Cassidy K. Buhler (she/her)

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cassiebuhler

Education

2019 – 2024 Ph.D. Operations & Business Analytics, Drexel University

Graduate Minor: Computational Data Science

Thesis: Advances in optimization with applications to environmental sustainability

2015 – 2019 **B.S. Mathematics,** University of Utah

Keywords

Nonlinear Optimization, Mixed-Integer Optimization, Operations Research, Machine Learning, Computational Sustainability, Spatial Planning, AI for Conservation

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. DOI: 10.3934/mbe.2021315.

Conference Proceedings

C. K. Buhler and H. Y. Benson, "Optimal land conservation decisions for multiple species," To appear in Northeast Decision Science Institute Conference Proceedings, Washington, D.C., Mar. 2023. Spoi: 10.48550/arXiv.2307.11863.

Under Review

- **C. K. Buhler** and H. Y. Benson, "Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs," *arXiv preprint arXiv:2308.11549*, 2023. %DOI: 10.48550/arXiv.2308.11549.
- C. K. Buhler, H. Y. Benson, and D. F. Shanno, "Regularized step directions in conjugate gradient minimization for machine learning," arXiv preprint arXiv:2110.06308, 2021, Under review at Mathematical Programming Computation. SDOI: 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, %DOI: 10.48550/arXiv.2306.12639.
- C. K. Buhler and H. Y. Benson, "Regularized nonlinear conjugate gradient methods for machine learning,"

Software

BBLand: Decision-Making for Land Conservation: A Derivative-Free Optimization Framework

A mathematical programming tool for conservationists that allows for linear and nonlinear inputs, continuous and discrete variables, and can be paired with existing ecological software.

• Open source download: https://github.com/cassiebuhler/BBLand

Software (continued)

Conmin-CG: Hybrid Cubic Regularization of Conjugate Gradient Minimization Method

An optimization algorithm with memoryless and matrix-free properties that solves large-scale problems more efficiently by improving step quality with cubic regularization.

- Implemented in C, MATLAB, and Python.
- Open source download: https://github.com/cassiebuhler/ConminCG

Technical Skills

Coding

Language	Proficiency	Applications
Python	***	machine learning, data collection, data visualization, mathematical modeling, web scraping
R	***	data collection, data visualization, mathematical modeling, statistical testing, numerical analysis, spatial data analysis
MATLAB	***	machine learning, deep learning, data collection, data visualization, mathematical modeling, numerical analysis
SAS	★ ☆☆☆	data collection
Stata	★ ☆☆☆	data collection

Optimization Software

Solver	Proficiency	Applications
GURO	BI ***	quadratic programming
CVX	★★☆☆	convex programming
CPLEX	☆☆☆☆	integer programming
AMPL	★★☆☆	unconstrained nonlinear programming
	Basic: ★☆☆☆	Intermediate:

Conference Talks

- 2023 Reserve design in biodiversity conservation, SIAM Conference on Optimization, Seattle, WA.
 - **Optimal land conservation decisions for multiple species**, NEDSI Annual Conference, *Washington, D.C.*
- 2021 Regularized step directions in conjugate gradient minimization for machine learning, INFORMS Annual Meeting, Virtual.
 - Conjugate gradient methods for machine learning, SIAM Conference on Optimization, Virtual.

Teaching

Instructor

Responsible for all lectures, course materials, and grading.

2022 - Present BSAN 360: Programming for Data Analytics

- Winter 2022
- Data analytics applied to business processes and data-driven decision making.
- · Language: R

2021 - Present **Ph.D. Programming Bootcamp**

- Summer 2021, Summer 2022
- Graduate level data workshop for incoming Ph.D. students.
- · Language: Python

2019 - Present MIS 200: Management Information Systems (Recitation Section)

- Fall 2019, Fall 2020, Winter 2021
- Integrating technical skills to the functional areas of a business.
- Tools: Excel, Microsoft Access, HTML

Teaching Assistant

Assists primary instructor with duties such as holding office hours, preparing assignments, and grading.

2020 - Present BSAN 360: Programming for Data Analytics

• Spring 2021

OPM 200: Operations Management

- Spring 2020, Fall 2021, Spring 2023
- Process and techniques for planning and controlling the operations function.

OPM 341: Supply Chain Management

- Spring 2021, Spring 2022, Fall 2022
- · Concepts, insights, and practical tools for the effective managements of supply chains.

OPM 344: Revenue Management

- Fall 2022
- Aligning operational management of product demand with supply.

OPR 320: Linear Models for Decision Making

- Summer 2020, Spring 2021
- Linear programming, integer programming, goal programming, and networks in business.

STAT 201: Intro to Business Statistics

- Winter 2020, Spring 2020, Fall 2021, Summer 2022, Spring 2023
- Descriptive statistics, probability, statistical inference, and simple regression analysis.

STAT 202: Business Statistics II

- Summer 2021, Spring 2023
- Two sample procedures, categorical data analysis, ANOVA, and regression analysis.

STAT 205: Statistical Inference I

- Spring 2020, Fall 2021
- Probability, joint distributions, sampling distributions, and interval estimation.

STAT 206: Statistical Inference II

- Summer 2021
- Hypothesis testing, two sample procedures, ANOVA, regression, and statistical software.

Teaching (continued)

STAT 510: Introduction to Statistics for Business Analytics

- Summer 2023
- Graduate level course for MBA students
- · Statistics and analytical tools used in business decision making.

STAT 642: Data Mining for Business Analytics

- Winter 2023
- Graduate level course for MS Business Analytics students
- Logistic regression, trees, neural networks, support vector machines, and random forests.
- · Language: R

Computer Lab & Mathematics Teaching Assistant

Provided math and programming assistance at the T. Benny Rushing Mathematics Student Center, University of Utah.

2018 − 2019 Languages: MATLAB, Python, & R

- MATH 1010: Intermediate Algebra
- MATH 1050: College Algebra
- MATH 1210: Calculus I
- MATH 1220: Calculus II
- MATH 2210: Calculus III
- MATH 2270: Linear Algebra
- ▶ MATH 3070: Applied Statistics I
- ▶ MATH 3080: Applied Statistics II

Grants

2023 🏛 DEI & Environment and Sustainability Innovation Micro-Grant

Lebow College of Business, Drexel University

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

m ESIIL Travel Grant

Environmental Data Science Innovation & Inclusion Lab

• Funding to attend the ESIIL Summit at CU Boulder

Teck-Kah Lim Graduate Student Travel Subsidy Award

Graduate College, Drexel University

• Funding to attend 2023 SIAM Conference on Optimization in Seattle, WA.

m SIAM Student Travel Award

2023 SIAM Conference on Optimization

• Funded by NSF to participate at a SIAM conference.

2021 🏛 SIAM Student Travel Award

2021 SIAM Conference on Optimization

• Funded by NSF to participate at a SIAM conference.

Grants (continued)

2019 – 2021 **m Modeling the Dynamics of Life Fund**

University of Utah

• Research support provided by Professor Frederick R. Adler.

2019



m Research Experience for Undergraduates (REU)

Department of Mathematics, University of Utah

• Grant for undergraduate students conducting research with a faculty member.

Awards

2022 **Teaching Assistant Excellence Award**

Graduate College, Drexel University

· Recognizes graduate students who exhibit exemplary commitment to student learning, based on nominations and evaluations from undergraduate students and faculty.

Teaching Assistant Excellence Award (Highly Commended)

Graduate College, Drexel University

· Nominees given close consideration by the review committee were given recognition as "highly commended" award finalists.

2019

Undergraduate Research Scholar Designation

University of Utah

• Undergraduate students who have completed two semesters of research, presented in the Undergraduate Research Symposium, and published research in the Undergraduate Research Journal.

Work Experience

2018 **Computer Scientist Intern**

United States Air Force

- Conducted research related to improving software for US Air Force aircraft.
- Hired under the Premier College Intern Program (PCIP) and earned a position in the PALACE Acquire (PAQ) program.

Service

2023 **Session Chair** Nonlinear Optimization in Machine Learning INFORMS Annual Meeting

» Session Organizer Nonlinear Optimization and Applications SIAM Conference on Optimization

» Session Chair Land, Sand, and Plastic Management NEDSI Annual Conference

2022 **Panelist** Teaching Assistance Orientation Session

Graduate College, Drexel University

Math Tutor Utah Prison Education Project

Timpanogos Women's Correctional Facility

Supported students who are incarcerated in a Salt Lake Community College math course.

Organizations

- *** 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

References

Hande Benson, *Ph.D. Research Advisor* Professor of Decision Sciences and MIS Drexel University

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Frederick Adler, Undergraduate Research Advisor
Professor of Biology and Mathematics
Director, School of Biological Sciences
University of Utah

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