Cassidy K. Buhler (she/her)

🔀 cb3452@drexel.edu

in cassie-buhler

🔇 cassiebuhler.github.io/

🗘 cassiebuhler

EDUCATION

Ph.D. Operations & Business Analytics , <i>Computational Data Science Minor</i> Drexel University	Philadelphia, PA 09/2019 – 06/2024 (Expected)
Thesis: Advances in Optimization with Applications to Biodiversity Conservation	
B.S. Mathematics, Statistics Emphasis	Salt Lake City, UT
University of Utah	08/2015 - 05/2019

PUBLICATIONS

JOURNAL ARTICLES

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. **SDOI**: 10.3934/mbe.2021315.

REFEREED CONFERENCE PROCEEDINGS

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*, vol. 38, 2024, pp. 21932–21939. **DOI:** 10.1609/aaai.v38i20.30195.

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.

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.

IN PROGRESS

C. K. Buhler and H. Y. Benson, "Efficient solution of portfolio optimization problems via dimension reduction and sparsification," *arXiv preprint arXiv:2306.12639*, Working paper. **%**DOI: 10.48550/arXiv.2306.12639.

C. K. Buhler and H. Y. Benson, "Regularized nonlinear conjugate gradient methods for machine learning," Working paper.

Research

Doctoral Research Fellow

Drexel University | Department of Decision Sciences & MIS

- Led research projects that applied optimization methods and models to machine learning and biodiversity conservation.
- Developed an open-source decision-making tool for spatial conservation planning that allows for more complex decision inputs than existing models. This framework utilized mixed-integer nonlinear programming to select protected areas that minimize a species' predicted extinction risk.
- Advanced unconstrained optimization methods for nonlinear programming by improving the step direction calculation in nonlinear conjugate gradient methods. When solving large instances of machine learning problems, the algorithm exhibited a reduced iteration count compared to existing methods.

Research Assistant

University of Utah | Department of Mathematics

- Collaborated on an interdisciplinary team in order to mathematically model the response of castration-resistant prostate cancer under various treatment regimens.
- Simulated biological dynamics as differential equations, formulating models with differing mechanism complexity.
- Evaluated modern treatment regimens under this scheme and disseminated findings to academic and medical audiences.

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.

• Executed data analysis and data visualization to present and deliver insights to team leadership.

09/2019 - 06/2024

05/2018 - 08/2018

08/2018 - 08/2021

TEACHING

Instructor

Drexel University | Decision Sciences & MIS Department

• Created, organized, and delivered instructional materials for undergraduate and PhD classes/workshops.

• Earned two student-nominated teaching awards and obtained course evaluation scores above college and department averages.

Level	Quarter	Skills
U	Winter 2022	R
PhD	Summer 2021; Summer 2022	Python
TT	Eall accor Eall accor Winter accor	MS Access;
G Fail 2019; Fail 2020; Willier 2021		Excel; HTML
	Level U PhD U	LevelQuarterUWinter 2022PhDSummer 2021; Summer 2022UFall 2019; Fall 2020; Winter 2021

*Undergraduate (U)

Teaching Assistant

Drexel University | Decision Sciences & MIS Department

• Served TA for 25+ classes, assisting undergraduate, MS, MBA, Executive MBA, and PhD students.

Course	Level	Quarter	Skills
BSAN 360: Programming for Data Analytics	U	Spring 2021	R
BSAN 601: Business Analytics for Managers	MS; MBA	Spring 2024	Excel
MIS 612: Aligning Information Systems & Business Strategies	EMBA; MBA	Fall 2023	-
MIS 625: Management of Information Technology Operations	MBA	Fall 2023	-
OPM 200: Operations Management	U	Spring 2020; Fall 2021; Spring 2023	-
OPM 341: Supply Chain Management	U	Spring 2021; Spring 2022; Fall 2022	Excel
OPM 344: Revenue Management	U	Fall 2022	Excel
OPR 320: Linear Models for Decision Making	U	Summer 2020; Spring 2021	Excel
STAT 2011 Intro to Business Statistics	IT	Winter 2020; Spring 2020; Fall 2021;	Excel
STAT 201. Intro to Busiless Statistics	0	Summer 2022; Spring 2023; Winter 2024	Excel
STAT 202: Business Statistics II	U	Summer 2021; Spring 2023	Excel
STAT 205: Statistical Inference I	U	Spring 2020; Fall 2021	Excel
STAT 206: Statistical Inference II	U	Summer 2021	Excel
STAT 510: Intro to Statistics for Business Analytics	MBA	Summer 2023; Winter 2024	Excel
STAT 642: Data Mining for Business Analytics	MS; PhD	Winter 2023	R

*Undergraduate (U)

Computer Lab Assistant & Mathematics Tutor

University of Utah | T. Benny Rushing Mathematics Student Center

- Tutored math and provided programming support for courses that required using computer applications.
- Assisted professors and instructors with grading coursework.
- Subjects: Intermediate Algebra, College Algebra, Calculus, Linear Algebra, Applied Statistics.
- Programming Languages: MATLAB, Python, & R.

SOFTWARE

Derivative-Free Optimization for Land Conservation

https://github.com/cassiebuhler/conservation-dfo

Conmin-CG: Hybrid Cubic Regularization of Conjugate Gradient Methods

https://github.com/cassiebuhler/ConminCG

</>
C, MATLAB, and Python.

01/2018 - 05/2019

09/2019 - 06/2024

09/2019 - 06/2024

SKILLS

PROGRAMMING

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

OPTIMIZATION SOFTWARE

Applications
Quadratic Programming Linear Programming
Mixed-Integer Nonlinear Programming Derivative-Free Optimization
Convex Optimization
Integer Programming Linear Programming
Nonlinear Programming

COURSEWORK

Subject	Courses
Comp Sci	Data Structures & Algorithms Deep Learning Artificial Intelligence Machine Learning Data Mining
Data Science	Data Acquisition & Pre-Processing Data Analysis & Interpretation
Statistics	Statistical Inference Multivariate Analysis Time Series Analysis
Applied Math	Nonlinear Programming Linear Programming Stochastic Optimization Math Econ Game Theory

PRESENTATIONS

2023MIT Sloan Rising Scholars Conference Talk: Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs.Cambridge, MA (Virtual Talk: Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs.2023INFORMS Annual Meeting Talk: Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs.Phoenix, AZ2023SIAM Conference on Optimization (OP23) Talk: Reserve design in biodiversity conservation.Seattle, WA2023NEDSI Annual Conference Talk: Optimal land conservation decisions for multiple species.Washington, D.C2021INFORMS Annual Meeting Talk: Regularized step directions in conjugate gradient minimization for machine learning.Nirtual2021SIAM Conference on Optimization (OP21) Talk: Conjugate gradient methods for machine learning.Virtual2020INFORMS Annual Meeting Talk: Efficient solution of portfolio optimization problems via dimension reduction & sparsification.Virtual	2024	AAAI Conference on Artificial Intelligence (AAAI-24) Poster: Decision-making for land conservation: A derivative-free optimization framework with nonl	<i>Vancouver, BC, Canada.</i> linear inputs.
2023INFORMS Annual Meeting Talk: Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs.Phoenix, AZ Phoenix, AZ2023SIAM Conference on Optimization (OP23) Talk: Reserve design in biodiversity conservation.Seattle, WA2023NEDSI Annual Conference Talk: Optimal land conservation decisions for multiple species.Washington, D.C2021INFORMS Annual Meeting Talk: Regularized step directions in conjugate gradient minimization for machine learning.Anaheim, CA. (Virtual Virtual 	2023	MIT Sloan Rising Scholars Conference Talk: Decision-making for land conservation: A derivative-free optimization framework with nonlin	<i>Cambridge, MA (Virtual)</i> near inputs.
2023SIAM Conference on Optimization (OP23) Talk: Reserve design in biodiversity conservation.Seattle, WA2023NEDSI Annual Conference Talk: Optimal land conservation decisions for multiple species.Washington, D.C2021INFORMS Annual Meeting Talk: Regularized step directions in conjugate gradient minimization for machine learning.Anaheim, CA. (Virtual Virtual2021SIAM Conference on Optimization (OP21) Talk: Conjugate gradient methods for machine learning.Virtual Virtual2020INFORMS Annual Meeting 	2023	INFORMS Annual Meeting Talk: Decision-making for land conservation: A derivative-free optimization framework with nonlin	<i>Phoenix, AZ.</i> near inputs.
2023NEDSI Annual Conference Talk: Optimal land conservation decisions for multiple species.Washington, D.C.2021INFORMS Annual Meeting Talk: Regularized step directions in conjugate gradient minimization for machine learning.Anaheim, CA. (Virtual Virtual Talk: Conjugate gradient methods for machine learning.2020SIAM Conference on Optimization (OP21) Talk: Conjugate gradient methods for machine learning.Virtual Virtual 	2023	SIAM Conference on Optimization (OP23) Talk: Reserve design in biodiversity conservation.	Seattle, WA.
2021INFORMS Annual Meeting Talk: Regularized step directions in conjugate gradient minimization for machine learning.Anaheim, CA. (Virtual Virtual Virtual2021SIAM Conference on Optimization (OP21) 	2023	NEDSI Annual Conference Talk: Optimal land conservation decisions for multiple species.	Washington, D.C.
2021SIAM Conference on Optimization (OP21) Talk: Conjugate gradient methods for machine learning.Virtual2020INFORMS Annual Meeting Talk: Efficient solution of portfolio optimization problems via dimension reduction & sparsification.Virtual	2021	INFORMS Annual Meeting Talk: Regularized step directions in conjugate gradient minimization for machine learning.	Anaheim, CA. (Virtual)
2020 INFORMS Annual Meeting Talk: Efficient solution of portfolio optimization problems via dimension reduction & sparsification.	2021	SIAM Conference on Optimization (OP21) Talk: Conjugate gradient methods for machine learning.	Virtual.
	2020	INFORMS Annual Meeting Talk: Efficient solution of portfolio optimization problems via dimension reduction & sparsification.	Virtual.

AWARDS & GRANTS

2023

2024	NCEAS Travel Grant
	• Funding to attend the Environmental Data Science Summit hosted by National Center for Ecological Analysis and Synthesis.

2023 MIT Sloan Rising Scholar

• Ph.D. and postdoctoral scholars selected to speak at the Rising Scholars Conference hosted by MIT Sloan School of Management.

Drexel University Graduate Student Travel Subsidy Award

• Funding to present at the 2023 INFORMS Annual Meeting in Phoenix, AZ.

2023 Drexel University DEI & Environment and Sustainability Innovation Micro-Grant

- Awarded to research projects with contributions to DEI or environmental sustainability.
- Project: "Black-box optimization for reserve design in biodiversity conservation".

AWARDS & GRANTS (CONTINUED)

2023 Drexel University Teck-Kah Lim Graduate Student Travel Subsidy Award

• Funding to present at the 2023 SIAM Conference on Optimization in Seattle, WA.

2023 SIAM Student Travel Award

• Funding to present at the 2023 SIAM Conference on Optimization in Seattle, WA.

2023 ESIIL Travel Grant

• Funding to attend the Innovation Summit hosted by the Environmental Data Science Innovation & Inclusion Lab.

2022 Drexel University Teaching Assistant Excellence Award

• Awarded to graduate students based on nominations and evaluations from undergraduate students and faculty.

2021 Drexel University Teaching Assistant Excellence Award (Highly Commended)

• Awarded based on nominations/evaluations from undergraduates/faculty. Finalists are recognized as "highly commended".

2021 SIAM Student Travel Award

• Funding to present at the 2021 SIAM Conference on Optimization.

2019 University of Utah Undergraduate Research Scholar

• Awarded to undergraduate students who have conducted 2 semesters of research, presented at the Undergraduate Research Symposium, and published in the Undergraduate Research Journal.

2019 University of Utah Research Experience for Undergraduates (REU)

- Grant for undergraduate students conducting research with a faculty mentor.
- Project: "Mathematical Modeling of Adaptive Therapy in Prostate Cancer". Mentor: Frederick Adler.

SERVICE

2023	Session Chair Session: Nonlinear Optimization in Machine Learning.	INFORMS Annual Meeting
2023	Session Organizer Session: Nonlinear Optimization and Applications.	SIAM Conference on Optimization
2023	Session Chair Session: Land, Sand, and Plastic Management.	NEDSI Annual Conference
2022	Panelist Session: Teaching Assistance Orientation Session.	Drexel University
2019	Mathematics Tutor - Volunteer Tutored students who are incarcerated in a Salt Lake Community College math course.	Utah Prison Education Project

ORGANIZATIONS

AAAI: Association for the Advancement of Artificial Intelligence

AWM: Association for Women in Mathematics

ESA: Ecological Society of America

INFORMS: The Institute for Operations Research and the Management Sciences

SIAM: Society for Industrial and Applied Mathematics