# 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. %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 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	<b>★</b> ☆☆☆	data collection
Stata	<b>★</b> ☆☆☆	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

### 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.

### **©** 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

### 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

## m 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.

## **Grants (continued)**

## 2021 **SIAM Student Travel Award**

2021 SIAM Conference on Optimization

• Funded by NSF to participate at a SIAM conference.

## 2019 - 2021 **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.

### 2021 **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 **Tundergraduate 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

# Service (continued)

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

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