Cassidy K. Buhler (she/her)

cb3452@drexel.edu cassiebuhler.github.io/ cassiebuhler

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

Do mechanisms matter? Comparing cancer treatment strategies across mathematical models and outcome objectives
Mathematical Biosciences and Engineering (2021). vol. 18, no. 5, pp. 6305–6327
Cassidy K. Buhler, Rebecca S. Terry, Kathryn G. Link, Frederick R. Adler

Conference Proceedings

Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs
38th AAAI Conference on Artificial Intelligence (2024). Forthcoming.
(24.2% acceptance rate)
Cassidy K. Buhler & Hande Y. Benson

Optimal land conservation decisions for multiple species
52nd Northeast Decision Science Institute Annual Conference (2023). vol. 52, pp. 808–816.
Cassidy K. Buhler & Hande Y. Benson

In Progress

Regularized step directions in nonlinear conjugate gradient methods
Under 2nd round of review at *Mathematical Programming Computation*.
Cassidy K. Buhler, Hande Y. Benson, David F. Shanno

Nonlinear conjugate gradient methods for machine learning
Working paper.
Cassidy K. Buhler & Hande Y. Benson

Efficient solution of portfolio optimization problems via dimension reduction and sparsification
Working paper.
Cassidy K. Buhler & Hande Y. Benson

Software

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/conservation-dfo`

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

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:* ★★★★

Awards & Grants

2023 **Rising Scholar**, *MIT Sloan School of Management*

- Selected from a competitive pool of Ph.D. and postdoctoral scholars to present at the 4th annual Rising Scholars Conference hosted by the MIT Sloan Ph.D. Program.

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"

Awards & Grants (continued)

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

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*

Teaching (continued)

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, Winter 2024*
- 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.

STAT 510: Introduction to Statistics for Business Analytics

- *Summer 2023, Winter 2024*
- 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

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.*

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.

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
hvb22 [at] drexel [dot] edu

Frederick Adler, *Undergraduate Research Advisor*
Professor of Biology and Mathematics
Director, School of Biological Sciences
University of Utah
adler [at] math [dot] utah [dot] edu