Cassidy K. Buhler (she/her)

cb3452@drexel.edu cassie-buhler cassiebuhler.github.io/ cassiebuhler

About

I'm a Ph.D. candidate on the job market for a research position (e.g. post-doc, applied scientist, research scientist) and am particularly interested in roles which address environmental challenges using AI and ML.

Education

2024 **Ph.D. Business Analytics** ***Drexel University***
Minor: Computational Data Science Philadelphia, PA
Thesis: Advances in Optimization with Applications to Nature Conservation
Expected Graduation: June 2024

2019 **B.S. Mathematics** ***University of Utah***
Statistics Emphasis Salt Lake City, UT

Employment

2019 – Present **Doctoral Research Fellow** ***Drexel University***

Led research that applied optimization methods and models to machine learning and land conservation.

Project Area #1: Mixed-Integer Nonlinear Optimization + Conservation-Decision Making

- Developed an open source decision-making tool for spatial conservation planning using an optimization framework that minimizes a species' predicted extinction risk.
- Framework allows for more complex decision inputs compared to existing spatial planning models, and can be paired with existing ecological software.

Software: `https://github.com/cassiebuhler/conservation-dfo`.
Presentations:
- *AAAI 2024, Rising Scholars Conference 2023 (MIT Sloan), INFORMS 2023, SIAM 2023, & NEDSI 2023.*

Papers:
- *Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs.*
- *Optimal land conservation decisions for multiple species.*

Project Area #2: Nonlinear Optimization + Machine Learning

- Advanced unconstrained optimization methods for nonlinear programming by improving the step direction calculation in nonlinear conjugate gradient methods.
- Algorithm exhibited reduced iteration count when solving large instances of machine learning problems.

Software: `https://github.com/cassiebuhler/ConminCG`.
Presentations: *SIAM 2021, INFORMS 2021, & INFORMS 2020.*
Papers:
- *Regularized step directions in nonlinear conjugate gradient methods.* Under review.
- *Nonlinear conjugate gradient methods for machine learning.* In progress.

2019 – Present **Instructor & Teaching Assistant** ***Drexel University***
Department of Decision Sciences & MIS

- Served as an instructor for 4 classes and 2 workshops, and as a TA for 25+ classes.
- Created and delivered instructional materials for BS, MS, MBA, Executive MBA, and PhD students.
- Earned two student-nominated awards for teaching performance, along with course evaluation scores above the college and department average.

Awards: *TA Excellence Award 2022 & TA Excellence Award (Highly Commended) 2021*
Subjects: *Statistics, Operations Research, Supply Chain Management, Operations Management, MIS, Business Analytics, & Data Mining.*

Employment (continued)

2018 – 2021 **Research Assistant** ***University of Utah***
Department of Mathematics

- Developed mathematical models to understand the response of castration-resistant prostate cancer under various treatment regimens.
- Simulated the dynamics of biological systems as differential equations, formulating the models with differing mechanism complexity.
- Evaluated modern treatment regimens under this scheme and disseminated findings to academic and medical audiences.

Paper: *Do mechanisms matter? Comparing cancer treatment strategies across mathematical models.*

2018 **Computer Scientist Intern** ***United States Air Force***
Hill Air Force Base

- Conducted research related to improving software for USAF aircraft in the Software Engineering Group.
- Hired under the Premier College Intern Program and earned a position in the PALACE Acquire program.

Technical Skills

Coding

Language	*Libraries/Packages/Toolboxes*
Python	PyTorch, TensorFlow, Pandas, BeautifulSoup, scikit-learn, Keras, Seaborn, rasterio.
R	tidyverse, ggplot, rgdal, raster, rgeos, SDMTools, deSolve.
MATLAB	Deep Learning, Statistics & Machine Learning, Optimization, Financial, Computer Vision.

Optimization Software

Solver	*Applications*
GUROBI	Quadratic programming, Linear programming
Pyomo	Mixed-integer nonlinear programming
CVX	Convex programming
CPLEX	Integer programming
AMPL	Unconstrained nonlinear programming

Publications

C. K. Buhler and H. Y. Benson, "Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs," in *Proceedings of the AAAI Conference on Artificial Intelligence.*, Acceptance rate 24.2%, 2024. DOI: 10.48550/arXiv.2308.11549, forthcoming.

C. K. Buhler and H. Y. Benson, "Optimal land conservation decisions for multiple species," in *Proceedings of the 52nd Northeast Decision Science Institute Annual Conference*, vol. 52, Washington, D.C., 2023, pp. 808–816.

C. K. Buhler, R. S. Terry, K. G. Link, and F. R. Adler, "Do mechanisms matter? Comparing cancer treatment strategies across mathematical models and outcome objectives," *Mathematical Biosciences and Engineering*, vol. 18, no. 5, pp. 6305–6327, 2021, ISSN: 1551-0018. DOI: 10.3934/mbe.2021315.

Under Review

C. K. Buhler, H. Y. Benson, and D. F. Shanno, "Regularized step directions in nonlinear conjugate gradient methods," *arXiv preprint arXiv:2110.06308*, 2021, Under 2nd round of review at Mathematical Programming Computation. DOI: 10.48550/arXiv.2110.06308.