# Owen M. Dugan

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## Education

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| **B.S. Physics**, MIT, Cambridge, MA. Unweighted GPA 5.0/5.0 | May 2024 |
| **High School**, Dugan Homeschool, Sleepy Hollow, NY. Weighted GPA 5.66/4.0 | May 2021 |

## Awards & Accomplishments

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| **Knight-Hennessy Scholars Finalist**, Stanford University Knight-Hennessy Scholarship | 2024 |
| **Hertz Fellowship Finalist**, Fannie and John Hertz Foundation | 2024 |
| **Talentplace Network Member**, Andreessen Horowitz | 2023 |
| **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 |
| **William Lowell Putnam Mathematical Competition**, 329th place (top 12%) | 2021 |
| **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

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

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

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

5) **Owen Dugan**, Varun Hariprasad, Rumen Dangovski, Marin Soljačić
*Efficient and Performant Language Modeling with Linear Recurrences*

4) **Owen Dugan**, Georgia Karagiorgi
*Determination of the Expected Neutrino Signal from Kilonovae in the Deep Underground Neutrino Experiment Using Data from Simulations Employing M1 and Monte Carlo Schemes*

3) Rayhan Tanudjaja, **Owen Dugan**, Rumen Dangovski, Marin Soljačić
*Symbolic Regression through Pretrained Transformers*

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

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| 6) Q-Flow: Generative Modeling for Differential Equations of Open Quantum Dynamics with Normalizing Flows<br>*American Physical Society (APS) March Meeting* | March 2024 |
| 5) Q-Flow: Generative Modeling for Differential Equations of Open Quantum Dynamics with Normalizing Flows<br>*International Conference on Machine Learning* | July 2023 |
| 4) OccamNet: A Feed-Forward Neural Model for Symbolic Regression<br>*MIT Conference on Mechanistic Interpretability* | May 2023 |
| 3) Q-Flow: Generative Modeling for Differential Equations of Open Quantum Dynamics with Normalizing Flows<br>*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<br>*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<br>*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

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| **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

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| **Lector,** MIT Catholic Community | 2023 – Present |
| **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 |