

# Branton DeMoss

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<b>Education</b>	<i>DPhil Candidate in Machine Learning</i> University of Oxford	2021-25 (expected)
	<i>BA Mathematics and Physics</i> University of Colorado Boulder	2018
	<i>Visitor Mathematical and Theoretical Physics</i> University of Oxford	2016-17
<b>Experience</b>	Mathematical Institute, University of Oxford <i>Postdoctoral Research Associate</i> <ul style="list-style-type: none"><li>• Research on the mathematical and computational foundations of AI.</li></ul>	2025-
	Oxford Robotics Institute <i>Graduate Student Researcher</i> <ul style="list-style-type: none"><li>• Research in complexity, generalization, reinforcement learning, world models.</li></ul>	2021-25
	The Collaboratory <i>Co-founder; Chief Science Officer</i> <ul style="list-style-type: none"><li>• Deep learning on language and graphs for knowledge curation.</li><li>• Led product strategy, design, and ML R&amp;D.</li></ul>	2020-23
	Comma.ai <i>ML Research Intern</i> <ul style="list-style-type: none"><li>• Reinforcement learning for self-driving cars.</li></ul>	2020
	Front Range Geosciences <i>Machine Learning Engineer</i> <ul style="list-style-type: none"><li>• Sole dev on ML system for seismic data, sold to multinational co.</li></ul>	2017-20
	Center for Theory of Quantum Matter <i>Research Assistant</i> <ul style="list-style-type: none"><li>• Research on quantum many-body localization.</li></ul>	2017
	Mathematics Department, CU Boulder <i>Research Assistant</i> <ul style="list-style-type: none"><li>• Knot theory and topological quantum field theory.</li></ul>	2016
	High Energy Particle Physics Group, Physics Department, CU Boulder <i>Research Assistant</i> <ul style="list-style-type: none"><li>• High performance Monte Carlo simulations (C++) for DUNE experiment.</li></ul>	2014-15
<b>Publications</b>	<i>The Complexity Dynamics of Grokking</i> Physica D: Nonlinear Phenomena	2025

	<i>The Complexity Dynamics of Double Descent</i> Work in progress. I explain double descent in neural networks from a complexity perspective.	2025
	<i>LUMOS: Language-Conditioned Imitation Learning with World Models</i> ICRA 2025	2024
	<i>DITTO: Offline Imitation Learning with World Models</i> Under submission to NeurIPS arXiv:2302.03086	2023
	<i>Combining physics and deep learning to automatically pick first breaks in the Permian Basin</i> First International Meeting for Applied Geoscience & Energy	2021
	<i>Ein Liebesbrief an KataGo</i> Deutsche Go Zeitung, Ausgabe 4/2020	2020
	<i>Love Letter to KataGo, or: Go AI Past, Present, and Future</i> American Go E-Journal	2020
	<i>DeepTrace: A breakthrough application of deep learning to automate first break picking</i> SEG 2019 Lenovo Thought Leadership Series	2019
	<i>Topology and Knot Theory</i> Course notes for CU Boulder special topics course: “Topology, Knot Theory, and their applications in Physics and Chemistry”	2016
	<i>Secondary Particle Showers from Hadron Absorber Interactions</i> Deep Underground Neutrino Experiment (DUNE) Collaboration Documents	2016
<b>Teaching</b>	<i>Physics of Information and Complexity</i> Received highest possible marks for teaching performance. Oxford, HT 24	2024
	<i>Philosophy of Emergence</i> Received highest possible marks for teaching performance. Oxford, HT 24	2024
	<i>Topics in Reinforcement Learning</i> Received highest possible marks for teaching performance. Oxford, MT 23	2023
	<i>Rocket League Behaviour Cloning from Unlabelled Data</i> Supervised Master's Thesis, Oxford Student obtained highest marks, and secured funded DPhil position in Oxford.	2023
<b>Talks</b>	<i>2<sup>nd</sup> Symposium on Algorithmic Information Theory and Machine Learning</i> Talk on my discovery of complexity phase transitions in learning systems. Link.	2025
	<i>ICRA 2025, Robot Foundation Models Session</i>	2025

Talk on our work LUMOS, addressing reinforcement learning in world models.

*Harvard/Tufts, Levin Group* 2025  
Invited talk on complexity dynamics to Michael Levin's computational biology group.  
[Link](#).

*Oxford, Department of Physics* 2024  
Invited talk on complexity dynamics to Ard Louis's research group.

*Oxford, Department of Statistics* 2024  
Invited talk on complexity and generalization to the RainML group.

Awards		
	<i>AWS Lighthouse Scholarship (fully funded PhD)</i>	Oxford, 2021
	<i>Stribic-Martin Scholarship (\$10k for top mathematics undergrad)</i>	Boulder, 2017
	<i>UROP Fellowship (\$3k summer research grant)</i>	Boulder, 2017
	<i>Dawkins Fund Award (Exeter College)</i>	Oxford, 2016
	<i>Gilman Scholarship (\$5k US Dept of State)</i>	Oxford, 2016
	<i>Esteemed Scholar Award (\$7k/yr for top enrolling undergrads)</i>	Boulder, 2014

**References**  
*Prof. Nick Hawes*  
Professor of AI and Robotics, Oxford  
Director, Oxford Robotics Institute  
[nickh@robots.ox.ac.uk](mailto:nickh@robots.ox.ac.uk)

*Prof. Ingmar Posner*  
Professor of Applied AI, Oxford  
Deputy Director, Oxford Robotics Institute  
[ingmar@robots.ox.ac.uk](mailto:ingmar@robots.ox.ac.uk)

*Prof. Jakob Foerster*  
Associate Professor, Oxford  
[jakob@robots.ox.ac.uk](mailto:jakob@robots.ox.ac.uk)

*Prof. Jared Tanner*  
Professor of the Mathematics of Information, Oxford  
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