Owen M. Dugan

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Education

Ph.D. Computer Science, Stanford University	TBD	2024 - Present
B.S. Physics, MIT	5.0/5.0	2021 - 2024

Awards & Accomplishments

Hertz Fellow, Fannie and John Hertz Foundation	2024
Knight-Hennessy Scholar, Stanford University Knight-Hennessy Scholarship	2024
NSF Graduate Research Fellow, National Science Foundation	2024
Sigma Pi Sigma Member, Sigma Pi Sigma Society	2024
Phi Beta Kappa Member, Phi Beta Kappa Society	2024
Outstanding UROP (Undergraduate Research) Award, MIT School of Science	2023
U.S. Patent Nos. 11,688,045 and 11,756,304, US Patent & Trademark Office	2023
William Lowell Putnam Mathematical Competition, 164th place (top 5%)	2022
MIT Advanced Standing Examinations, Received credit for 8 MIT classes	2021
US Presidential Scholar, US Department of Education	2021
Neo Scholar, Neo Venture Capital Firm	2021
Davidson Fellows Scholar, Davidson Institute	2021
STS Scholar, Regeneron Science Talent Search	2020
ISEF Finalist, International Science and Engineering Fair	2020
DoD Scholar, Department of Defense	2020
RSI Scholar, Research Science Institute	2020
SAT, 1600 (Perfect Score)	2020
National Merit Scholar, National Merit Scholarship Corporation	2019
Caroline D. Bradley Scholar, Institute for Educational Advancement	2016

Publications

Published

11) **Owen Dugan**, Donato Manuel Jimenez Beneto, Charlotte Loh, Zhuo Chen, Rumen Dangovski, Marin Soljačić
OccamLLM: Fast and Exact Language Model Arithmetic in a Single Step
arXiv:2406.06576

10) Zhuo Chen, Rumen Dangovski, Charlotte Loh, **Owen Dugan**, Di Luo, Marin Soljačić
QuanTA: Efficient High-Rank Fine-Tuning of LLMs with Quantum-Informed Tensor Adaptation
arXiv:2406.00132

9) **Owen Dugan**
Machine Learning for Physics: from Symbolic Regression to Quantum Simulation
MIT Undergraduate Physics Thesis, 2024. Thesis Link.

8) **Owen Dugan**, Peter Lu, Rumen Dangovski, Di Luo, Marin Soljačić
Q-Flow: Generative Modeling for Differential Equations of Open Quantum Dynamics with Normalizing Flows
Proceedings of the 40th International Conference on Machine Learning, Honolulu, Hawaii. PMLR 202, 2023.
arXiv:2302.12235

7) **Owen Dugan**, Rumen Dangovski, Allan Costa, Samuel Kim, Pawan Goyal, Joseph Jacobson, Marin Soljačić
OccamNet: A Fast Neural Model for Symbolic Regression at Scale
arXiv:2007.10784

6) Julia Balla, Sihao Huang, **Owen Dugan**, Rumen Dangovski, Marin Soljačić
AI-Assisted Discovery of Quantitative and Formal Models in Social Science
arXiv:2210.00563

5) **Owen Dugan**
QiskiFT: Quantum Error Correction and Quantum Fault Tolerance Development Kit
Documentation

4) **Owen Dugan**
Astronomy Will Not Trail Off: Novel Methods for Removing Satellite Trails from Celestial Images
Journal of the American Association of Variable Star Observers, vol. 48, no. 2, p. 262, 2020. (Abstract only.)

3) Peyton Robertson, Connor Espenshade, Jay Sarva, **Owen Dugan**, Kalée Tock
An Automated Approach to Modeling Jupiter's Synchrotron Radiation from Radio Telescope Observations
Astronomy Theory, Observations and Methods, vol. 1, no. 1, pp. 24-33, 2020.

2) **Owen Dugan**, Thomas Robinson, Finnian Carmeci, Kalée Tock
CCD Measurements and Reclassification of WDS 07106 +1543 to an Optical Double
Journal of Double Star Observations, vol. 15, no. 1, pp. 119–129, 2019.

1) **Owen Dugan**, James Krasner
Soup, Bones, and Shakespeare: Literary Authorship and Allusion in Middle-earth
Mythlore, vol. 40, no. 2, pp. 105-120, 2022.

In Preparation

6) **Owen Dugan**, Gopal Goel, Hong Liu
Effective Field Theory for Dissipative Superfluid Hydrodynamics

5) **Owen Dugan**, Zhuo Chen, Peter Lu, Rumen Dangovski, Di Luo, Marin Soljačić
Q-Function and Wigner Function Quantum Tomography

4) **Owen Dugan**, Varun Hariprasad, Rumen Dangovski, Marin Soljačić
Language Modeling with Linear Recurrences

3) Jerry Liu, Jessica Grogan, **Owen Dugan**, Simran Arora, Atri Rudra, Christopher Re
Steps Toward High Precision Machine Learning

2) Viggo Moro, **Owen Dugan**, Rumen Dangovski, Momchil Tomov, Marin Soljačić, Sam Gershman
Applications of Machine Learning to Neuroscience

1) Eegan Ram, Zhuo Chen, **Owen Dugan**, Rumen Dangovski, Di Luo, Marin Soljačić
Quantum Simulation with Reinforcement Learning

Presentations

6) Q-Flow: Generative Modeling for Differential Equations of Open Quantum Dynamics with Normalizing Flows *American Physical Society (APS) March Meeting*	March 2024
5) Q-Flow: Generative Modeling for Differential Equations of Open Quantum Dynamics with Normalizing Flows *International Conference on Machine Learning*	July 2023
4) OccamNet: A Feed-Forward Neural Model for Symbolic Regression *MIT Conference on Mechanistic Interpretability*	May 2023
3) Q-Flow: Generative Modeling for Differential Equations of Open Quantum Dynamics with Normalizing Flows *Institute for AI and Fundamental Interactions – External Advisory Board Review*	May 2023
2) Q-Flow: Generative Modeling for Differential Equations of Open Quantum Dynamics with Normalizing Flows *Institute for AI and Fundamental Interactions – Mini Symposium*	April 2023
1) Astronomy Will Not Trail Off: Novel Methods for Removing Satellite Trails from Celestial Images *Joint Meeting of the Society for Astronomical Sciences (SAS) and the American Association of Variable Star Observers (AAVSO 108th Spring Meeting)*	May 2020

Relevant Coursework

Physics

Graduate Level: Quantum Theory, Quantum Field Theory 1 & 2, Statistical Mechanics, Solid-State Physics.
Undergraduate Level: Quantum Computing, Classical Mechanics, Experimental Physics, Physics Thesis.

Mathematics

Undergraduate Level: Calculus, Multivariable Calculus, Counting and Probability 1 & 2, Number Theory 1 & 2, Linear Algebra, Differential Equations, Real Analysis, Complex Analysis, Abstract Algebra 1 & 2.

Computer science

Graduate Level: Reinforcement Learning.
Undergraduate Level: Algorithms 1 & 2, Automata Theory & Decidability, Computer Vision.

Economics

Undergraduate Level: Microeconomics, Macroeconomics, Psychology and Economics.

Computer Science Skills

Python, Java, Mathematica, Swift, Dart; PyTorch, JAX, NumPy, SkLearn, Pandas; Unix, Linux; LaTeX.

Teaching and Mentoring

IAIFI Summer School and Workshop Committee Member	
– invited by the Institute for Artificial Intelligence and Fundamental Interactions	2023 – Present
Lecture Transcriber for Quantum Field Theory 1	
– selected by MIT Physics department	
– published on MIT OpenCourseWare	
– ocw.mit.edu/courses/8-323-relativistic-quantum-field-theory-i-spring-2023	2023 – 2024
Tutor for Graduate Quantum Theory 1 – selected by MIT Physics department	2023
Research Mentor at the Research Science Institute – mentor for three students	2023
Teaching Assistant for Six Classes – Stanford Online High School	2018 – 2021
Peer Tutor for Ten Classes – Stanford Online High School	2018 – 2021

Leadership, Service, and Outreach

Cofounder, Stanford Online High School Advanced Math Theoretical Physics Club	2019 – 2021
Instructor, RSHM Life Center Robotics Program	2015 – 2021
Leader, RSHM Life Center Coding Program	2014 – 2015