanning Nature, Science, and a variety of conferences and journals in AI and Computer Science. Her research group has been supported by over \$50M in basic research funds. Gomes is a Fellow of the Association for the Advancement of Artificial Intelligence (AAAI), a Fellow of the Association for Computing Machinery (ACM), and a Fellow of American Association for the Advancement of Science (AAAS).



REFERENCES

- [1] Carla P. Gomes, Thomas G. Dietterich, Christopher Barrett, Jon Conrad, Bistra Dilikina, Stefano Ermon, Fei Fang, Andrew Farnsworth, Alan Fern, Xiaoli Z. Fern, Daniel Fink, Douglas H. Fisher, Alexander Flecker, Daniel Freund, Angela Fuller, John M. Gregoire, John E. Hopcroft, Steve Kelling, J. Zico Kolter, Warren B. Powell, Nicole D. Sintov, John S. Selker, Bart Selman, Daniel Sheldon, David B. Shmoys, Milind Tambe, Weng-Keen Wong, Christopher Wood, Xiaojian Wu, Yexiang Xue, Amulya Yadav, Abdul-Aziz Yakubu, and Mary Lou Zeeman. 2019. Computational sustainability: computing for a better world and a sustainable future. *Communications of ACM* 62, 9 (2019), 56–65.