

# Carla P. Gomes

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## Current position

Co-Director, Cornell University AI for Science Institute (CUAISci)

Director, Institute for Computational Sustainability, Cornell University

Ronald C. and Antonia V. Nielsen Professor of Computing and Information Science, Cornell University

Professor, Dept. of Computer Science, Dept. of Information Science, and Dyson School of Applied Economics and Management, Cornell University

Cornell Research Field Membership: Computer Science, Information Science, Applied Mathematics, Applied Economics and Management, and City and Regional Planning.

## Education

Ph.D. (Computer Science), University of Edinburgh (1993).

Area: Artificial Intelligence and Operations Research

Advisors: Professors Austin Tate (Artificial Intelligence) and Lyn Thomas (Oper. Research)

M.Sc. (Applied Mathematics), Technical University of Lisbon (1987).

Area: Operations Research

Advisor: Professor Teresa Almeida

## **Research Interests:**

Artificial Intelligence; Computational Sustainability; Scientific Discovery; Combinatorial Reasoning, Decision, and Optimization Problems; Connections with Operations Research, Machine and Statistical Learning, and Dynamical Systems; Multi-agent Systems; Approximations, randomization, and sampling techniques to identify structure; Science of Computation (synthesis of formal and experimental research).

## Professional Recognition

*Fellow*, Association for Computing Machinery (ACM), 2017.

*Fellow*, American Association for the Advancement of Science (AAAS), 2013.

*Fellow*, Association for the Advancement of Artificial Intelligence (AAAI), 2007.

*Allen Newell Award*, ACM–AAAI, 2021.

*Feigenbaum Prize*, AAAI, 2021.

*Lead P.I.*, NSF Expeditions in Computing Award (\$10M). CompSustNet: Expanding the Horizons of Computational Sustainability, 2015-2020.

*Lead P.I.*, NSF Expeditions in Computing Award (\$10M). Computational Sustainability: Computational Methods for a Sustainable Environment, Economy, and Society, 2008-2013.

*Fellow*, Radcliffe Institute for Advanced Study, Harvard University, 2011–2012.

*Chair-elect, Chair, Retired Chair*, the Section on Information, Computing and Communication of the American Association for the Advancement of Science (AAAS) 2014, 2015, 2016.

*Member*, Executive Council, Association for the Advancement of Artificial Intelligence, 2002-2005, 2012-2015.

*Most influential Cornell professor selected by Merrill Presidential Scholar*, Cornell University, 2020.

*Research Excellence Award*, Cornell University College of Engineering, 2019.

*Innovative AI Award*, EeLISA: Combating Global Warming Through the Rapid Analysis of Eelgrass Wasting Disease. IAAI 2021.

*Top 10 Coolest Army Science and Technology Advances (Number 4)*, AI to identify fuel-efficient materials, U.S. Army CCDC Army Research Laboratory, 2019.

*ACS Editors' Choice Award*, Automated Phase Mapping with AgileFD and its Application to Light Absorber Discovery in the V–Mn–Nb Oxide System, ACS, 2016.

*AAAI Classic Paper Award*, Boosting Combinatorial Search Through Randomization, AAAI, 2016.

*Innovative AI Award*, Phase-Mapper: An AI Platform to Accelerate High Throughput Materials Discovery. IAAI 2016.

*Innovative AI Award*, eBird: A Human/Computer Learning Network to Improve Biodiversity Conservation and Research. IAAI 2012.

*Best Paper Award*, Model counting: A new strategy for obtaining good bounds. Twenty-first National Conference on Artificial Intelligence (AAAI06), 2006.

*Distinguished Paper Award*, Statistical Regimes Across Constrainedness Regions, Conference on the Principles and Practice of Constraint Programming, 2004.

*Editor*, special issue on Computational Sustainability, AI Magazine , 2013.

*Program Chair*, 10th International Conference on Integration of Artificial Intelligence and Operations Research Techniques in Constraint Programming, IBM T. J. Watson Research Center, NY, USA (CPAIOR 2013).

*Program Chair*, special track on Computational Sustainability of the Twenty-Third International Joint Conference on Artificial Intelligence,(IJCAI-13).

*Program Chair*, special track on Computational Sustainability of the Twenty-Fifth Conference on Artificial Intelligence, (AAAI-13).

*Program Co-chair*, Twenty-Third Conference on Artificial Intelligence, Chicago, IL, USA (AAAI-08), 2008.

*Program Co-chair*, Ninth International Conference on Theory and Applications of Satisfiability Testing, Seattle, Washington, USA, (SAT 2006), 2006.

*Conference Chair*, International Conference on the Principles and Practice of Constraint Programming, Ithaca, NY, USA (CP-2002), 2002.

*Member, Advisory Committee, International Scientists*, for the Research Council President of the European Union, 2000.

*Special Recognition Award*, Information Directorate, Air Force Research Laboratory, 1999. Citation: Dr. Carla P. Gomes is recognized for her ground-breaking research in integrating Artificial Intelligence and Operations Research techniques which led to a “boosted” search method that allowed several orders of magnitude speedups for solving hard, real-world problems. 1999.

AFRL/IF nominated ROMAN for the *General Ronald Yates Award* for Excellence in Technology Transfer. ROMAN is a system incorporating AI techniques for generating provably correct and safe schedules for planned shutdowns of nuclear power plants. (Carla Gomes was the principal investigator of ROMAN.) 1996.

Ph.D. Scholarship Portuguese Scientific Foundation (3 years).

*Best Student Paper Award*, (Ph.D. Student: Stefano Ermon.) Computing the density of states of Boolean formulas. Conference on the Principles and Practice of Constraint Programming, 2010.

## Publications

### *Journals and Refereed Proceedings*

1. Courtney L. Davis, Yiwei Bai, Di Chen, Orin Robinson, Viviana Ruiz-Gutierrez, Carla P. Gomes, Daniel Fink. Deep learning with citizen science data enables estimation of species diversity and composition at continental extents. *Ecology* e4175, 2023.
2. Dieqiao Feng, Yuanqi Du, Carla P. Gomes, Bart Selman. Weighted Sampling without Replacement for Deep Top-k Classification. *ICML 2023*: 9910–9920.
3. Shufeng Kong, Caihua Liu, Carla P. Gomes. IPGPT: Solving Integer Programming Problems with Sequence to Contrastive Multi-Label Learning. *STRL@IJCAI 2023*.
4. Hanchen Wang, Tianfan Fu, Yuanqi Du, Wenhao Gao, Kexin Huang, Ziming Liu, Payal Chandak, Shengchao Liu, Peter Van Katwyk, Andreea Deac, Anima Anandkumar, Karianne Bergen, Carla P. Gomes, Shirley Ho, Pushmeet Kohli, Joan Lasenby, Jure Leskovec, Tie-Yan Liu, Arjun Manrai, Debora Marks, Bharath Ramsundar, Le Song, Jimeng Sun, Jian Tang, Petar Veličković, Max Welling, Linfeng Zhang, Connor W. Coley, Yoshua Bengio, Marinka Zitnik. Scientific discovery in the age of artificial intelligence. *Nature* 620: 47–60, 2023.
5. David Rolnick, Priya L. Donti, Lynn H. Kaack, Kelly Kochanski, Alexandre Lacoste, Kris Sankaran, Andrew Slavin Ross, Nikola Milojevic-Dupont, Natasha Jaques, Anna Waldman-Brown, Alexandra Sasha Luccioni, Tegan Maharaj, Evan D. Sherwin, S. Karthik Mukkavilli, Konrad P. Kording, Carla P. Gomes, Andrew Y. Ng, Demis Hassabis, John C. Platt, Felix Creutzig, Jennifer T. Chayes, Yoshua Bengio. Tackling Climate Change with Machine Learning. *ACM Comput. Surv.* 55(2): 42:1–42:96, 2023.
6. Jinzhao Li, Daniel Fink, Christopher Wood, Carla P. Gomes, Yexiang Xue. Provable Optimization of Quantal Response Leader-Follower Games with Exponentially Large Action Spaces. *AAMAS 2023*: 756–765.
7. Renee Mirka, Laura Greenstreet, Marc Grimson, Carla P. Gomes. A New Approach to Finding  $2 \times n$  Partially Spatially Balanced Latin Rectangles (Short Paper). *CP 2023* 47: 1–11.
8. Yiwei Bai, Qinru Shi, Marc Grimson, Alexander Flecker, Carla P. Gomes. Efficiently Approximating High-Dimensional Pareto Frontiers for Tree-Structured Networks Using Expansion and Compression. *CPAIOR 2023*: 1–17.
9. Rafael M Almeida, Rafael JP Schmitt, Andrea Castelletti, Alexander S Flecker, Julien J Harou, Sebastian A Heilpern, Noah Kittner, G Mathias Kondolf, Jeff J Opperman, Qinru Shi, Carla P Gomes, Peter B McIntyre. Strategic planning of hydropower development: balancing benefits and socioenvironmental costs. *Current Opinion in Environmental Sustainability*, 2022.

10. Lillian R. Aoki, Brendan Rappazzo, Deanna S. Beatty, Lia K. Domke, Ginny L. Eckert, Morgan E. Eisenlord, Olivia J. Graham, Leah Harper, Timothy L. Hawthorne, Margot Hensing-Lewis, Kevin A. Hovel, Zachary L. Monteith, Ryan S. Mueller, Angeleen M. Olson, Carolyn Prentice, John J. Stachowicz, Fiona Tomas, Bo Yang, J. Emmett Duffy, Carla Gomes, C. Drew Harvell. Disease surveillance by artificial intelligence links eelgrass wasting disease to ocean warming across latitudes. *Limnology and Oceanography*, 2022.
11. Rafael M. Almeida, Rafael Schmitt, Steven M. Grodsky, Alexander S. Flecker, Carla P. Gomes, Lu Zhao, Haohui Liu, Nathan Barros, Rafael Kelman, Peter B. McIntyre. Floating solar power could help fight climate change — let’s get it right. *Nature* 606: 246–249, 2022.
12. Guillaume Perez, Sebastian Ament, Carla P. Gomes, Michel Barlaud. Efficient projection algorithms onto the weighted  $\ell_1$  ball. *Artif. Intell.* 306: 103683, 2022.
13. Joshua Fan, Junwen Bai, Zhiyun Li, Ariel Ortiz-Bobea, Carla P. Gomes. A GNN-RNN Approach for Harnessing Geospatial and Temporal Information: Application to Crop Yield Prediction. *AAAI 2022*: 11873–11881.
14. John Paul Ryan, Sebastian E. Ament, Carla P. Gomes, Anil Damle. The Fast Kernel Transform. *AISTATS 2022*: 11669-11690.  
 Sebastian Ament, Carla P. Gomes. Generalized Matching Pursuits for the Sparse Optimization of Separable Objectives. *ICASSP 2022*: 5553–5557.
15. Johan Bjorck, Carla P. Gomes, Kilian Q. Weinberger. Is High Variance Unavoidable in RL? A Case Study in Continuous Control. *ICLR 2022*.
16. Sebastian E. Ament, Carla P. Gomes. Scalable First-Order Bayesian Optimization via Structured Automatic Differentiation. *ICML 2022*: 500–516.
17. Junwen Bai, Shufeng Kong, Carla P. Gomes. Gaussian Mixture Variational Autoencoder with Contrastive Learning for Multi-Label Classification. *ICML 2022*: 1383–1398.
18. Joshua Fan, Di Chen, Jiaming Wen, Ying Sun, Carla P. Gomes. Monitoring Vegetation From Space at Extremely Fine Resolutions via Coarsely-Supervised Smooth U-Net. *IJCAI 2022*: 5066–5072.
19. Dieqiao Feng, Carla P. Gomes, Bart Selman. Left Heavy Tails and the Effectiveness of the Policy and Value Networks in DNN-based best-first search for Sokoban Planning. *NeurIPS 2022*.
20. Alexander S. Flecker, Qinru Shi, Rafael M. Almeida, Héctor Angarita, Jonathan M. Gomes-Selman, Roosevelt García-Villacorta, Suresh A. Sethi, Steven A. Thomas, N. LeRoy Poff, Bruce R. Forsberg, Sebastian A. Heilpern, Stephen K. Hamilton, Jorge D. Abad, Elizabeth P. Anderson, Nathan Barros, Isabel Carolina Bernal, Richard Bernstein, Carlos M. Cañas, Olivier Dangles, Andrea C. Encalada, Ayan S. Fleischmann, Michael Goulding, Jonathan Higgins, Céline Jezequel, Erin I. Larson, Peter B. McIntyre, John M. Melack, Mariana Montoya, Thierry Oberdorff, Rodrigo Paiva, Guillaume Perez, Brendan H. Rappazzo, Scott Steinschneider, Sandra Torres,

- Mariana Varese, M. Todd Walter, Xiaojian Wu, Yexiang Xue, Xavier E. Zapata-Ríos, Carla P. Gomes. Reducing adverse impacts of Amazon hydropower expansion. *Science* 375(6582):753–760, 2022.
21. Shufeng Kong, Francesco Ricci, Dan Guevarra, Jeffrey B. Neaton, Carla P. Gomes, John M. Gregoire. Density of states prediction for materials discovery via contrastive learning from probabilistic embeddings. *Nature Communications* 13, 2022.
  22. Sebastian Ament, Maximilian Amsler, Duncan R. Sutherland, Ming-Chiang Chang, Dan Guevarra, Aine B. Connolly, John M. Gregoire, Michael O. Thompson, Carla P. Gomes, R. Bruce van Dover. Autonomous materials synthesis via hierarchical active learning of non-equilibrium phase diagrams. *Science Advances* 7(51), 2021.
  23. Maya L. Groner, Morgan E. Eisenlord, Reyn M. Yoshioka, Evan A. Fiorenza, Phoebe D. Dawkins, Olivia J. Graham, Miranda Wingham, Alex Vompe, Natalie D. Rivlin, Bo Yang, Colleen A. Burge, Brendan Rappazzo, Carla P. Gomes, C. Drew Harvell. Warming sea surface temperatures fuel summer epidemics of eelgrass wasting disease. *Marine Ecology Progress Series (MEPS)*, 2021.
  24. Olivia J. Graham, Lillian R. Aoki, Tiffany Stephens, Joshua Stokes, Sukanya Dayal, Brendan Rappazzo, Carla P. Gomes, C. Drew Harvell. Effects of Seagrass Wasting Disease on Eelgrass Growth and Belowground Sugar in Natural Meadows. *Frontiers in Marine Science*, 2021.
  25. Rafael M. Almeida, Ayan S. Fleischmann, João P.F. Brêda, Diego S. Cardoso, Hector Angarita, Walter Collischonn, Bruce Forsberg, Roosevelt García-Villacorta, Stephen K. Hamilton, Phillip M. Hannam, Rodrigo Paiva, N. LeRoy Poff, Suresh A. Sethi, Qinru Shi, Carla P. Gomes, Alexander S. Flecker. Climate change may impair electricity generation and economic viability of future Amazon hydropower. *Global Environmental Change*, 2021.
  26. Yiewi Bai, Di Chen, Carla P. Gomes. CLR-DRNets: Curriculum Learning with Restarts to Solve Visual Combinatorial Games. *CP 2021*: 17:1–17:14.
  27. Di Chen, Yiwei Bai, Sebastian Ament, Wenting Zhao, Dan Guevarra, Lan Zhou, Bart Selman, R. Bruce van Dover, John M. Gregoire, Carla P. Gomes. Automating crystal-structure phase mapping by combining deep learning with constraint reasoning. *Nature Machine Intelligence* 3: 812–822, 2021. (Featured on the front cover.)
  28. Carla P. Gomes, Daniel Fink, R. Bruce van Dover, John M. Gregoire. Computational sustainability meets materials science. *Nature Reviews Materials*, 2021.
  29. Johan Björck, Xiangyu Chen, Christopher De Sa, Carla P. Gomes, Kilian Q. Weinberger. Low-Precision Reinforcement Learning: Running Soft Actor-Critic in Half Precision. *ICML 2021*: 980–991.
  30. Johan Björck, Carla P. Gomes, Kilian Q. Weinberger. Towards Deeper Deep Reinforcement Learning with Spectral Normalization. *NeurIPS 2021*: 8242–8255.

31. Junwen Bai, Weiran Wang, Carla P. Gomes. Contrastively Disentangled Sequential Variational Autoencoder. *NeurIPS 2021*: 10105–10118.
32. Sebastian E. Ament, Carla P. Gomes. Sparse Bayesian Learning via Stepwise Regression. *ICML 2021*: 264–274.
33. Sebastian Ament, Carla P. Gomes. On the Optimality of Backward Regression: Sparse Recovery and Subset Selection. *ICASSP 2021*: 5599–5603.
34. Shufeng Kong, Dan Guevarra, Carla P. Gomes, John M. Gregoire. Materials representation and transfer learning for multi-property prediction. *Applied Physics Reviews* 8: 021409, 2021.
35. Johan Bjorck, Anmol Kabra, Kilian Weinberger, Carla P Gomes. Characterizing the Loss Landscape in Non-Negative Matrix Factorization. *AAAI 2021*.
36. Johan Bjorck, Kilian Weinberger, Carla P Gomes. Understanding Decoupled and Early Weight Decay. *AAAI 2021*.
37. Johan Bjorck, Qinru Shi, Carrie Brown-Lima, Jennifer Dean, Angela Fuller, Carla P Gomes. Learning Augmented Methods for Matching: Improving Invasive Species Management and Urban Mobility. *AAAI 2021*.
38. Johan Bjorck, Brendan Rappazzo, Qinru Shi, Carrie Brown-Lima, Jennifer Dean, Angela Fuller, Carla P Gomes. Accelerating Ecological Sciences from Above: Spatial Contrastive Learning for Remote Sensing. *AAAI 2021*.
39. Wenting Zhao, Shufeng Kong, Junwen Bai, Daniel Fink, Carla P Gomes. HOT-VAE: Learning High-Order Label Correlation for Multi-Label Classification via Attention-Based Variational Autoencoders. *AAAI 2021*.
40. Brendan H. Rappazzo, Morgan E. Eisenlord, Olivia J. Graham, Lillian R. Aoki, Phoebe D. Dawkins, Drew Harvell, Carla P. Gomes. EeLISA: Combating Global Warming through the Rapid Analysis of Eelgrass Wasting Disease. *IAAI-21*.
41. Di Chen, Yiwei Bai, Wenting Zhao, Sebastian Ament, John M. Gregoire, Carla P. Gomes. Deep Reasoning Networks for Unsupervised Pattern De-mixing with Constraint Reasoning. *ICML 2020*: 1500–1509.
42. Dieqiao Feng, Carla P. Gomes, Bart Selman. Solving Hard AI Planning Instances Using Curriculum-Driven Deep Reinforcement Learning. *IJCAI 2020*: 2198–2205.
43. Junwen Bai, Shufeng Kong, Carla P. Gomes. Disentangled Variational Autoencoder based Multi-Label Classification with Covariance-Aware Multivariate Probit Model. *IJCAI 2020*: 4313–4321.
44. Shufeng Kong, Junwen Bai, Jae Hee Lee, Di Chen, Andrew Allyn, Michelle Stuart, Malin Pinsky, Katherine Mills, Carla P. Gomes. Deep Hurdle Networks for Zero-Inflated Multi-Target Regression: Application to Multiple Species Abundance Estimation. *IJCAI 2020*: 4375–4381.



45. Di Chen, Yada Zhu, Xiaodong Cui, Carla P. Gomes. Task-Based Learning via Task-Oriented Prediction Network with Applications in Finance. *IJCAI 2020*: 4476–4482.
46. Dieqiao Feng, Carla P. Gomes, Bart Selman. A Novel Automated Curriculum Strategy to Solve Hard Sokoban Planning Instances. *NeurIPS 2020*.
47. Duncan R. Sutherland, Aine Boyer Connolly, Maximilian Amsler, Ming-Chiang Chang, Katie Rose Gann, Vidit Gupta, Sebastian Ament, Dan Guevarra, John M. Gregoire, Carla P. Gomes, R. Bruce van Dover, Michael O. Thompson. Optical Identification of Materials Transformations in Oxide Thin Films. *ACS Combinatorial Science* 22(12): 887–894, 2020.
48. Nathan Jensen, Elizabeth Lyons, Eddy Chebelyon, Ronan Le Bras, Carla Gomes. Conspicuous monitoring and remote work. *Journal of Economic Behavior & Organization* 176: 489–511, 2020.
49. Yolanda Gil, Suzanne A. Pierce, Hassan A. Babaie, Arindam Banerjee, Kirk D. Borne, Gary Bust, Michelle Cheatham, Imme Ebert-Uphoff, Carla P. Gomes, Mary C. Hill, John Horel, Leslie Hsu, Jim Kinter, Craig A. Knoblock, David M. Krum, Vipin Kumar, Pierre Lermusiaux, Yan Liu, Chris North, Victor Pankratius, Shanan Peters, Beth Plale, Allen Pope, Sai Ravela, Juan Restrepo, Aaron J. Ridley, Hanan Samet, Shashi Shekhar. Intelligent systems for geosciences: an essential research agenda. *Commun. ACM* 62(1): 76–84, 2019.
50. Carla P. Gomes, Thomas G. Dietterich, Christopher Barrett, Jon Conrad, Bistra Dilkina, 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, Mary Lou Zeeman. Computational sustainability: computing for a better world and a sustainable future. *Commun. ACM* 62(9): 56–65, 2019. (Featured on the front cover.)
51. Johan Bjorck, Brendan H. Rappazzo, Di Chen, Richard Bernstein, Peter H. Wrege, Carla P. Gomes. Automatic Detection and Compression for Passive Acoustic Monitoring of the African Forest Elephant. *AAAI 2019*: 476–484.
52. Di Chen, Carla P. Gomes. Bias Reduction via End-to-End Shift Learning: Application to Citizen Science. *AAAI 2019*: 493–500.
53. Anmol Kabra, Yexiang Xue, Carla P. Gomes. CPU-accelerated principal-agent game for scalable citizen science. *COMPASS 2019*: 165–173.
54. Junwen Bai, Zihang Lai, Runzhe Yang, Yexiang Xue, John M. Gregoire, Carla P. Gomes. Imitation Refinement for X-ray Diffraction Signal Processing. *ICASSP 2019*: 3337–3341.
55. Rafael M. Almeida, Qinru Shi, Jonathan M. Gomes-Selman, Xiaojian Wu, Yexiang Xue, Hector Angarita, Nathan Barros, Bruce R. Forsberg, Roosevelt García-Villacorta, Stephen K. Hamilton,

- John M. Melack, Mariana Montoya, Guillaume Perez, Suresh A. Sethi, Carla P. Gomes, Alexander S. Flecker. Reducing greenhouse gas emissions of Amazon hydropower with strategic dam planning. *Nature Communications*, 2019.
56. Carla P. Gomes, Bart Selman, John M. Gregoire. Artificial intelligence for materials discovery. *MRS Bulletin*, 2019.
  57. Amrita Gupta, Bistra Dilkina, Dana J. Morin, Angela K. Fuller, J. Andrew Royle, Christopher Sutherland, Carla P. Gomes. Reserve design to optimize functional connectivity and animal density. *Conservation Biology*, 2019.
  58. Sebastian E. Ament, Helge S. Stein, Dan Guevarra, Lan Zhou, Joel A. Haber, David A. Boyd, Mitsutaro Umehara, John M. Gregoire, Carla P. Gomes. Multi-component background learning automates signal detection for spectroscopic data. *npj Computational Materials*, 2019.
  59. Carla P. Gomes, Junwen Bai, Yexiang Xue, Johan Björck, Brendan Rappazzo, Sebastian Ament, Richard Bernstein, Shufeng Kong, Santosh K. Suram, R. Bruce van Dover, John M. Gregoire. CRYSTAL: a multi-agent AI system for automated mapping of materials' crystal structures. *MRS Communications*, 2019.
  60. Junwen Bai, Yexiang Xue, Johan Björck, Ronan Le Bras, Brendan Rappazzo, Richard Bernstein, Santosh K. Suram, Robert Bruce van Dover, John M. Gregoire, Carla P. Gomes. Phase Mapper: Accelerating Materials Discovery with AI. *AI Magazine* 39(1): 15–26, 2018. (Featured on the front cover.)
  61. Johan Björck, Yiwei Bai, Xiaojian Wu, Yexiang Xue, Mark C. Whitmore, Carla P. Gomes. Scalable Relaxations of Sparse Packing Constraints: Optimal Biocontrol in Predator-Prey Networks. *AAAI 2018*: 748–756.
  62. Luming Tang, Yexiang Xue, Di Chen, Carla P. Gomes. Multi-Entity Dependence Learning With Rich Context via Conditional Variational Auto-Encoder. *AAAI 2018*: 824–832.
  63. Xiaojian Wu, Jonathan Gomes-Selman, Qinru Shi, Yexiang Xue, Roosevelt García-Villacorta, Elizabeth Anderson, Suresh Sethi, Scott Steinschneider, Alexander Flecker, Carla P. Gomes. Efficiently Approximating the Pareto Frontier: Hydropower Dam Placement in the Amazon Basin. *AAAI 2018*: 849–859.
  64. Guillaume Perez, Brendan Rappazzo, Carla P. Gomes. Extending the Capacity of  $1/f$  Noise Generation. *CP 2018*: 601–610.
  65. Junwen Bai, Sebastian Ament, Guillaume Perez, John M. Gregoire, Carla P. Gomes. An Efficient Relaxed Projection Method for Constrained Non-negative Matrix Factorization with Application to the Phase-Mapping Problem in Materials Science. *CPAIOR 2018*: 52–62.
  66. Jonathan M. Gomes-Selman, Qinru Shi, Yexiang Xue, Roosevelt García-Villacorta, Alexander S. Flecker, Carla P. Gomes. Boosting Efficiency for Computing the Pareto Frontier on Tree Structured Networks. *CPAIOR 2018*: 263–279.

67. Qinru Shi, Jonathan M. Gomes-Selman, Roosevelt García-Villacorta, Suresh Sethi, Alexander S. Flecker, Carla P. Gomes. Efficiently Optimizing for Dendritic Connectivity on Tree-Structured Networks in a Multi-Objective Framework. *COMPASS 2018*: 26:1–26:8.
68. Di Chen, Yexiang Xue, Carla P. Gomes. End-to-End Learning for the Deep Multivariate Probit Model. *ICML 2018*: 931–940.
69. Nils Bjorck, Carla P. Gomes, Bart Selman, Kilian Q. Weinberger. Understanding Batch Normalization. *NeurIPS 2018*: 7705–7716.
70. Xue, Y.; Wu, X.; Morin, D.; Dilkina, D.; Fuller, A.; Royle, A.; Gomes, C. Dynamic Optimization of Landscape Connectivity Embedding Spatial-Capture-Recapture Information. *AAAI 2017*: 4552–4558.
71. Diaz, M.; Le Bras, R.; Gomes, C. In Search of Balance: The Challenge of Generating Balanced Latin Rectangles. *CPAIOR 2017*.
72. Bai, J.; Bjorck, J.; Xue, Y.; Suram, S.; Gregoire, J.; Gomes, C. Relaxation Methods for Constrained Matrix Factorization Problems: Solving the Phase Mapping Problem in Materials Discovery. *CPAIOR 2017*.
73. Chen, D.; Xue, Y.; Fink, D.; Chen, S.; Gomes, C. Deep Multi-species Embedding. *IJCAI 2017*.
74. Wu, X.; Xue, Y.; Selman, B.; Gomes, C. XOR-Sampling for Network Design with Correlated Stochastic Events. *IJCAI 2017*: 4640–4647.
75. Xue, Y.; Bai, J.; Le Bras, R.; Rappazzo, B.; Bernstein, R.; Bjorck, J. Longpre, Suram, S.; van Dover, B.; Gregoire, J.; and Gomes, C. Phase-Mapper: An AI Platform to Accelerate High Throughput Materials Discovery. *AAAI 2017*: 4635–4643. (IAAI Innovative AI Award).
76. Suram, S.; Xue, Y.; Bai, J.; Le Bras, R.; Rappazzo, B.; Bernstein, R.; Bjorck, J.; Zhou, L.; van Dover, R. B.; Gomes, C.P. Automated Phase Mapping with AgileFD and its Application to Light Absorber Discovery in the V–Mn–Nb Oxide system. *ACS Combinatorial Science* 19: 37–46, 2017. (Featured on the front cover.)
77. Xue, Yexiang; Davies, Ian; Fink, Daniel; Wood, Christopher; Gomes, Carla P. Avicaching: A Two Stage Game for Bias Reduction in Citizen Science. *Proceedings of the 2016 International Conference on Autonomous Agents and Multiagent Systems (AAMAS-2016)*, Singapore, 2016.
78. Xue, Yexiang; Davies, Ian; Fink, Daniel; Wood, Christopher; Gomes, Carla P. Behavior Identification in Two-Stage Games for Incentivizing Citizen Science Exploration. *Principles and Practice of Constraint Programming - 22nd International Conference (CP-2016)*, France, 2016.
79. Xue, Yexiang; Ermon, Stefano; Le Bras, Ronan; Gomes, Carla P.; Selman, Bart. Variable Elimination in the Fourier Domain. *Proceedings of the 33rd International Conference on Machine Learning (ICML 2016)*, New York, NY, 2016.

80. Xue, Yexiang; Li, Zhiyuan; Ermon, Stefano; Gomes, Carla P.; Selman, Bart. Solving Marginal MAP Problems with NP Oracles and Parity Constraints. *Proceedings of the Advances in Neural Information Processing Systems 29: Annual Conference on Neural Information Processing Systems (NIPS-2016)*, Barcelona, 2016.
81. Ermon, Stefano; Le Bras, Ronan; Suram, Santosh K.; Gregoire, John M.; Gomes, Carla P.; Selman, Bart; van Dover, Robert Bruce. Pattern Decomposition with Complex Combinatorial Constraints: Application to Materials Discovery. *Proceedings of the Twenty-Ninth AAAI Conference on Artificial Intelligence (AAAI-2015)*, Texas, 2015.
82. Ermon, Stefano; Xue, Yexiang; Toth, Russell; Dilkina, Bistra N.; Bernstein, Richard; Damoulas, Theodoros; Clark, Patrick; DeGloari, Steve; Mude, Andrew; Barrett, Christopher; Gomes, Carla P. Learning Large-Scale Dynamic Discrete Choice Models of Spatio-Temporal Preferences with Application to Migratory Pastoralism in East Africa. *Proceedings of the Twenty-Ninth AAAI Conference on Artificial Intelligence (AAAI-2015)*, Texas, 2015.
83. Xue, Yexiang; Ermon, Stefano; Gomes, Carla P.; Selman, Bart. Uncovering Hidden Structure through Parallel Problem Decomposition for the Set Basis Problem. *Computational Sustainability, Papers from the 2015 AAAI Workshop (AAAI WS)*, Texas, 2015.
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202. Gomes, Carla P. and Selman, Bart. Search Strategies for Hybrid Search Spaces. *Proceedings of the Eleventh International Conference on Tools with Artificial Intelligence (ICTAI-99)*, 1999.
203. Gomes, Carla and Selman, Bart. On the Fine Structure of Large Search Spaces. *Proceedings of the Eleventh International Conference on Tools with Artificial Intelligence (ICTAI-99)*, 1999.
204. Gomes, Carla P.; Selman, Bart; and Kautz, Henry. Boosting Combinatorial Search Through Randomization. *Proceedings of the Fifteenth National Conference on Artificial Intelligence (AAAI-98)*, Madison, WI, 1998.
205. Gomes, Carla; McAloon, Ken; Selman, Bart; and Tretkoff, Carol. Randomization in Backtrack Search: Exploiting Heavy-Tailed Profiles for Solving Hard Scheduling Problems. *Proceedings of the Fourth International Conference on Artificial Intelligence Planning Systems (AIPS-98)*, Pittsburgh, PA, 1998.

206. Gomes, Carla and Selman, Bart. Problem Structure in the Presence of Perturbations. *Proceedings of the Fourteenth National Conference on Artificial Intelligence (AAAI-97)*, New Providence, RI, 1997.
207. Gomes, Carla and Selman, Bart. Algorithm Portfolio Design: Theory vs. Practice. *Proceedings of the 13th Conference on Uncertainty in Artificial Intelligence (UAI-97)*, New Providence, RI, 1997.
208. Gomes, Carla; Selman, Bart; and Crato, Nuno. Heavy-Tailed Probability Distributions in Combinatorial Search. *Proceedings of 4th Intl. Conference on the Principles and Practice of Constraint Programming (CP-97), Lecture Notes in Computer Science*, Vol. 1330, Springer, 1997, 408–422.
209. Gomes, Carla and Hsu, Julie. An Assignment Based Algorithm for Resource Allocation. *Sigart Bulletin, Assoc. for Comput. Machin.*, 7 (1), 1996, 2–8.
210. Gomes, Carla; Smith, Douglas; and Westfold Stephen. Synthesis of Schedulers for Planned Shutdowns of Power Plants. *Proceedings of the Eleventh Knowledge-Based Software Engineering Conference*, IEEE, Computer Society Press, 1996
211. Alguire, Karen and Gomes, Carla. Technology for Planning and Scheduling under Complex Constraints. *Proceedings of the International Society for Optical Engineering*. Boston, Massachusetts, 1996.
212. Alguire, Karen and Gomes, Carla. ROMAN: An Application of Advanced Technology to Outage Management, *Proceedings of the Sixth Annual Dual-Use Technologies & Applications Conference*, IEEE Computer Society Press, 1996.
213. Gomes, Carla. Derivation of Correct Programs for Planning. *Proceedings of the Fifth Annual Dual-Use Technologies & Applications Conference*, IEEE Computer Society Press, 1995.
214. Roberts, N.; Kudla, A.; and Gomes, C. Making “Dual-Use” of Formal Methods. *Proceedings of the Fourth Annual Dual-Use Technologies & Applications Conference*, 67–77. IEEE Computer Society Press, 1994.
215. Gomes, Carla; Tate, Austin; and Lyn, Thomas. A Distributed Scheduling Framework. *Proceedings of the 6th International Conference on Tools with Artificial Intelligence*, 1994.
216. Gomes, Carla and Beck, Howard. Synchronous and Asynchronous Factory Scheduling. *Journal of the Singapore Computer Society*, 5 (2), 1992.

*Invited Survey Articles and Book Chapters*

217. Xue, Yexiang and Gomes, Carla P. Engaging Citizen Scientists in Data Collection for Conservation. In *Artificial Intelligence and Conservation*, F. Fang, M. Tambe, B. Dilkina, and A. J. Plumptre (Eds.), Cambridge University Press, 2019. (Invited chapter.)
218. Gomes, Carla; Kautz, Henry; Sabharwal, Ashish; and Selman, Bart. Satisfiability Solvers. In *Handbook of Knowledge Representation, in the series Foundations of Artificial Intelligence*, F. van Harmelen, V. Lifschitz, and B. Porter (Eds.), Elsevier, 2008. (Invited chapter.)
219. Gomes, Carla and Sabharwal, Ashish. Exploiting Runtime Variation in Complete Solvers. In *Handbook of Satisfiability*, A. Biere, M. Heule, H. van Maaren, and T. Walsh (Eds.), IOS Press, 2009. (Invited chapter.)
220. Gomes, Carla; Sabharwal, Ashish; and Selman, Bart. Model Counting. In *Handbook of Satisfiability*, A. Biere, M. Heule, H. van Maaren, and T. Walsh (Eds.), IOS Press, 2009. (Invited chapter.)
221. Lesser, W. and C. Gomes, 2007. Network Analysis for Interpreting Patent Date: A Preliminary, Visual Approach. In *Agricultural Biotechnology and Intellectual Property Seeds of Change*, J. Kesan (Ed.). Cambridge, MA: CABI. 2007.
222. Gomes, Carla and Walsh, Toby. Randomness and Structure. In *Handbook of Constraint Programming*, P. van Beek, F. Rossi, and T. Walsh (Eds.), Elsevier, 2006. (Invited chapter.)
223. Gomes, Carla and Williams, Ryan. Approximation Algorithms. In *Introduction to Optimization, Decision Support and Search Methodologies*, Burke and Kendall (Eds.), Kluwer, 2005. (Invited survey.)
224. Gomes, Carla. Complete Randomized Backtrack Search. In *Constraint and Integer Programming: Toward a Unified Methodology*, Milano, M., (ed.), Kluwer, 2003, 233–283. (Invited survey.)
225. Selman, Bart and Gomes, Carla. Hill Climbing Search. In *Nature Encyclopedia of Cognition*, Nature Publ., 2002. (Invited article.)
226. Gomes, Carla; Xie, Xi; and Wicker, Stephen. Complexity, Phase Transitions, and the Sequential Decoding of Convolutional Codes. In *Forney Festschrift*, Kluwer, 2000. (Invited article.)
227. Gomes, Carla; Selman Bart; Crato, Nuno; and Kautz, Henry. Heavy-tailed phenomena in satisfiability and constraint satisfaction problems. In *SAT-2000, Highlights of Satisfiability Research in the Year 2000*. Kluwer Academic Publishers, Holland, 2000. (Invited article.)

*Edited Proceedings*

228. Fox, Dieter and Gomes, Carla (Eds.). Proceedings of the Twenty-Third AAAI Conference on Artificial Intelligence (AAAI-08), Chicago, Illinois, 2008.



229. Biere, Armin and Gomes, Carla (Eds.). Proceedings of the Ninth Conference on Theory and Applications of Satisfiability Testing (SAT 2006), Seattle, Washington, 2006.

*Other Publications*

230. Junwen Bai, Yuanqi Du, Yingheng Wang, Shufeng Kong, John Gregoire, Carla P Gomes. Xtal2DoS: Attention-based Crystal to Sequence Learning for Density of States Prediction. *NeurIPS 2022 AI for Science: Progress and Promises*, 2022.
231. Joshua Fan, Junwen Bai, Zhiyun Li, Ariel Ortiz-Bobea, Carla P Gomes. A GNN-RNN Approach for Harnessing Geospatial and Temporal Information: Application to Crop Yield Prediction. *NeurIPS 2021 Workshop on Tackling Climate Change with Machine Learning*, 2021.
232. Joshua Fan, Di Chen, Jiaming Wen, Ying Sun, Carla P Gomes. Resolving Super Fine-Resolution SIF via Coarsely-Supervised U-Net Regression. *NeurIPS 2021 Workshop on Tackling Climate Change with Machine Learning*, 2021.
233. David Rolnick, Priya L. Donti, Lynn H. Kaack, Kelly Kochanski, Alexandre Lacoste, Kris Sankaran, Andrew Slavin Ross, Nikola Milojevic-Dupont, Natasha Jaques, Anna Waldman-Brown, Alexandra Luccioni, Tegan Maharaj, Evan D. Sherwin, S. Karthik Mukkavilli, Konrad P. Körding, Carla P. Gomes, Andrew Y. Ng, Demis Hassabis, John C. Platt, Felix Creutzig, Jennifer Chayes, Yoshua Bengio. Tackling Climate Change with Machine Learning. *Technical Report, Climate Change AI*, 2019.
234. Gomes, Carla; Hoeve, Willem; and Lucian Leahu. The Power of Semidefinite Programming Relaxations for SAT. *Technical Report, IISI, Cornell*, 2006.
235. Hoffmann, Joerg; Gomes, Carla; and Selman, Bart. Synthetic Planning Domains with Small Backdoors. *Proceedings of the Workshop on Constraint Propagation and Implementation at CP'05*, Sitges, Spain, 2005.
236. Lesser, W.; and C. Gomes. Network Analysis For Interpreting Patent Data: A Preliminary, Visual Approach, in *J. Kasen (ed.)*, 2005.
237. van Es, H; Gomes, C.; Sellmann, M.; and van Es Cindy. Spatially-Balanced Designs: A Proposed Standard for Agronomic Experiments. *What's Cropping Up? A Newsletter for New York Field Crops & Soils*, Vol. 15, (1), 2005, 1–4.
238. Gomes, Carla and Shmoys, David. Completing Quasigroups: A Structured Graph Coloring Problem. *Proceedings Computational Symposium on Graph Coloring and Generalizations*, 2002.
239. Gomes, Carla. Hybrid Compute Intensive Approaches for Combinatorial Optimization. *Technical Report, RL-TR-02-65, AFRL, Information Directorate*, 2002.

240. Bejar, Ramon; Gomes, Carla; and Vetsikas, Ioannis. Fair Allocations for the Virtual Transportation Company Problem. *Technical Report, DARPA-TASK meeting*, Sante Fe, NM, 2001.
241. Bejar, Ramon; Krishnamachari, Bhaskar; Gomes, Carla; and Selman, Bart. Distributed Constraint Satisfaction in a Wireless Sensor Tracking System. *Proceedings of Workshop on Distributed Constraint Reasoning (CONS-2), IJCAI-2001*, Seattle, 2001.
242. Meier, Andreas; Gomes, Carla; and Melis, Erica. Heavy-Tailed Behavior and Randomization in Proof Planning. *Proceedings AAAI Symposium on Model-based Validation of Intelligence*, Stanford, CA, 2001.
243. Gomes, Carla. Artificial Intelligence and Operations Research: Challenges and Opportunities in Planning and Scheduling. *Technical Report, RL-TR-00-57, AFRL, Information Directorate*, 2000.
244. Gomes, C.; Smith D.; and Westfold, S. A Transformational Approach Applied to Outage Management of Nuclear Power Plants. *Proceedings of 13th HICC, IEEE Computer Society*, 1997.
245. Gomes, Carla and Selman, Bart. Practical Aspects of Algorithm Portfolio Design, *Proceedings of the 3rd ILOG Conference*, Paris, France, 1997.
246. Crato, Nuno; Gomes, Carla; and Selman, Bart. Non-Gaussian Stable Distributions, *Proceedings of CEMAPRE*, 1997.
247. Gomes, Carla. Exploiting Stochasticity in Systematic Search: Results on a Highly Structured Domain. *Technical Report, RL-TR-97-167, Rome Laboratory*, 1997.
248. Gomes, Carla. Automatic Scheduling of Outages of Nuclear Power Plants with Time Windows. *Technical Report, RL-TR-96-157, Rome Laboratory*, 1996.
249. Gomes, Carla. O-Plan2 vs. Sipe-2 — A General Comparison. *Technical Report, RL-TR-94-96, Rome Laboratory*, 1996.
250. Gomes, Carla. Planning and Scheduling of Nuclear Power Plant Outages. *Proceedings of the First International Workshop of AI and OR*. Timberline, Oregon, 1995.
251. Gomes, Carla. Planning in KIDS. *Technical Report, RL-TR-95-205, Rome Laboratory*, 1995.
252. Gomes, Carla and Hsu, Julie. An Assignment Based Algorithm. *Proceedings of the Workshop on Scheduling at the Conference on Tools with Artificial Intelligence*, New Orleans, Louisiana, 1994.
253. Gomes, Carla. and Alguire, Karen. Looking at O-PLAN2 and SIPE2 through Missionaries and Cannibals. *Proceedings of the ARPA-RL Planning Initiative Workshop*. Arizona, 1994.
254. Gomes, Carla. Achieving Global Coherence by Exploiting Conflict: A Distributed Framework for Job Shop Scheduling. *Ph.D. Thesis, University of Edinburgh*, 1993.

255. Gomes, Carla. Achieving Global Coherence by Exploiting Conflict. *Proceedings of the 10th UK SIG Planning*, Cambridge, 1991.
256. Gomes, Carla, and Almeida, Teresa. Pairing Generation — A Graph Partitioning Approach to a Short Haul Fleet Problem. *Proceedings of AGIFORS*, Copenhagen, 1988.
257. Gomes, Carla. Pairing Generation — A Graph Partitioning Approach to a Short Haul Fleet Problem. *Master's Thesis, University of Lisbon*, 1987.

## Invited Talks, Survey Lectures, Tutorials, and Research Briefings

### *Invited Talks*

1. *Keynote Speaker*, The Fifth International Conference on Distributed Artificial Intelligence (DAI 2023): AI to Accelerate Scientific Discovery for a Sustainable Future, Singapore, 2023.
2. *Speaker*, AI for Humanity 20231031: What's the Next Big Question? Leaders in A.I. Discuss the Science of the Future, Online, 2023.
3. *Speaker*, National Academies Workshop on AI for Scientific Discovery: What is the Goal of an AI Scientist (in Conducting Independent Research)?, Washington, DC, 2023.
4. *Keynote Speaker*, The Genetic and Evolutionary Computation Conference (GECCO 2023): AI for Scientific Discovery and a Sustainable Future, Lisbon, Portugal, 2023.
5. *Panelist*, Vienna Center for Logic and Algorithms LogicLounge 2023: Exploring Connections: Wittgenstein, Gödel, and ChatGPT, Vienna, Austria, 2023.
6. *Vienna Gödel Lecture*, TU Wien Informatics: AI for Scientific Discovery and a Sustainable Future, Vienna, Austria, 2023.
7. *Keynote Speaker*, DIMACS Workshop on Algorithm and Mechanism Design for Achieving the UN Sustainable Development Goals: Computational Sustainability: Computing for a Better World and a Sustainable Future AI for Accelerating Scientific Discovery, Piscataway, NJ, 2023.
8. *Keynote Speaker*, The 21st International Conference on Pervasive Computing and Communications (PerCom 2023): AI for Scientific Discovery and a Sustainable Future, Atlanta, GA, 2023.
9. *Speaker*, NSF Sponsored Workshop on AI-Enabled Scientific Revolution: Plenary Lightning Talk on Advancing AI-2, Alexandria, VA, 2023.
10. *Invited Speaker*, 2nd AI for Science Workshop at ICML: AI for Scientific Discovery: Computational Sustainability, Baltimore, MD, 2022.

11. *Keynote Speaker*, 19th International Conference on the Integration of Constraint Programming, Artificial Intelligence, and Operations Research (CPAIOR 2022): Combining Reasoning and Learning for Discovery, Los Angeles, CA, 2022.
12. *Speaker*, American Physical Society (APS): Combining AI Reasoning and Machine Learning for Accelerating Materials Discovery, Chicago, IL, 2022.
13. *Invited Speaker*, AAAI Workshop on Combining Learning and Reasoning: Programming Languages, Formalisms, and Representations (CLear 2022): Combining Reasoning and Learning for Discovery, Online, 2022.
14. *Invited Speaker*, 1st Annual AAAI Workshop on AI to Accelerate Science and Engineering (AI2ASE), Online, 2022.
15. *Speaker*, AFOSR Leaders in A.I Discuss the Science of the Future Webinar, A.I. 2040 and Beyond 20220202: What's the next BIG QUESTION?, Online, 2022.
16. *Keynote speaker*, 23rd International Conference on Distributed Computing and Networking (ICDCN): Computational Sustainability: Computing for a Better World and a Sustainable Future, Online, 2022.
17. *Invited Speaker*, Inaugural Lecture of Distinguished Lecture series on AI, Center for Artificial Intelligence Foundations and Scientific Applications, Penn State University: Computational Sustainability: Computing for a Better World and a Sustainable Future, Online, 2021.
18. *Invited Speaker*, Distinguished Colloquium CS Dept and Intelligent Systems Center at Missouri S&T, Computational Sustainability: Computing for a Better World and a Sustainable Future, Online, 2021.
19. *Keynote speaker*, IEEE SMARTCOMP, Computational Sustainability: Computing for a Better World and a Sustainable Future, Online, 2021.
20. *Speaker*, AI for Materials: From Discovery to Production Webinar, Artificial Intelligence (AI) for Accelerating Materials Discovery, Online, 2020.
21. *Speaker*, Ars Electronica x Austrian Council for Robotics and AI, Panel on AIxEcology, Computational Sustainability: Computing for a Better World and a Sustainable Future, Online, 2020.
22. *Keynote speaker*, Earth Day at KDD, Computational Sustainability: Computing for a Better World and a Sustainable Future, Online, 2020.
23. *Panelist*, ICML, Doing Some Good with Machine Learning, Online (scheduled for Vienna, Austria), 2020.
24. *Keynote speaker*, AAMAS, Online (scheduled for Auckland, NZ), 2020.
25. *Invited talk*, NeurIPS Joint Workshop on AI for Social Good, Vancouver, Canada, 2019.

26. *Invited talk*, NeurIPS Workshop on Tackling Climate Change with Machine Learning, Vancouver, Canada, 2019.
27. *Distinguished Lecture*, NSF CISE, Alexandria, VA, 2019.
28. *Talk*, Defense Materials Manufacturing and its Infrastructure (DMMI) Workshop on: Data Analytics for the Materials Community, Washington, DC, 2019.
29. *Keynote speaker*, SAT, Lisboa, Portugal, 2019.
30. *Talk*, Michigan Institute for Computational Discovery and Engineering (MICDE) Symposium, Ann Arbor, MI, 2019.
31. *Keynote speaker*, ICAART, Prague, Czech Republic, 2019.
32. *Webinar*, Materials Research Society (MRS), Machine Learning, AI, and Data-Driven Materials Development and Design, 2018.
33. *Talk*, Sci-Foo Camp, Google, 2018.
34. *Invited talk*, Eighth International Workshop on Statistical Relational AI (StarAI-2018), IJCAI, 2018.
35. *Talk*, MURI kickoff meeting, AFOSR, Dayton, OH, Scientific Autonomous Reasoning Agent for Materials Discovery (SARA), 2018.
36. *Colloquium*, Computer Science Department, National University Singapore (NUS), 2018.
37. *Invited talk*, Artificial Intelligence for Materials Development Forum, Materials Research Society (MRS), 2018.
38. *Keynote speaker*, AI\*IA, Bari, Italy, 2017.
39. *Keynote speaker*, SustainIT, Sustainable Internet and ICT for Sustainability, Funchal, Portugal, 2017.
40. *Invited talk*, SCI Institute Distinguished Lecture Series, University of Utah Scientific Computing and Imaging Institute, Salt Lake City, Utah, Computational Sustainability, 2017.
41. *Invited plenary speaker*, Microsoft Faculty Summit, Redmond, Washington, 2017.
42. *Plenary panelist*, Microsoft Faculty Summit, Redmond, Washington, 2017.
43. *Keynote speaker*, Workshop Advanced Computing for Earth Sciences (ACES), Porto, Portugal, 2017.
44. *Invited talk*, Amazon Dams II Conference, Lima, Peru, 2017.
45. *Panelist*, Mechanism for Social Good, MIT, 2017.

46. *Invited talk*, AAAI symposium on "AI for Social Good", Stanford University, 2017.
47. *Co-organizer and Invited talk*, Accelerating Science: A Grand Challenge for AI, AAAI Fall Symposium, Arlington, VA, Challenges for AI in Computational Sustainability, 2016.
48. *Invited talk*, Carnegie Mellon School of Computer Science, Challenges for AI in Computational Sustainability, AI Lunch and Seminar, 2016.
49. *Invited talk in computational sustainability session, chair, and tutorial host*, International Conference on Principles and Practice of Constraint Programming, CP2016, Toulouse, France, 2016.
50. *Invited talk*, World Economic Forum, remote to China, Harnessing artificial intelligence to target conservation efforts, 2016.
51. *Keynote speaker*, Computing Research: Addressing National Priorities and Societal Needs CCC Computing Community Consortium, Catalyst Series, Computational Sustainability: Computational Methods for Sustainable Development, 2016.
52. *Invited Talk*, University of Washington AI Research seminar series, Challenges for AI in Computational Sustainability, 2016.
53. *Invited Talk*, AAAS, Washington D.C., Computational Sustainability: UDiscoverIt: Incentivizing Citizen Science Discovery for a Sustainable World, 2015.
54. *Keynote Speaker*, Third International Green Computing Conference (IGCC'12), San Jose, CA, 2012.
55. *Keynote Speaker*, National Academy of Engineering Regional Symposium, Toward a Sustainable Future, Cornell University, Ithaca, NY, 2012.
56. *Colloquium Speaker*, University of Waterloo Computer Science Colloquium on Computational Sustainability, Waterloo, Canada, 2012.
57. *Invited Talk*, Radcliffe Institute for Advanced Study at Harvard University, Computational Sustainability: Computational Methods for a Sustainable Environment, Economy, and Society, 2011.
58. *Colloquium Speaker*, Department of Computer Science, Tufts University, Medford, MA, 2011.
59. *Invited Talk*, Workshop on Information and Communication Technologies for Sustainability (WICS), Salt Lake City, UT, 2011.
60. *Keynote Speaker*, NSF-IITD Indo-US PC3: Pervasive Communication and Computing Workshop (PC3). Computational Sustainability. New Delhi, India, 2011.
61. *Invited Talk*, Carnegie Mellon University, Department of Computer Science, Sustainability and Computer Science Seminar. Computational Sustainability. Pittsburgh, PA, 2011.

62. *Invited Plenary Talk*, National Symposium for the Advancement of Women in Science. The Future of Computer Science. Cambridge, MA, 2011.
63. *Invited Plenary Talk*, NSF/CCC Workshop on IT and Sustainability Enterprise: Role of Information Sciences in Sustainability (RISES). Computational Sustainability. Washington, DC, 2011.
64. *Invited Plenary Talk*, 24th National Conference of the American Association for Artificial Intelligence (AAAI-10). Challenges for AI in Computational Sustainability. Atlanta, Georgia, 2010.
65. *Invited Plenary Talk*, 7th International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems (CP-AI-OR'10). Challenges for CPAIOR in Computational Sustainability. Bologna, Italy, 2010.
66. *Invited Plenary Technical Talk*, Grace Hopper Celebration of Women in Computing, (Grace-Hopper'10). Computational Sustainability: Computational Methods for a Sustainable Future. Atlanta, Georgia, 2010.
67. *Invited Plenary Talk*, National Academy of Engineering, U.S. Frontiers of Engineering, Computational Sustainability: Computational Methods for a Sustainable Future. Irvine, 2009.
68. *Invited Plenary Talk*, 15th International Conference on the Principles and Practice of Constraint Programming (CP09). Computational Sustainability: Computational Methods for a Sustainable Future. 2009.
69. *Keynote Speaker*, Envisa workshop on Intelligent Analysis of Environmental Data. Computational Sustainability: Computational Methods for a Sustainable Future. Cork, Ireland, 2010.
70. *Colloquium Speaker*, University of Rochester, Department of Computer Science. Computational Sustainability: Computational Methods for a Sustainable Future. 2010.
71. *Colloquium Speaker*, CMU, Tepper Business School. Exploiting Structure and Randomization in Combinatorial Search. 2009.
72. *Invited Talk*, NSF Workshop on the Next Generation of Data Mining, (NGDM09). Computational Sustainability: Computational Methods for a Sustainable Future. Baltimore, 2009.
73. *Invited Talk*, Symposium on on Satisfiability Solvers and Program Verification (SSPV 2006). Beyond Satisfiability: Model Counting, Quantification, and Randomization, 2006.
74. *Keynote Speaker*, Ninth International Symposium on Artificial Intelligence and Mathematics. (AI & Math 2006). Adventures in Randomized Complete Methods, USA. 2006.
75. *Invited Talk*, American Association for the Advancement of Science (AAAS). Heavy-tailed Phenomena in Computation. Symposium entitled "The Pervasiveness of Extreme Phenomena in Science, Economics, and Engineering." Annual Meeting, Washington D.C., 2005.
76. *Invited Talk*, Inaugural Conference of the Northwestern Institute on Complex Systems (NICO). Heavy-Tailed Behavior in Computation, Northwestern University, 2004.

77. *Invited Talk*, Institute for Mathematics and its Applications (IMA). Heavy-Tailed Behavior in Computation. Feb. 2004.
78. *Invited Talk*, Institute for Pure and Applied Mathematics, UCLA. Randomization, Structure, and Complexity in Combinatorial Optimization. 2003.
79. *Colloquium Speaker*, University of Michigan, AI Colloquium. Bridging Paradigms for Combinatorial Search. 2003.
80. *Invited Talk*, Institute for Pure and Applied Mathematics, UCLA. The Integration of Constraint Programming and Mathematical Programming Methods. 2002.
81. *Colloquium Speaker*, University of Lisbon. Heavy-Tailed Phenomena in Combinatorial Search. March 2001.
82. *Invited Plenary Talk*, 17th National Conference of the American Association for Artificial Intelligence (AAAI-00). Structure, Duality, and Randomization — Common Themes in AI and OR. August, 2000.
83. *Invited Talk*, Stanford University, Broad Area Colloquium. Structure, Duality, and Randomization — Common Themes in AI and OR. Nov. 2000.
84. *Invited Talk*, SRI International. Structure, Duality, and Randomization — Common Themes in AI and OR. Nov. 2000.
85. *Invited Talk*, NASA, Ames. Structure, Duality, and Randomization — Common Themes in AI and OR. Nov. 2000.
86. *Invited Session Talk*, Institute for Operations Research and the Management Sciences (INFORMS). Algorithm Portfolio Approach for Solving Hard Combinatorial Problems. Cincinnati, OH, 1999.
87. *Colloquium Speaker*, University of Alberta, Colloquium, Dept. of Computer Science. Exploiting Heavy-Tail Phenomena to Speed-up Search. June, 1999.
88. *Invited Talk*, SRI International. Heavy-Tail Phenomena in Combinatorial Search. April, 1998.
89. *Colloquium Speaker*, Syracuse University, Colloquium, Dept. of Computer Science. Exploiting Heavy-Tail Phenomena to Speed-up Search. Oct., 1998.
90. *Invited Session Talk*, Institute for Operations Research and the Management Sciences (INFORMS). Practical Aspects of Randomized Algorithms. Montreal, Canada, April, 1998.
91. *Invited Talk*, Information 2000: Intelligent Information for the Next Millennium Workshop. Integration of Artificial Intelligence and Operations Research for Combinatorial Problems. Vernon, NY, Oct. 1997.
92. *Invited Talk*, *Distinguished Lecture Series*, AFRL/IF, Integration of Artificial Intelligence/Operations Research for Combinatorial Problems. Rome, NY, July 1997.



93. *Invited Talk*, Electrical Power Research Institute — Members Conference. Synthesis of Nuclear Power Plant Outage Schedulers. San Diego, CA. Nov. 1995.
94. *Colloquium Speaker*, Louisiana State University, Colloquium. A Distributed Framework for Scheduling. Baton Rouge, LA, Nov. 1994.
95. *Invited Talk*, Electrical Power Research Institute, Members Conference. Formal Methods Applied to Schedule Generation. Orlando, FL, Jul. 1994.

*Invited Survey Lectures and Tutorials*

96. Scientific Use of Experimentation for Combinatorial Optimization. Master Class on Experimental Study of Algorithms and Benchmarking. CPAIOR. Italy, 2010.
97. Complete Randomized Backtrack Search. American Association for Artificial Intelligence (AAAI), 2005.
98. Complete Randomized Backtrack Search. Conference on the Principles and Practice of Constraint Programming, 2005.
99. Heuristic Algorithms: Theory and Practice. Summer School on “Statistical Physics, Probability Theory, and Computational Complexity”, The International Centre for Theoretical Physics, Trieste, Italy, September 2002.
100. Randomization and Rational Decision Making in Optimization. Uncertainty in Artificial Intelligence (UAI), Edmonton, Alberta, Canada, 2002.
101. Phase Transitions and Structure in Combinatorial Problems. American Association for Artificial Intelligence (AAAI), Edmonton, Canada, July, 2002.
102. Exploiting Structure and Randomization in Combinatorial Search. School on Optimization. CPAI-OR 2002, Le Croisic, France, March 2002.
103. Phase Transitions and Structure in Combinatorial Problems. International Joint Conference on Artificial Intelligence (IJCAI), Seattle, WA, 2001.
104. Integration of Artificial Intelligence and Operations Research Techniques. American association for Artificial Intelligence (AAAI), Madison, WI, 1999.
105. Integration of Artificial Intelligence and Operations Research Techniques. American Association for Artificial Intelligence (AAAI), Providence, RI, 1998.

*Research Briefings*

106. NSF, Research talk to the NSF Advisory Board, Computing and Information Science and Engineering (CISE), 2009. Computational Sustainability: Computational Methods for a Sustainable Future, 2009.
107. AFOSR, Research Briefing to Dr. Lyle Schwartz (Director of AFOSR) and Dr. Herbert Carlson (Chief Scientist of AFOSR). Accomplishments and Future Directions for the Intelligent Information Systems Institute. June 2003.
108. AFRL/IF, Scientific Advisory Board. Vision and Directions for the Intelligent Information Systems Institute. Nov. 2001.
109. AFRL/IF, Distinguished Visitors, Research briefing to Maj. Gen. Neilsen (Commander of AFRL), Rome, NY, February, 2001.
110. AFRL/IF, Scientific Advisory Board, Research briefing, Rome, NY, Dec. 1999.
111. AFRL/IF, Distinguished Visitors, Research briefing to Dr. Donald Daniel and Dr. Cliff Rhoades (Director of Mathematics Geosciences Directorate of AFOSR), Rome, NY, September 1998.
112. AFRL/IF, Distinguished Visitors, Research briefing to Dr. Janni (Director of AFOSR), Rome, NY, August 1998.
113. AFRL/IF, Distinguished Visitors, Research briefing to Maj. Gen. Paul (Commander of AFRL), Rome, NY, July 1998.
114. AFRL/IF, Distinguished Visitors, Research briefing to Dr. Kenneth Harwell (Chief Scientist of AFRL) and Col. Jim Heald (Vice-Cmd of AFRL), Rome, NY, June 1998.
115. AFRL/IF, Distinguished Visitors, Research briefing to Dr. Hastings (Chief Scientist of US Air Force) Rome, NY, May, 1998.
116. AFRL/IF, Distinguished Visitors, Research briefing to Dr. Feigenbaum (Chief Scientist of US Air Force) Rome, NY, 1996.

## **Open Source, Demos, and Web Applications**

1. Quasigroup Completion Problem and Heavy Tailed Phenomena (Java Applet)  
<http://www.cs.cornell.edu/gomes/QUASIdemo.html>
2. Computational Methods for the Generation of Spatially Balanced Latin Squares for Experimental Design. <http://www.cs.cornell.edu/gomes/sbls.htm>
3. Visualization of Portfolios of Algorithms (Java Applet)  
<http://www.cs.cornell.edu/Info/People/gomes/visualBrelaz/visualBrelaz.html>
4. Generator of Quasigroup Completion Problem and related problems (C code)  
<http://www.cs.cornell.edu/gomes/lencode-v1.1.tar.Z>

5. Paramedic Crew Assignment (Java Applet)  
<http://www.cs.cornell.edu/gomes/demos/demo/html/people.html>
6. Visualization of Heavy-tailed Behavior (Java Applet)  
<http://www.cs.cornell.edu/gomes/BalancedBranchApplet/ImbalancedApplet.html>
7. Sudoku  
<http://www.cs.cornell.edu/gomes/SUDOKU/sudoku.html>
8. Grizzly Bear Wildlife Corridor Problem Generator
9. Red-Cockaded Woodpecker (endangered species) Problem Generator  
<http://www.cs.cornell.edu/kiyan/rcw/generator.htm>

## Teaching, Course Development, and Research Advising at Cornell

### *Courses developed recently*

CS-6703 — *AI for Science*. This is a studio style course that emphasizes collaborative learning. It leverages the AI for Science Schmidt postdoc fellowship program and other programs. Schmidt postdoc fellows will present their research and progress. We will discuss background literature, related research, and possible research directions in class. Throughout the semester, students will learn various AI research methodologies, including AI/ML code, packages, and software, and engage in discussions on current advancements and applications of AI in science and engineering.

CS/AEM/INFO-2770 — *Excursions in Computational Sustainability*. This is an introductory undergraduate level course. An important objective of the course is to show how the often ill-defined notions of sustainability can be made operational through computational and mathematical models, and how those models can improve policies to alter or modify unsustainable human behavior. The course introduces the students to a range of sustainability notions, concepts, and challenges as they arise in different fields (ecology, geology, economics, and other biological, physical, and social sciences). Sustainability topics include sustainable development, biodiversity and wildlife conservation, poverty mitigation, food security, renewable resources, energy, transportation, and climate change. In the context of these sustainability topics, the course will introduce students to mathematical and computational modeling techniques, algorithms, and machine and statistical learning methods.

### *Other courses taught*

CS/INFO-6702 — *Topics in Computational Sustainability*.

INFO-7990 — *Distributed Seminar on Sustainability Science*.

CS-4700 — *Foundations of Artificial Intelligence*.

CS-4701 — *Artificial Intelligence Practicum*.

CS/INFO-3720 — *Explorations in Artificial Intelligence*.

CS-6730 — *Integration of Artificial Intelligence and Operations Research Techniques for Combinatorial Problems*.

AEM-4120 — *Computational Methods for Management and Economics*.

*Student research advising, Ph.D. / M.Eng. / Undergraduate:*

Yiwei Bai (Ph.D., CS), Christian Belardi (Ph.D., CS), Yuanqi Du (Ph.D., CS), Joshua Fan (Ph.D., CS), Dieqiao Feng (Ph.D., CS, with Bart Selman), Laura Greenstreet (Ph.D., CS), Marc Grimson (Ph.D., CS), Yimeng Min (Ph.D., CS), Brendan Rappazzo (Ph.D., CS), Yingheng Wang (Ph.D., CS), Wenting Zhao (Ph.D., CS), Sebastian Ament (Ph.D., CS, now research scientist at Meta), Junwen Bai (Ph.D., CS, now research scientist at Google), Qinru Shi (Ph.D., Applied Math), Johan Bjorck (Ph.D., CS, now at Microsoft Turing), Di Chen (Ph.D., CS), Avralt-Od Purevjav (Ph.D., AEM; chair: Shanjun Li), Duhan Zhang (Ph.D., Mechanical Engineering; chair: Robert Shepherd), Ryan Finseth (Ph.D., AEM; chair: Jon Conrad), Yexiang Xue (Ph.D., CS, now assistant professor at Purdue University), Ronan Le Bras (Ph.D., CS, now researcher at Paul Allen Institute for Artificial Intelligence), Stefano Ermon (Ph.D., CS, now assistant professor at Stanford), Bistra Dilkina (Ph.D., CS, now associate professor at University of Southern California), Yunsong Guo (Ph.D., CS, now at Pinterest), Katherine Lai (Ph.D., CS), Maarika Teose (Ph.D., CAM), Ricardo Arguello (Ph.D., CRP, 2009, minor; chair: Nancy Chau), Zevi Azzaino (Ph.D., CRP, minor; chair: Jon Conrad), Yan Zhao (M.Sc., AEM), Keith Savageau (M.Sc., AEM, 2005), Sam Henry (M.Eng., research project Sp 2010), Lisa Cai (M.Eng., research project Sp 2005), Anan Kapur (M.Eng., research project Spring 2005), Ryan Williams (M.Eng., research project Summer 2002), Sean N. Byrnes (M.Eng, research project 2001), Vicky Weissman (M.Eng., research project Summer 1999), Anmol Kabra (Undergrad, research projects), Tharun Sankar (Undergrad, research projects), Liane Longpre (Undergrad, research projects), Steven McDonald (Undergrad, research projects), Jordan Stout (Undergrad, research projects), John Tregurtha (Undergrad, research projects), Galen Weld (Undergrad, research projects), Runzhe Yang (Undergrad, Shanghai Jiao Tong University), Luming Tang (Undergrad, Shanghai Jiao Tong University), Jonathan Nino Cortes (Undergrad, Universidad de los Andes, Colombia), Noah Sorbello (Undergrad), Andrew Perrault (Undergrad), Gregory Sadowski (Undergrad Fall 2009), Raoul Reit (Undergrad Spring 2010), Sarah Chung (Undergrad Fall 2002), Nir Etzion (Undergrad Fall 2001), Guilherme Luiz Karnas Hoefel (Undergraduate / M.Eng. OR - Research project 2001/2002), Patrick Dowell (Undergrad, research project Summer 2001), Radha Narayan (Undergrad, research project Summer 2001), Mike Sweredoski (Undergrad, research project Summer 2002), Ben Kraus (Undergrad, research project Summer 2000).

*Postdoctoral associates:*

Shufeng Kong (2018-present); Roosevelt Garcia (2017-2018, with Alex Flecker, EEB); Guillaume Perez (2017-2018); Xiaojian Wu (2016-2017; now at Facebook); Bistra Dilkina (2012-2013; now associate professor at University of Southern California); Theodoros Damoulas (2009-2013, now assistant professor at University of Warwick, UK); Ashish Sabharwal (2005-2010, now at Paul Allen Institute for Artificial Intelligence); Willem van Hove (2005-2007, now professor at CMU); Carlos Ansoategui (2005, now professor at Lleida University, Spain); Cesar Fernandez (2004, now professor at Lleida University, Spain); Meinolf Sellmann (2004, now at IBM T.J. Watson Research Center); Carmel Domshlak (2002-2003, now professor at Technion University, Israel); Ramon Bejar (2001, now professor at Lleida University, Spain);

**Professional Service**

Editorial Boards (past and current):

*Artificial intelligence Journal* (Associate Editor, current)  
*ACM Transaction on Intelligent Systems and Technology* (current)  
*Journal of Artificial Intelligence Research*  
*ACM Transactions on Programming Languages and Systems*  
*Constraints Journal*  
*Journal of Knowledge Engineering Review*  
*Journal of Satisfiability, Boolean Modeling and Computation*

Chair, ACM Eugene L. Lawler Award for Humanitarian Contributions within Computer Science and Informatics.

Member, Advisory Board, Climate Change AI.

Member, Advisory Board, National AI Institute for Future Agricultural Resilience, Management and Sustainability (AIFARMS), University of Illinois at Urbana-Champaign.

Member, Artificial Intelligence Staging Task Force, Materials Research Society (MRS).

Member, Cornell University Sustainability Task Force.

Chair, Scientific Review Panel, Portuguese Minister of Science and the President of the Portuguese Foundation of Science and Technology (FCT) (2018).

Guest Editor, *ACM Transactions on Intelligent Systems and Technology*, Special issue on Computational Sustainability (2010-2011).

Program Chair (with Brian Williams) Special Track on Computational Sustainability at AAAI, 25th Conference on Artificial Intelligence, CompSust@AAAI, San Francisco, 2011.

Program Chair (with Tom Dietterich and Brian Williams) 2nd Intl. Conference on Computational Sustainability (CompSust-2009), MIT, Boston, USA, 2009.

Program Chair (with Jon Conrad and David Shmoys) 1st Intl. Conference on Computational Sustainability (CompSust-2009), Cornell University, Ithaca, USA, 2009.

Program Chair (with Dieter Fox), Twenty-Third Conference on Artificial Intelligence (AAAI-08), Chicago, USA, 2008.

Program Chair (with Armin Biere), Ninth International Conference on Theory and Applications of Satisfiability Testing (SAT 2006), Seattle, Washington, USA, 2006.

Conference Chair, Eighth International Conference on the Principles and Practice of Constraint Programming (CP2002), Ithaca, NY, 2002.

Co-Chair:

AAAI Tutorial program, American Association for Artificial Intelligence AAAI-2006.  
AAAI Workshop on Probability and Search, Edmonton, Canada, 2002 (with Toby Walsh).  
AAAI Fall Symposium, Uncertainty in Computation, Boston, Nov. 2001 (with Toby Walsh).  
AAAI Workshop, Leverage Randomization, and Probability, Austin, TX, 2000 (with H. Hoos).

External committee member (Ph.D.):

Alda Carvallho, Applied Mathematics, Technical University of Lisbon, 2010.  
Mathew Streeter, Comp. Sci. Dept., Carnegie Mellon University, 2008.

Erik van der Meers, Information Technology, University of Copenhagen, 2006.  
Vincent Cicerello, Comp. Sci. Dept., Carnegie Mellon University, 2004.  
Carlos Ansotegui, Comp. Sci. Dept., Univ. Lleida, Spain, 2004.  
Ines Lynce, Comp. Sci. Dept., University of Lisbon, 2003  
Ramon Bejar, Comp. Sci. Dept., Univ. Aut3noma de Barcelona, Spain, 2000.  
Anil Menon, Computer Science Department, University of Syracuse, 1998.

Guest Editor, *J. of Knowledge Engineering Review*, on AI/OR for Planning and Scheduling (2001).

Program Committees:

National Conference of the American Association for Artificial Intelligence AAAI-2010 (Nectar PC); 16th International Conference on the Principles and Practice of Constraint Programming, CP-2010; International Conference on the Integration of AI and OR in CP for Combinatorial Optimization (CPAIOR-2009);

21st International Joint Conference on Artificial Intelligence, IJCAI-2009; International Conference on the Integration of AI and OR in CP for Combinatorial Optimization (CPAIOR-2008); International Conference on the Integration of AI and OR in CP for Combinatorial Optimization (CPAIOR-2007); International Conference on the Integration of AI and OR in CP for Combinatorial Optimization (CPAIOR-2006); International Conference on Automated Planning and Scheduling, ICAPS-2006; International Joint Conference on Artificial Intelligence, IJCAI-2005; International Conference on the Integration of AI and OR in CP for Combinatorial Optimization (CPAIOR-2005); International Conference on Automated Planning and Scheduling, ICAPS-2005; National Conference of the American Association for Artificial Intelligence AAAI-2005 (senior PC); International Conference on the Integration of AI and OR in CP for Combinatorial Optimization (CPAIOR-2004); International Conference on Automated Planning and Scheduling, ICAPS-2004; 7th International Conference on the Theory and Applications of Satisfiability Testing, SAT-2004; International Conference on Automated Planning and Scheduling, ICAPS-2003; 9th International Conference on the Principles and Practice of Constraint Programming, CP-2003; 6th International Conference on the Theory and Applications of Satisfiability Testing, SAT-2003; American Association for Artificial Intelligence AAAI-2002; Symp. on the Theory and Applications of Satisfiability Testing (SAT-2001, part of LICS-2001); Abstract State Machine Workshop, ASM-2000; European Conference on Planning, ECP-1999; Agents 1999; American Association for Artificial Intelligence AAAI-1996; Artificial Intelligence Tools (AI-TOOLS) 1994; AI/OR Workshop, Vermont, 1994.

Judge, Intel International Science and Engineering Fair, May 12-18, 2002, USA.

Advisory Committee Member, *International Scientists, Presidency of European Community*, 2000.

Member, Electrical and Computer Engineering — Robotics and Information Systems, Funding Review Panel of the National Science and Technology Foundation, Portugal, Febr. 2002.

Member, DARPA Future Directions Study Group (ISAT), Self-Configuring Wireless Sensor Networks, Woods Hole, MA, August 2000; Study on Probabilistic Methods in Computational Systems and Infrastructure, Woods Hole, MA, August 1999.

Organizer, New World Vistas AFOSR Annual Review, 1999.

Reviewer for:

Artificial Intelligence Journal; Constraints: An International Journal; Discrete Applied Mathe-

matics; Constraint Programming; American Association for Artificial Intelligence (AAAI); Air Force Office of Scientific Research (AFOSR); Artificial Intelligence Tools Journal; IEEE Expert; International Joint Conference on Artificial Intelligence (IJCAI); Journal of Automated Reasoning; Journal of Artificial Intelligence Research; NASA; and NSF.

## Employment History

Since Jul. 2020	Ronald C. and Antonia V. Nielsen Professor of Computing and Information Science, Cornell University.
Since Jul. 2010	Professor, Dept. of Computer Science, Dept. of Information Science and Dyson School of Economics and Management, Cornell University.
2003-2010	Associate Professor, Computing and Information Science, Dept. of Applied Economics and Management, and Dept. of Computer Science, Cornell University.
2001-2008	Director, Intelligent Information Systems Institute (IISI), Computing and Information Science, Cornell University.
1998-2000	Research Associate, Computer Science Dept., Cornell University.
1993-1998	Researcher, Air Force Research Lab, Information Directorate, Information Technology, Technical Advisor: Nort Fowler.
1990-1992	Teaching Assistant at the University of Edinburgh.
1987-1989	Research Analyst, Department of Informatics, Air Portugal. Main projects: Crew Scheduling and Automatic Passenger Profile Analysis.

## Recent Media

- *13 researchers named Eric and Wendy Schmidt AI in Science Postdoctoral Fellows*, Cornell CIS, Dec 20, 2023.
- *Science Is Becoming Less Human: AI is accelerating the pace of discovery—but at what cost?*, The Atlantic, Dec 11, 2023.
- *Google AI and robots join forces to build new materials*, Nature, Nov 29, 2023.
- *Big Data, AI Help Advance Ornithology*, Tech Briefs, Nov 9, 2023.
- *New AI model gives bird’s-eye view of avian distribution at vast scale*, Mongabay, Nov 8, 2023.
- *AI analyzes bird sightings to help conserve species*, Cornell Chronicle, Oct 4, 2023.
- *Little by little, a bird builds its nest*, Nature Computational Science, Jun 26, 2023.
- *AI for a Sustainable Future*, TU Wien Informatics, Jun 12, 2023.
- *Wie ChatGPT die Welt verbessern kann*, Future Zone, Jun 8, 2023.
- *Expertin: KI ist “Superkraft” für Nachhaltigkeitsforschung*, Austria Presse Agentur Science, Jun 5, 2023.

- *Einaudi seed grants finding fertile soil*, Cornell Chronicle, May 11, 2023.
- *AI-CLIMATE institute aims to curb emissions, boost economy*, Cornell Chronicle, May 4, 2023.
- *Artificial Intelligence for Materials Discovery*, Communications of the ACM, Mar 23, 2023.
- *10 researchers named inaugural Eric and Wendy Schmidt AI in Science Postdoctoral Fellows*, Cornell Chronicle, Mar 21, 2023.
- *Cornell joins Schmidt AI in Science postdoc research initiative*, Cornell Chronicle, Oct 26, 2022.
- *AI reveals scale of eelgrass vulnerability to warming, disease*, Cornell Chronicle, Jun 15, 2022.
- *Gomes Receives ACM – AAAI Allen Newell Award*, Cornell Chronicle, Jun 13, 2022.
- *The 2030 Project to marshal faculty to solve climate crisis*, Cornell Chronicle, May 12, 2022.
- *ACM celebrates technical achievements that drive far-reaching advances in technology*, AAAS EurekAlert!, May 11, 2022.
- *Machine learning for spectral properties*, Nature Computational Science, Mar 18, 2022.
- *Episode 4: Meet research team member SARA*, MRS Bulletin Materials News Podcast, Mar 18, 2022.
- *How AI could help bring a sustainable reckoning to hydropower*, Popular Science, Feb 26, 2022.
- *AI can help build kinder, gentler dams*, Anthropocene Magazine, Feb 23, 2022.
- *AI enables strategic hydropower planning across Amazon basin*, Cornell Chronicle, Feb 17, 2022.
- *Reducing negative impacts of Amazon hydropower expansion on people and nature*, Cary Institute of Ecosystem Studies, Feb 17, 2022.
- *AI could optimize hydroelectric dams in the Amazon*, FIU News, Feb 17, 2022.
- *Autonomous experiment finds stable fuel-cell material in minutes*, C&EN, Dec 28, 2021.
- *AI powers autonomous materials discovery*, Cornell Chronicle, Dec 17, 2021.
- *Climate-driven disease compromises seagrass health*, Cornell Chronicle, Dec 10, 2021.
- *“Clarity and well-chosen examples are critical to communicating research” — An Interview with Carla P. Gomes*, Typeset, Oct 14, 2021.
- *DRNets can solve Sudoku, speed scientific discovery*, Cornell Chronicle, Sep 17, 2021.
- *Computational Sustainability Meets Materials Science*, Communications of the ACM, Jul 30, 2021.



- *Profile of Carla Gomes' Research on Hierarchical Machine Learning for Material Discovery*, Cornell CS News, Jul 16, 2021.
- *Hierarchical machine learning framework pushes boundaries of multi-property material discovery*, AIP Scilight, Jun 23, 2021.
- *Carla Gomes Receives Cornell Atkinson Grant to Study Amazonian Aquaculture*, Cornell CS News, Jun 23, 2021.
- *Cornell Atkinson awards \$1.8 million to fund vital collaborations*, Cornell Chronicle, Jun 16, 2021.
- *Grant to accelerate AI materials discovery and design*, Cornell Chronicle, May 18, 2021.
- *Autonomous materials development using in situ laser annealing and scan-probe, grazing incident x-ray microdiffraction*, CHESS News, Apr 13, 2021.
- *Computational sustainability trailblazer honored*, Cornell Chronicle, Mar 9, 2021.
- *Cornell Researchers Collaborate to Investigate Environmental Consequences of Hydropower Dams*, The Cornell Daily Sun, Oct 31, 2020.
- *Many Rivers, Too Many Dams*, The New York Times, Oct 2, 2020.
- *Every Place Under Threat*, The New York Times, Oct 2, 2020.
- *Big Red data: crunching numbers to fight COVID-19 and more*, Cornell Chronicle, Jun 17, 2020.
- *Merrill Scholars near and far honor their teachers, mentors*, Cornell Chronicle, May 21, 2020.
- *K-12 Education from Cornell Tech; Donald Greenberg; Anmol Kabra; Emin Gün Sirer*, Cornell CS News, May 4, 2020.
- *Cornell scientists amplify 'green' research at AAAS*, Cornell Chronicle, Feb 20, 2020.
- *IEEE calls for standards to combat climate change and protect kids in the age of AI*, VentureBeat, Feb 6, 2020.
- *Cornell, Nature Conservancy to study key climate projects*, Cornell Chronicle, Jan 15, 2020.
- *No. 4 on Top Ten "Coolest Science, Technology Advances"*, Cornell CS News, Jan 14, 2020.
- *Army releases top 10 list of coolest science, technology advances*, AerotechNews, Dec 30, 2019.
- *AI experts urge machine learning researchers to tackle climate change*, VentureBeat, Dec 16, 2019.
- *Carla Gomes Receives Research Excellence Award for Leadership in Innovative Research*, Cornell CS News, Dec 12, 2019.

- *A.I. in the Amazon; Cornell-Led Research Team Uses A.I. to Decrease Greenhouse Gas Emissions*, The Cornell Daily Sun, Nov 11, 2019.
- *AI helps shrink Amazon dams' greenhouse gas emissions*, Cornell Chronicle, Sep 19, 2019.
- *Crystal Phase Mapping with AI and ML in Pursuit of the Next Generation of Fuel Cells*, Cornell CS News, Sep 3, 2019.
- *Innovative AI system could help make Army fuel cells more efficient*, CCDC Army Research Laboratory, Aug 6, 2019.
- *Innovative AI system could help make fuel cells more efficient*, Cornell Chronicle, Jul 24, 2019.
- *A Tribute to the Women in Lab Coats, Behind the Microscopes and Computer Screens*, Cornell Daily Sun, Mar 8, 2019.
- *The Rockefeller Foundation Establishes Atlas AI - New Startup to Generate Actionable Intelligence on Global Development Challenges*, PR Newswire, Feb 6, 2019.
- *AI adjusts for gaps in citizen science data*, Cornell Chronicle, Jan 25, 2019.
- *Giving algorithms a sense of uncertainty could make them more ethical*, MIT Technology Review, Jan 18, 2019.
- *Learning from the big picture*, Nature Materials: News & Views, Nov 23, 2018.
- *NSF grants \$1.3M to Cornell, partners to hunt eelgrass disease*, Cornell Chronicle, Sep 25, 2018.
- *Recent PhD grad wins highest award for junior AI researchers*, Stanford Engineering, May 8, 2018.
- *ACM Recognizes 2017 Fellows for Making Transformative Contributions and Advancing Technology in the Digital Age: Carla Gomes*, Association for Computing Machinery, Dec 11, 2017.
- *AI for Discovering Clean Energy Materials*, Cornell Research, Oct 19, 2017.
- *CS Profs on Research Team to Receive \$7.5M Grant*, Cornell CIS, Aug 3, 2017.
- *Two groups both win \$7.5M to study AI, autonomous systems*, Cornell Chronicle, Jul 19, 2017.
- *Collaboration across (baseball) fields leads to Amazonian rivers*, Cornell Chronicle, 7/6/2017.
- *Phase Mapper wins Innovation Application Award at IAAI 2017*, Cornell CS News, Mar 16, 2017.
- *Combining Artificial Intelligence with Combinatorial X-ray Diffraction Enables Rapid Phase Mapping of New Materials*, Joint Center for Artificial Photosynthesis, Jan 23, 2017.
- *Computing cost-effective wildlife corridors*, Mongabay Wildtech, Nov 11, 2016.

- *Teaching robots to solve their own problems*, Cornell Chronicle, Nov 10, 2016.
- *When animals share, conservation is affordable*, Cornell Chronicle, Oct 27, 2016.
- *Wildlife migration routes for multiple species can link conservation reserves at lower cost*, Phys.org, Oct 21, 2016.
- *Economist, partners clinch USAID award for drought insurance*, Cornell Chronicle, Oct 12, 2016.
- *Materials to do anything under the sun*, Cornell Engineering Magazine, October 4, 2016.
- *Optimization technique identifies cost-effective biodiversity corridors*, ScienceDaily, September 27, 2016.
- *Students Come Together to Code, Solve Problems at the BigRed Hacks*, Cornell Sun, September 19, 2016.
- *Three ways artificial intelligence is helping to save the world*, Ensia, April 26, 2016.
- *Computers play a crucial role in preserving the Earth*, NSF Web site, April 20, 2016.
- *Computing and Information Science receives 10 million dollar grant*, Cornell Chronicle, March 29, 2016.
- *Cornellians illuminate world's scientific strides*, Cornell Chronicle, February 18, 2016.
- *Incentivizing citizen science discovery for a sustainable world*, Phys.org, February 13, 2016.
- *Cornellians to share scientific studies at AAAS meeting*, Cornell Chronicle, February 2, 2016.
- *Prof Awarded 10 million dollar Grant for Computational Sustainability Work*, Cornell Daily Sun, January 28, 2016.
- *Harnessing the power of computers to create a sustainable future*, Research News @ Vanderbilt, January 8, 2016.
- *NSF puts 30 million dollars behind software bug killing, synthetic biology and computational sustainability*, Network World, January 8, 2016.
- *NSF Commits 30 million dollars to Theoretical Computer Science, Synthetic Biology, Computational Sustainability*, Scientific Computing, January 7, 2016.
- *NSF commits 30 million dollars to expand the frontiers of computing*, NSF press release, January 7, 2016.
- *Computing and Information Science receives 10 million dollar grant*, Cornell Chronicle, January 7, 2016.
- *Cornell joins pleas for responsible AI research*, Cornell Chronicle, August 26, 2015.

- *Ecological corridor to preserve Ecuadorian Andes bears*, Cornell Chronicle, March 9, 2015.
- *App tracks Kenya's best places to graze*, Futurity Science and Technology, February 20, 2015.
- *Space-age technology points African herders in right direction*, Cornell Chronicle, February 15, 2015.
- *Forging a New Path: Working to Build the Perfect Wildlife Corridor*, Pacific Standard Nature and TEch, September 25, 2014.
- *Forging a New Path*, On Earth, September 15, 2014.
- *Interview, Planetary Skin, cross media project, Werden Wir die erde retten?*, A project by Roman Brinzanik, Tobias Hülswitt and Gunther Kreis, on behalf of the Federal Cultural Foundation and in cooperation with the Suhrkamp Verlag, 2012.

## Research Funding

Faculty Lead — The Eric and Wendy Schmidt AI in Science Postdoctoral Fellowship, Schmidt Futures (2022–2028).

Lead Principal Investigator — Collaborative Research: CompSustNet: Expanding the Horizons of Computational Sustainability, NSF Expedition: Award CCF-1522054 (2015–2020), \$10,000,000.

Lead Principal Investigator — Collaborative Research: Computational Sustainability: Computational Methods for a Sustainable Environment, Economy, and Society, NSF Expedition: Award CNS-0832782 (2008–2016), \$10,000,000.

Co-Principal Investigator (University of Minnesota subaward) — AI-CLIMATE (AI Institute for Climate-Land Interactions, Mitigation, Adaptation, Tradeoffs and Economy), NSF and USDA-NIFA: Award 2023-67021-39829 (2023–2028), \$20,000,000.

Co-Principal Investigator — Bridging Data-Intensive and Knowledge-Intensive Methods for Scientific and Mathematical Discovery, AFOSR: Award FA9550-23-1-0322 (2023–2026), \$1,200,000.

Principal Investigator — Extending the Power of AI for Scientific Discovery, AFOSR, DURIP: Award FA9550-23-1-0569 (2023–2024), \$826,225.

Co-Principal Investigator — Balancing Environmental and Nutritional Tradeoffs of Expanding Amazonian Aquaculture, Cornell Atkinson Center for Sustainability Academic Venture Fund (2021–2023).

Principal Investigator — AI for Discovery Assistant (AIDA): A Computational Platform for Accelerating Scientific Discovery with AI, AFOSR, DURIP (2021–2022), \$341,000.

Co-Principal Investigator — The Integration of Reasoning and Learning Strategies for Scientific Discovery, AFOSR (2020–2023), \$566,000.

Co-Principal Investigator — Strategies for Climate-Ready Fishing Communities: Optimal Fishing Portfolios for Changing Ocean Ecosystems, Joint Cornell Atkinson Center for Sustainability - The Nature Conservancy Innovation for Impact Fund (Joint Atkinson-TNC IIF) (2020–2021), \$200,000.

Principal Investigator (Caltech subaward) — Energy Materials Chemistry Integrating Theory, Experiment and Data Science, DOE: Award DE-SC0020383 (2019–2022), \$405,000.

Co-Principal Investigator — Convergence Accelerator Phase I (RAISE): Convergence Research to Meet Ocean Decision Challenges, NSF: Award OIA-1936950 (2019–2020), \$987,955.

Co-Principal Investigator — Collaborative Research: The role of a keystone pathogen in the geographic and local-scale ecology of eelgrass decline in the eastern Pacific, NSF: Award OCE-1829921 (2018–2021), \$1,302,932.

Principal Investigator — Accelerated Learning Lab: Capturing Deep Structure to Accelerate Materials Discovery, Toyota Research Institute (2017–2025), \$2,000,000.

Co-Principal Investigator — A Scientific Autonomous Reasoning Agent: Integrating Theory, Experiment Computation, Multidisciplinary University Research Initiative, AFOSR (2017–2022), \$7,500,000.

Principal Investigator — A Platform for Computational-and-Data-Intensive Methods for Large-Scale Intelligent Distributed Systems, ARO, DURIP (2017–2018), \$425,000.

Co-Principal Investigator — The Integration of Reasoning and Learning Strategies for Scientific Discovery, AFOSR (2017–2020), \$566,000.

Principal Investigator — UDiscoverIt: Integration of Computational Reasoning, Learning, and Crowd-Sourcing for Accelerating Materials Discovery, National Science Foundation INSPIRE Track 1: Award IIS-1344201 (2013–2017), \$699,986.

Principal Investigator — Crowd-Sourcing for Scientific Discovery, DOD-Army Research Office (ARO) Award W911-NF-14-1-0498 (2014–2017), \$600,000.

Principal Investigator — NSF Collaborative Project: Wireless Sensor Networks for Protecting Wildlife and Humans (with Ohio State and UCLA), CNS-1143651, National Science Foundation Collaborative Project (2011–2014), \$121,791.

Principal Investigator — Exploratory Research in Automated Computational Analysis of Inorganic Materials Libraries, National Science Foundation EAGER: Award IIS-1258330 (2013–2014), \$133,440.

Principal Investigator — The human and environmental impacts of migratory pastoralism in arid and semi-arid East Africa, Australian Development Research Awards Scheme (ADRAS): Collaborating with University of Sydney (2013–2015), \$694,226.

Principal Investigator — Computing research infrastructure for constraint optimization, machine learning, and dynamical models for computational sustainability, CNS-1059284, National Science Foundation (2011–2012), \$378,016.

Principal Investigator — Integrating Ecological and Social Data to Optimize Economic Decisions on Wildlife Corridors, US Forest Service, Rocky Mountain Research Station, 10-JV11221635-241 (2010–2015), \$60,613.

Principal Investigator — Bridging the Gap Between Theory and Practice: Structure and Randomization in Large Scale Combinatorial Search, Air Force Office of Scientific Research. Basic research FA9550-08-1-0196 (2008–2010), \$419,987.

Co-Principal Investigator — Extending the Reach of SAT Technology: Quantification, Counting, and Sampling, National Science Foundation, 713499 (2007–2010), \$405,000.

Principal Investigator — Computational Intelligence for Print Shop Workflows, University of Rochester (2007–2008), \$30,000.

Principal Investigator — Computational Intelligence for Print Shop Workflows, Kodak Eastman, Supplement 12 (2007–2008), \$170,000.

Principal Investigator — Intelligent Information Systems Institute, Air Force Office of Scientific Research, Basic research, FA9550-04-1-0151 (2004–2008), \$3,870,000.

Co-Principal Investigator — Boosting Reasoning Technologies Through Randomization, Structure Discovery, and Hybrid Strategies, DOD-DARPA/AFRL, FA8750-04-2-0216 (2004–2009), \$3,580,000.

Principal Investigator — Intelligent Information Systems Institute, Air Force Office of Scientific Research, Basic research, F49620-01-1-0076 (2000–2004), \$3,200,000.

Co-Principal Investigator — Controlling Computational Cost: Structure, Phase Transitions, and Randomization, DOD-DARPA/AFRL, F30602-00-2-0596 (2000–2003), \$550,000.

Co-Principal Investigator — Controlling Computational Cost: Structure, Phase Transitions, and Randomization, DOD-DARPA/AFRL, F30602-00-2-0530 (2000–2003), \$1,621,041.

Co-Principal Investigator — Principled Analysis & Synthesis of Agent Systems Using Tools from Statistical Physics. DARPA (2000–2003), \$650,000.

Co-Principal Investigator — Self-Configuring Wireless Transmission and Decentralized Data Processing for Generic Sensor Networks, DARPA, (with S. Wicker (PI), T. Fine, L. Tong, and V. Veeravalli (2000–2003), \$890,000.

Co-Principal Investigator — Cooperative Control in Uncertain, Adversarial Environments. Air Force Office of Scientific Research, (MURI) Principal Investigator J. Shamma, UCLA. Joint with UCLA, MIT, Caltech (2001–2006), Cornell portion: \$1,000,000.

Principal Investigator — Hybrid Approaches for Combinatorial Problems, DOD-DARPA/AFRL, F30602-99-1-0006 (1999–2002), \$260,688.

Principal Investigator — Integration of AI and OR for Mixed Initiative Continuous Planning and Scheduling, Air Force Office of Scientific Research (1996–2001), \$1,150,000.

Principal Investigator — Compute-Intensive Methods for Combinatorial Problems, DOD-Air Force Research Labs, F30602-99-1-0005 (1999–2001), \$395,817.

Principal Investigator — Compute-Intensive Methods for Combinatorial Problems, AFOSR, DURIP, F49620-99-1-0195 (1999–2000), \$158,076.

Principal Investigator — Compute-Intensive Methods for Combinatorial Problems, DOD - Air Force, Rome Laboratories, F30602-98-1-0008 (1998–1999), \$203,677.