Derek Onken

https://derekonken.com/

Philomath, Polymath, BS in Math

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Current Research Interests

I view myself as a data scientist working in the interdisciplinary overlap of mathematics, computer science, and statistics. I value using the 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

Ph.D. in Computer Science & Informatics, Emory University
Advisor: Lars Ruthotto
Research: 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

Comfortable in	Python, PyTorch, Matlab, SQL, Java
Familiar with	Julia, TensorFlow, `C`, `C++`, R
Exposed to	MPI, x86, OpenCL, CUDA, HTML, Mathematica

Work Experience

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

Leadership & Service

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*

Mentor Polygence 2021-2022
Member Emory Society for Industrial and Applied Mathematics (SIAM) 2016-2021
Volunteer Atlanta Science Festival 2016-2019
University of Georgia Men's Swimming & Diving Team 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

Student-Athlete Advisory Committee Team Representative 2014-2015

Honors & Awards

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) 2021
Eli Lilly Innovator Award (x5) 2021,2022
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.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, June 2022
| 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), Feb 2021, 118 (6) e2005241118
| 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 | url | talk slides | talk recording | poster |

Invited Talks

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 |

Peer-Reviewed Poster Presentations

[R.2] **D. Onken**, S. W. Fung, X. Li, L. Ruthotto
Normalizing Flows Via Mean Field Games and Hamilton-Jacobi-Bellman Equations
SIAM/CAIMS AN2020

[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 2020

Selected Presentations & Posters

[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

Selected Relevant Coursework

Coursework at Emory University:

- Numerical Optimization
- Deep Learning Numerics
- Numerical Analysis II
- Numerical Analysis I
- Data Mining
- Machine Learning
- Biostatistical Methods
- Algorithms
- Systems Programming
- Distributed Processing
- Database Systems
- Computer Security (Hacking)

Graduate-level coursework at the University of Georgia:

- Bivariate Splines
- Complex Analysis
- Automata
- Algorithms
- Software Engineering
- Thermodynamics