

# Derek Onken

*Philomath, Polymath, BS in Math*

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## CURRENT RESEARCH INTERESTS

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I view myself as a data scientist working in the interdisciplinary overlap of mathematics, computer science, and statistics. I value leveraging theory from these fields to develop models for practical applications that mostly fall in the physical and biological realms.

### Machine Learning for Pharmaceutical Applications

- Developing and deploying machine learning tools for use in clinical trials
- Leveraging neural networks to increase pharmaceutical product manufacturing yield
- Applying machine learning for accelerating drug development

## EDUCATION

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### Ph.D. in Computer Science & Informatics, Emory University

*Advisor:* Lars Ruthotto

*Dissertation:* Optimal Control Approaches for Designing Neural Ordinary Differential Equations

### M.S. in Computer Science, Emory University

### B.S. in Mathematics and Computer Science, Honors College, University of Georgia

*Minors:* Physics and Classical Culture

*Honors:* Graduated High Honors with Capstone

*Advisor:* Juan B. Gutierrez

## COMPUTATIONAL SKILLS

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Comfortable in PYTHON, PYTORCH, MATLAB, SQL

Familiar with AWS, Julià, TENSORFLOW, C, C++, JAVA, R

Exposed to MPI, x86, OPENCL, CUDA, HTML, MATHEMATICA

## WORK EXPERIENCE

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<b>Sr. Research Scientist</b> , Eli Lilly, Advanced Analytics and Data Science (AADS)	2023-present
<b>Research Scientist</b> , Eli Lilly, Advanced Analytics and Data Science	2021-2023
<b>Data Scientist Intern</b> , UnitedHealth Group, R&D	2019, 2020
<b>High Performance Computing Intern</b> , Air Force Research Labs, UES Inc.	2018
<b>Teaching Assistant</b> , Emory University	2016-2018
<b>Tutor</b> , University of Georgia Athletic Department	2016
<b>Undergraduate Researcher</b> , University of Georgia Mathematics Department	2014
<b>Piano Teacher</b>	2013-2014
<b>Summer League Swim Coach</b>	2009, 2010

## LEADERSHIP & SERVICE

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**External Reviewer** for several entities, including:

- Mathematical Sciences of Machine Learning Conference

- [Cell Patterns](#)
- [Springer International Journal of Dynamics and Control](#)
- [IEEE Transactions on Neural Networks and Learning Systems](#)

<b>Representative</b>	Stadium Village Business Association	2024-present
<b>Mentor</b>	Polygence	2021-2024
<b>Member</b>	Emory Society for Industrial and Applied Mathematics (SIAM)	2016-2021
<b>Volunteer</b>	Atlanta Science Festival	2016-2019
<b>University of Georgia Men's Swimming &amp; Diving Team</b>		2011-2015
– Captain & NCAA Division I Varsity Athlete		
– Competed at the Southeastern Conference Championships		
– Qualified and competed at the 2016 U.S. Olympic Trials		
– NCAA Academic All-American Honorable Mention	2013, 2014, 2015	
– Awarded Dick Bestwick Scholar-Athlete Award, UGA Athletic Dept	2015	
– Awarded Ramsey Scholarship for Academic and Athletic Excellence	2014-2015	
– Awarded Peter O'Sullivan Hardest Worker Award, UGA Men's Swimming	2014, 2015	
– Awarded Alex Patterson Scholar-Athlete Award , UGA Men's Swimming	2014	
– College Swim Coaches of America Association Scholar All-American Team	2013, 2014, 2015	
<b>Student-Athlete Advisory Committee</b>	Team Representative	2014-2015

## HONORS & AWARDS

Eli Lilly Chief Information & Digital Officer Finalist (Cross-Functional, Rising Star)	2024
Eli Lilly Chief Information & Digital Officer Finalist (Immunology, Rising Star)	2022
Eli Lilly Chief Information & Digital Officer Award (Manufacturing)	2021
Eli Lilly Top 100 Innovator Award (Immunology, x2)	2021,2023
Eli Lilly Innovator Award (x6)	2021-2023
Phi Beta Kappa	2015
University of Georgia Presidential Scholar	2014
University of Georgia Athletic Director's Honor Roll	2012-2015
Southeastern Conference Academic Honor Roll	2012-2015
University of Georgia Dean's List	2012-2015

## PUBLICATIONS

[Title](#) is a clickable link to access manuscript pdf.

For conferences and posters, presenter is underlined.

\* denotes co-first authors

### *Preprints*

[P.1] **D. Onken**, L. Ruthotto

[Discretize-Optimize vs. Optimize-Discretize for Time-Series Regression and Continuous Normalizing Flows](#)

arXiv:2005.13420, 2020

| [code](#) | [videos](#) |

## Peer-Reviewed Journal Articles

- [J.3] I. Morales-Ivorra, D. Taverner, O. Codina, S. Castell, P. Fischer, **D. Onken**, P. Martínez-Osuna, C. Battouï, M.A. Marín-López  
[External Validation of the Machine Learning-Based Thermographic Indices for Rheumatoid Arthritis: A Prospective Longitudinal Study](#)  
*Diagnostics* 14(13), 1394, Jun 2024  
| [doi](#) |
- [J.2] **D. Onken**, L. Nurbekyan, X. Li, S. W. Fung, S. Osher, L. Ruthotto  
[A Neural Network Approach for High-Dimensional Optimal Control Applied to Multi-Agent Path Finding](#)  
*IEEE Transactions on Control Systems Technology* 31(1), pp. 235-251, Jan 2023  
| [code](#) | [videos](#) | [doi](#) |
- [J.1] Y. Vigfusson\*, T. Karlsson\*, **D. Onken\***, *et al.*  
[Cell-Phone Traces Reveal Infection-Associated Behavioral Change](#)  
*Proceedings of the National Academy of Sciences (PNAS)* 118(6), e2005241118, Feb 2021  
| [code](#) | [doi](#) |

## Peer-Reviewed Conference Proceedings

- [C.2] **D. Onken**, L. Nurbekyan, X. Li, S. W. Fung, S. Osher, L. Ruthotto  
[A Neural Network Approach Applied to Multi-Agent Optimal Control](#)  
European Control Conference (ECC), 1036–1041, 2021  
| [code](#) | [videos](#) | [doi](#) | [talk slides](#) | [talk recording](#) |
- [C.1] **D. Onken**, S. W. Fung, X. Li, L. Ruthotto  
[OT-Flow: Fast and Accurate Continuous Normalizing Flows via Optimal Transport.](#)  
AAAI Conference on Artificial Intelligence, 35(10), 9223-9232, 2021  
| [code](#) | [doi](#) | [talk slides](#) | [talk recording](#) | [poster](#) |

## PEER-REVIEWED POSTER AND ORAL PRESENTATIONS

- [R.6] C. Battouï, P. Brodskiy, K. Gottlieb, M. Haft-Javaherian, W. Eastman, J. Lehrer, E. Yu, **D. Onken**, D. Thomason, W. Reinisch, D. Colucci, S. Baxi  
[Validating Calibration of an Artificial Intelligence Assessment of Endoscopic Severity in Ulcerative Colitis](#)  
American College of Gastroenterology Annual Meeting (ACG), Oct 2025
- [R.5] C. Battouï, P. Brodskiy, K. Gottlieb, M. Haft-Javaherian, W. Eastman, J. Lehrer, E. Yu, **D. Onken**, D. Thomason, D. Colucci, W. Reinisch, S. Baxi  
[Machine Learning Assessment of Endoscopic Severity in Ulcerative Colitis Trials: Model Evaluation Against the 2+1 Reference Standard](#)  
European Crohn's and Colitis Organisation (ECCO), Jan 2025
- [R.4] C. Battouï, P. Brodskiy, K. Gottlieb, M. Haft-Javaherian, W. Eastman, J. Lehrer, E. Yu, **D. Onken**, D. Thomason, D. Colucci, W. Reinisch, S. Baxi  
[Application of a Machine Learning Model in the 2+1 Central Reading Paradigm to Assess Endoscopic Severity in Ulcerative Colitis Trials](#)  
European Crohn's and Colitis Organisation (ECCO), Jan 2025
- [R.3] P. Shannon, **D. Onken**, K. Gottlieb, S. Morton, A. Fischer, W. McFalda, M. Feely, N. Rance, A. Vadhariya, W. N. Malatestinic, A. Spizuoco

The Capture of Fingernail and Scalp Psoriasis Pictures Through a Mobile Application in a Real-World Ixekizumab Observation Study

Maui Derm, Jan 2024

- [R.2] **D. Onken**, S. W. Fung, X. Li, L. Ruthotto  
Normalizing Flows Via Mean Field Games and Hamilton-Jacobi-Bellman Equations  
SIAM/CAIMS Annual Meeting, Jul 2020
- [R.1] **D. Onken**, R. Jennings, S. Garth, E. Haber, E. Treister, S. Novikov, L. Ruthotto  
Using PDE-Based Neural Networks for Classifying 3-D LDCT Images for Lung Cancer Detection  
IPAM Deep Learning for Medical Applications, Jan 2020

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## INVITED TALKS

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*Digital Strategies for Improving Recruitment and Diversity in Clinical Trials*, presented at

- [T.6] Understanding Priorities for Use of Digital Health Technologies, FDA and Duke Margolis Center for Health Policy [Virtual Public Meeting](#), Mar 2023  
| [slides](#) | [recording](#) | presented by [Klaus Gottlieb](#)

*A Neural Network Approach for High-Dimensional Optimal Control*, presented at

- [T.5] Applied Mathematics and Statistics Colloquium, Colorado School of Mines, Oct 2021  
| [slides](#) |
- [T.4] Optimal Transport and Mean Field Games Seminar, University of South Carolina, Mar 2021  
| [slides](#) |
- [T.3] Applied Mathematics Seminar, UCLA, Mar 2021  
| [slides](#) |
- [T.2] Virtual Informal Systems Seminar (VISS) at Centre for Intelligent Machines (CIM) at McGill and the Groupe d'études et de Recherche en Analyse des Décisions (GERAD), Feb 2021  
| [slides](#) | [recording](#) |

*Efficient and Accurate Discretize-Optimize Approaches for Training Deep Residual Networks*,  
presented at

- [T.1] SIAM Mathematics of Data Science, Jun 2020  
| [slides](#) |

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## SELECTED PRESENTATIONS & POSTERS

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- [14] *poster*, Histology and Endoscopy AI, *Lilly: Data Science Summit*, Oct 2025
- [13] *talk*, Clinical Imaging, *Lilly AADS: Winning with AI Symposium*, Mar 2023
- [12] *demo*, Utilizing Amazon Web Services EC2 Bursting in High-Performance Computing environment, *Lilly AADS Tutorial*, Dec 2022
- [11] *talk*, Deep Learning for Manufacturing, *Game-Changers: Lilly Board of Directors*, Oct 2022
- [10] *talk*, Optimal Transport Primer, *Lilly AADS ML/AI Team Meeting*, Sep 2022
- [9] *demo*, Training Neural Networks in Amazon Web Services, *Lilly Technical Seminar Series*, Jun 2022

- [8] *talk*, Deep Learning Primer: The Truth Behind the Buzzword, *Lilly Technical Seminar Series*, Mar 2022
- [7] *talk*, Image Transformers, *Lilly AADS Image Capability Meeting*, Aug 2021
- [6] *talk*, Image Classification For Lung Cancer Via Neural Networks Based On Partial Differential Equations, *UnitedHealth Group Internship Presentation*, Aug 2019
- [5] *talk*, PDE-based Neural Networks, *UnitedHealth Group Brown Bag Lecture Series*, Jul 2019
- [4] *talk*, [Applying Higher-Order Runge-Kutta Methods To Neural Networks](#), *Emory Scientific Computing Seminar*, Apr 2019
- [3] *poster*, [Applying Higher-Order Runge-Kutta Methods To Neural Networks](#), *Georgia Scientific Computing Symposium*, Feb 2019
- [2] *poster & talk*, Cell Segmentation via Convolutional Neural Networks, *High Performance Computing and Modernization Program*, Aug 2018
- [1] *poster*, [Tracking Behavioral Alterations via Cell Phone Data](#), *Amazon Graduate Research Symposium*, Oct 2017