Cassidy K. Buhler (she/her)

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Education

2019 – 2024 Ph.D. Business Analytics, Drexel University
Graduate Minor: Computational Data Science
Thesis: *Advances in optimization with applications to nature conservation*

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

Keywords

Operations Research; Nonlinear Optimization; Mixed-Integer Optimization; Machine Learning; Conservation Planning; 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. DOI: 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 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*, 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`

Awards & Grants

2023 **Graduate Student Travel Subsidy Award**, *Drexel University*
- Funding to present at the 2023 INFORMS Annual Meeting in Phoenix, AZ.

2023 **DEI & Environment and Sustainability Innovation Micro-Grant**, *Drexel University*
- Awarded to research projects with unique contributions to DEI or environmental sustainability
- Project: "Black-box optimization for reserve design in biodiversity conservation"

2023 **Teck-Kah Lim Graduate Student Travel Subsidy Award**, *Drexel University*
- Funding to present at the 2023 SIAM Conference on Optimization in Seattle, WA.

2023 **SIAM Student Travel Award**, *SIAM*
- Funding to present at the 2023 SIAM Conference on Optimization.

2023 **ESIIL Travel Grant**, *Environmental Data Science Innovation & Inclusion Lab*
- Funding to attend the ESIIL Summit at CU Boulder

2022 **Teaching Assistant Excellence Award**, *Drexel University*
- Recognizes graduate students who exhibit exemplary commitment to student learning, based on nominations and evaluations from undergraduate students and faculty.

2021 **Teaching Assistant Excellence Award (Highly Commended)**, *Drexel University*
- Award committee recognized finalists as "highly commended" .

2021 **SIAM Student Travel Award**, *SIAM*
- Funding to present at the 2023 SIAM Conference on Optimization

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.

2019 **Research Experience for Undergraduates (REU)**, *University of Utah*
- Grant for undergraduate students conducting research with a faculty member.

Teaching

2019 – Present

Instructor

Drexel University

Responsible for all lectures, course materials, and grading.

BSAN 360: Programming for Data Analytics
- *Winter 2022*
- Data analytics applied to business processes and data-driven decision making.
- Language: R

Teaching (continued)

Ph.D. Programming Bootcamp

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

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

2020 – Present

Teaching Assistant

Drexel University

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

BSAN 360: Programming for Data Analytics

- *Spring 2021*

MIS 612: Aligning Information Systems and Business Strategies

- *Summer 2023*
- Graduate level course for Executive MBA and MBA students.
- Disrupting competition and shaping business strategy with information technology.

MIS 625: Management of Information Technology Operations

- *Fall 2023*
- Graduate level course for MBA students.
- Procuring, deploying, integrating, and managing a firm's IT assets.

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.

Teaching (continued)

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.

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 and PhD students.
- Logistic regression, trees, neural networks, support vector machines, and random forests.
- Language: R

Work Experience

2018 – 2019 **Computer Lab Assistant & Mathematics Tutor**
T. Benny Rushing Mathematics Student Center, University of Utah
Provided math and programming assistance for undergraduate math classes.

- 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

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

2023 **Session Organizer** Nonlinear Optimization and Applications
SIAM Conference on Optimization

Service (continued)

2023 **Session Chair** Land, Sand, and Plastic Management
NEDSI Annual Conference

2022 **Panelist** Teaching Assistance Orientation Session
Graduate College, Drexel University

2019 **Math Tutor** Utah Prison Education Project
Timpanogos Women's Correctional Facility
- Supported students who are incarcerated in a Salt Lake Community College math course.

Conference Talks

2023 **Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs**,
Rising Scholars Conference, *Cambridge, MA (Virtual).*

2023 **Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs**,
INFORMS Annual Meeting, *Phoenix, AZ.*

2023 **Reserve design in biodiversity conservation**,
SIAM Conference on Optimization, *Seattle, WA.*

2023 **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.*

2021 **Conjugate gradient methods for machine learning**,
SIAM Conference on Optimization, *Virtual.*

2020 **Efficient solution of portfolio optimization problems via dimension reduction and sparsification**,
INFORMS Annual Meeting, *Virtual.*

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

Technical Skills (continued)

Optimization Software

Solver	*Proficiency*	*Applications*
GUROBI	★★★☆	quadratic programming, linear programming
Pyomo	★★★☆	mixed-integer nonlinear programming
CVX	★★☆☆	convex programming
CPLEX	★★☆☆	integer programming
AMPL	★★☆☆	unconstrained nonlinear programming

Basic: ★☆☆☆ *Intermediate:* ★★☆☆ *Advanced:* ★★★☆ *Expert:* ★★★★

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