Derek Onken

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Philomath, Polymath, BS in Math Office: *N411 Math & Science, Emory University | donken@emory.edu*

Research

PDE-based Machine Learning *Sep 2018-present*

supervised by Dr. Lars Ruthotto, Emory University

- Applying knowledge of partial differential equation (PDE) solvers to neural networks, specifically higher-order time integration schemes, bound constraints, and the Discretize-Optimize approach.
- Addressing questions of efficient training beyond the standard gradient-based methods
- Building architectures that handle ill-posed problems more appropriately than current state-of-the-art

Parkinson's Disease Telemonitoring and Voice Analysis via Mobile App *Sep 2017-Dec 2017*

supervised by Dr. Eugene Agichtein, Emory University

- Collecting and analyzing voice data, touch pressure, and rest tremor to detect Parkinson's disease symptoms via remote patient monitoring and machine learning classifier

Mobile Phone Data to View Infection-Associated Behavior Change *Oct 2016-Feb 2019*

supervised by Dr. Ymir Vigfusson, Emory University

- Using call-detailed records coupled with influenza-like illness diagnosis date from 2009 H1N1 outbreak
- Visualize and quantify behavioral changes witnessed.
- Build machine learning classifier predicting sickness from behavior change, giving health officials real-time information regarding outbreak spread.

Lunar Influence on Sex Ratio at Conception *Aug 2014-Jul 2017*

supervised by Dr. Juan Gutierrez, University of Georgia

- Parsed 20 years of CDC Vital Statistics natality data, calculating fields based on moon phase.
- Analyzed the somewhat novel connection between gestation length and sex ratio.
- Performed statistical analyses on the sex ratio distributions for each day of the lunar month.
- Manuscript: https://arxiv.org/abs/1706.08151

Parallelization Comparison and Application to GSEA *May 2014 - Aug 2014*

supervised by Dr. Juan Gutierrez, University of Georgia

- Implemented parallelizations methods MPI, OpenCL, and CUDA for comparison on simplePDE
- Application to Gene Set Enrichment Analysis (GSEA) studying malaria in primate host: converted MATLAB code (runtime: >1 week) to C++ implementing MPI (runtime: 15 seconds on 100 cores).

Computational Skills

- *Comfortable in* MATLAB, Python, PyTorch, C, C++, SQL, Java
- *Familiar with* TensorFlow, Keras, R, x86, Mathematica, MPI, OpenCL, CUDA, HTML

Education

***PhD Candidate*, Emory University**, 2016 - 2021

Computer Science & Informatics track

***M.S.* Computer Science, Emory University**, 2019

Coursework in primary realms (numerical mathematics, data analysis, and systems):

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

***B.S.*, University of Georgia**, Honors College, 2011 - 2015

Majors: Mathematics and Computer Science

Minors: Physics and Classical Culture

Honors: Graduated High Honors with Capstone

Graduate-level Coursework: Bivariate Splines, Complex Analysis, Thermodynamics, Software Engineering, Algorithms, Automata

Work Experience

Data Scientist Internship, *UnitedHealth Group Research & Development* *Jun 2019-Aug 2019*
- Implemented PDE-based neural networks for lung cancer classification of 3-D low-dose computed tomography (LDCT) images

Air Force High Performance Computing Internship, *Air Force Research Labs* *May 2018-Aug 2018*
- Implemented convolutional neural network to perform cell segmentation for toxicological bioanalytic pipeline

Teaching, *Emory University*
- Teaching Assistant, Undergraduate Data Mining *Spring 2018*
- Lab Instructor, Undergraduate Numerical Analysis *Fall 2017*
- Teaching Assistant, Undergraduate Numerical Analysis *Spring 2017*
- Teaching Assistant, Undergraduate Introduction to Java *Fall 2016*

Tutor, *UGA Athletic Department* *Jan 2016-May 2016*
- Instructed Multivariable Calculus, Differential Equations, Discrete Math, Systems Programming, and Introductory Java
- 12 hours per week

Pre-Calculus Tutor *Aug 2015-May 2016*
- Instructed a high school senior weekly

Undergraduate Researcher, *UGA Mathematics Department* *May 2014-Aug 2014*
- Worked on parallelization comparison
- 20 hours per week

Piano Teacher *Aug 2013-Mar 2014*
- Instructed an 8-year old and 10-year old weekly

Summer League Swim Coach *Apr-Jun 2009, Apr-Jun 2010*
- Coached and taught children between ages 5 and 18

Leadership & Community Service

University of Georgia Men's Swimming & Diving Team *Aug 2011-2015*
Captain & Division I Varsity Athlete
- Hosted and advised prospective student-athlete recruits
- Competed at the SEC championships
- Qualified and competed at the 2016 U.S. Olympic Trials
- NCAA Academic All-American Honorable Mention - *2013, 2014, 2015*
- Awarded "Scholar-Athlete" Award for entire Athletic Department - *2015*
- Awarded Ramsey Scholarship for Academic and Athletic Excellence - *2014-2015*
- Awarded "Hardest Worker" Swimming Award - *2014, 2015*
- Awarded "Scholar-Athlete" Swimming Award - *2014*

Student-Athlete Advisory Committee, *Team Representative* *Aug 2014-2015*
- Served as interface between student-athletes and administrative officials
- Organized and participated in Community Service programs (Hunger Bowl, Hometown Heroes, etc.)

Honors & Awards

- UGA Athletic Director's Honor Roll
- Southeastern Conference Academic Honor Roll
- UGA Dean's List
- UGA Presidential Scholar
- Phi Beta Kappa

Presentations

- UnitedHealth Group Intern Presentation, Aug 2019
- Emory Scientific Computing Seminar, Apr 2019, slides
- Georgia Scientific Computing Symposium, Feb 2019, poster
- High Performance Computing and Modernization Intern Presentation, Aug 2018
- Amazon Graduate Research Symposium, Oct 2017, poster