Marta Kryven, Ph.D.

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Research Employment

2024 – **Assistant Professor**, Faculty of Computer Science, Department of Psychology & Neuroscience Dalhousie University, Canada
Director of Computation and Cognition Lab
Research interests: computational cognitive science; human-centered-AI; planning and representation learning; cognitive interpretability

2018 – 2023 **Postdoctoral Research Scientist**, MIT, Brain and Cognitive Sciences, USA
Advisor: Josh Tenenbaum
Research interests: computational cognitive science, planning, cognitive maps, social attribution, human-centered AI
Advised 5 graduate students, and 11 undergraduates

Education

2012 – 2017 **Ph.D., University of Waterloo** Computer Science.
Thesis title: *Attributed Intelligence.*
Research interests: computational models of perception, attention and social cognition

2017 **Visiting Scholar, Massachusetts Institute of Technology**
Advisor: Prof. Joshua Tenenbaum.

2015 **'Brains, Minds Machines', Summer School**, The Marine Biological Laboratory, Woods Hole

Teaching Fundamentals Certificate, Centre for Teaching Excellence, University of Waterloo

Employment in Industry

2008-2011 **Senior Software Engineer.** Newbay Software, Dublin, Ireland.

Publications (since 2020)

Articles

S. Dolek, R. Gonzales, X. Yu, W. T. Piriyakulkij, K. Ellis, and **M. Kryven**, "Reverse-engineering child-like causal learning via program induction and smc-s," *Advances in Neural Information Processing Systems (NeurIPS)*, 2025, Under review.

S. Dolek, M. Radovanovic, R. Gonzales, J. Sommerville, and **M. Kryven**, "Think outside the box: Making up causal hypotheses from unreliable evidence," *Proceedings of the Annual Meeting of the Cognitive Sciences Society*, vol. 47, 2025.

M. Geva-Sagiv, S. Jun, **M. Kryven**, J. Tenenbaum, E. D. Boorman, R. O'Reilly, J. J. Lin, I. Saez, and C. Ranganath, "Fronto-hippocampal synchronization in rapid spatial learning in humans," *Current Biology*, 2025, Under review.

M. Kryven, W. Cole, A. Curtis, and K. Ellis, "Cognitive maps are generative programs," *Proceedings of the Annual Meeting of the Cognitive Sciences Society*, 2025.

W. T. Piriyakulkij, Y. Liang, H. Tang, A. Weller, **M. Kryven**, and K. Ellis, "Poe-world: Compositional world modeling with products of programmatic experts," *Advances in Neural Information Processing Systems (NeurIPS)*, 2025, Under review.

J. Qin, A. Yang, Z. Xu, C. Wyeth, and **M. Kryven**, "Planning with generative cognitive maps," *Advances in Neural Information Processing Systems (NeurIPS)*, 2025, Under review.

X. Zeng, F. Rudzicz, and **M. Kryven**, "Social behavior and strategic adaptation in large language models," *Advances in Neural Information Processing Systems (Workshop)*, 2025.

M. Kryven, S. Yu, M. Kleiman-Weiner, T. Ullman, and J. Tenenbaum, "Approximate planning in spatial search," *PLOS Computational Biology*, vol. 20, no. 11, e1012582, 2024.

S. Acquaviva, Y. Pu, **M. Kryven**, T. Sechopoulos, C. Wong, G. Ecanow, M. Nye, M. Tessler, and J. Tenenbaum, "Communicating natural programs to humans and machines," *Advances in Neural Information Processing Systems*, vol. 35, pp. 3731–3743, 2022.

S. Sharma, A. Curtis, **M. Kryven**, J. Tenenbaum, and I. Fiete, "Map induction: Compositional spatial submap learning for efficient exploration in novel environments," *International Conference of Learning Representations*, 2022.

T. Shu, A. Magaro, **M. Kryven**, T. Ullman, and J. Tenenbaum, "Social attribution guides similarity judgment of abstract scenes," *Journal of Vision*, vol. 22, no. 14, pp. 3644–3644, 2022.

C. Bongiorno, Y. Zhou, **M. Kryven**, D. Theurel, A. Rizzo, P. Santi, J. Tenenbaum, and C. Ratti, "Vector-based pedestrian navigation in cities," *Nature Computational Science*, vol. 1, no. 10, pp. 678–685, 2021.

M. Kryven, T. D. Ullman, W. Cowan, and J. B. Tenenbaum, "Plans or outcomes: How do we attribute intelligence to others?" *Cognitive Science*, vol. 45, no. 9, pp. 13–41, 2021.

Y. Qian, **M. Kryven**, T. Gao, H. Joo, and J. Tenenbaum, "Modeling human intention inference in continuous 3d domains by inverse planning and body kinematics," *arXiv preprint arXiv:2112.00903*, 2021.

Y. Pu, K. Ellis, **M. Kryven**, J. Tenenbaum, and A. Solar-Lezama, "Program synthesis with pragmatic communication," *Advances in Neural Information Processing Systems*, vol. 33, pp. 13 249–13 259, 2020.

T. Shu, **M. Kryven**, T. D. Ullman, and J. Tenenbaum, "Adventures in flatland: Perceiving social interactions under physical dynamics.," *Proceedings of the Annual Meeting of the Cognitive Science Society*, 2020.

L. Tian, K. Ellis, **M. Kryven**, and J. Tenenbaum, "Learning abstract structure for drawing by efficient motor program induction," *Advances in Neural Information Processing Systems*, vol. 33, pp. 2686–2697, 2020.

Patents

M. Kryven, "Systems and methods for controlling autonomous robots using machine learning based planning," 10007674-1USPR, Feb. 2025.

Refereed Poster Abstracts

R. Gonzales and **M. Kryven**, "Music as programs: Discovery of musical structure via program induction," ISMIR (Workshop paper), 2025.

N. Vlavianos, T. Nagakura, and **M. Kryven**, "Human information seeking in architectural spaces simulated in virtual reality," in *Proceedings of the Annual Meeting of the Cognitive Science Society*, vol. 44, 2022.

G. Ecanow, C. Wong, S. Acquaviva, Y. Pu, **M. Kryven**, and J. Tenenbaum, "Core knowledge objects in reasoning and language use for highly abstract inductive tasks," in *Proceedings of the Annual Meeting of the Cognitive Science Society*, vol. 43, 2021.

Z. Yang, **M. Kryven**, H. Shrobe, and J. Tenenbaum, "Modeling human planning in a life-like search-and-rescue mission," in *Proceedings of the Annual Meeting of the Cognitive Science Society*, vol. 43, 2021.

M. Kryven, S. Croom, B. J. Scholl, and J. Tenenbaum, "Look out, it's going to fall!: Does physical instability capture attention and lead to distraction?" In *Proceedings of the Annual Meeting of the Cognitive Science Society*, 2019, p. 3500.

Selected Invited Talks

2025 Reverse-engineering real-world priors *Dalhaousie University, Department Seminar, Psychology and Neuroscience*

2024 Modeling cognition in real world *University of Toronto, Department of Psychology*
Modeling cognition in real world *University of Waterloo, Department of Psychology*
Cognitively-inspired AI *Dalhouise University, Department of Computer Science*
Cognitively-inspired AI *University of Waterloo, Department of Computer Science*
Cognitively-inspired AI *Leiden University, Computer Science Institute*

Selected Invited Talks (continued)

2021	Modeling human planning under uncertainty, *Harvard, Department of Neuroscience* Modeling human planning under uncertainty, *MIT, Department of Brain and Cognitive Sciences*
2020	Probabilistic Programming, *Lecture at CBMM Summer School, Woods Hole*
2019	Plan-generation and social attribution, *Boston College, Department of Psychology* Plan-generation and social attribution, *Harvard, Department of Neuroscience* Research Methods, *Lecture at CBMM Summer School, Woods Hole*
2018	Planning under uncertainty. *Yale University, Department of Neuroscience* Decision-making experiments, *Invited talk at MIT Museum* Perception as Inference, *Invited talk at MIT Museum* Perception as inference - what visual illusions tell us about the brain. Guest lecture, *Suffolk University, The New England School of Art and Design* Planning under uncertainty. *MIT, CSAIL*
2017	Value Based Decision-Making under Uncertainty. *MIT, Department of Brain and Cognitive Sciences*
2016	What do people mean by intelligence? *Future of Humanity Institute, Oxford*

Teaching

2025	Instructor: Computational Cognitive Science (graduate), Machine Learning (3-d year undergraduate), Data Science (3-d year undergraduate)
2019-2022	Teaching Assistant, MIT: Computational Cognitive Science.
2019-2020	Teaching Assistant, Marine Biological Laboratory: Brains, Minds and Machines Summer School
2012-2017	Teaching Assistant, University of Waterloo: Societal Implications of Computing, Introduction to Artificial Intelligence, Real-Time programming, Introduction to Computer Graphics

Mentorship

2025	PhD: Cole Wyeth (University of Waterloo), Robie Gonzales, Xijie Zheng, Xuemin Yu (Dalhousie University) MSc: Simal Dolek, Max Mascini (Dalhousie University), Ziheng Xu (Cornell) Undergraduate: Jeffrey Qin, Albert Yang (University of Waterloo), Akshit Sinh (IIT)
2018-2022	Yingdong Quian (MSc, now at Google), Suhyoun Yu (PhD, now at Amazon), Zhutian Yang (MSc, now PhD student at MIT), Nik Vlavianos (PhD, now startup CEO), Sughanda Sharma (PhD, now at Nvidia)

Awards

2025	NSERC Discovery Grant $180 000
	NSERC Discovery New Investigator Supplement $12 500
2019	MIT CBMM Research Award $56 000
2018	'Beyond the Ivory Tower' Writing for The Public Workshop, Northwestern University $2100
2017	Doctoral Thesis Award, University of Waterloo, $5000, 3 awarded annually.
2016	Women in Machine Learning Grant $2000
	Cheriton Scholarship, University of Waterloo, 9 awarded annually. $20 000
2015	Distinguished Teaching Assistant Award, University of Waterloo, $500
2014	Graduate Excellence Award in Computer Science, University of Waterloo, $10 000

Service

Organizer:	Computation and Cognition 2025 (`https://computationandcognition.github.io`) Atlantic AI Symposium 2025 (organizing committee) Undergraduate Certificate in Computation and Cognition (Dalhousie, 2025) Atlantic AI Institute (board and organizing committee)
Grant Leadership:	Nominated Principal Investigator, NFRF Explorations 2026 grant *Computational insights into cognitive failures in humans and machines* Nominated Principal Investigator, NFRF Transformations 2026 grant *Neuro-symbolic Computational Models for Musical Creativity, Cultural Transmission, and Human-AI Collaboration*
Journal Reviewer:	Nature Computational Science, Nature Scientific reports, Cell, Open Mind, Neural Computation, PNAS, Cognition, Cognitive Science, PLOS Computational Biology
Conference Reviewer:	AAAI 2025 (4), Neural Information Processing Systems 2025(5), 2024(6), 2023(6), 2022(3), 2021(5), 2017(3), Cognitive Sciences Society 2016-2025 (5 each year), International Conference on Learning Representations 2025(5), 2024(2), 2023(3), 2021(2), International Conference on Machine Learning 2025 (5), 2024 (5), International Conference on Robotics and Automation 2021(2)
Outreach	Lecturer, Exhibit designer, MIT Museum (2018-2020)

August 2025