

# 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;

## Research

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|-------------------------------|---|
| Publications<br>(Journals)    | <b>Do mechanisms matter? Comparing cancer treatment strategies across mathematical models and outcome objectives</b><br><i>Mathematical Biosciences and Engineering</i> (2021). vol. 18, no. 5, pp. 6305–6327<br><b>Cassidy K. Buhler</b> , Rebecca S. Terry, Kathryn G. Link, Frederick R. Adler |
| Publications<br>(Conferences) | <b>Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs</b><br><i>38th AAAI Conference on Artificial Intelligence</i> (2024). Forthcoming.<br>(24.2% acceptance rate)<br><b>Cassidy K. Buhler</b> & Hande Y. Benson                              |
|                               | <b>Optimal land conservation decisions for multiple species</b><br><i>52nd Northeast Decision Science Institute Annual Conference</i> (2023). vol. 52, pp. 808–816.<br><b>Cassidy K. Buhler</b> & Hande Y. Benson   |
| Preprints                     | <b>Regularized step directions in nonlinear conjugate gradient methods</b><br>Under 2nd round of review at <i>Mathematical Programming Computation</i> .<br><b>Cassidy K. Buhler</b> , Hande Y. Benson, David F. Shanno   |
|                               | <b>Regularized nonlinear conjugate gradient methods for machine learning</b><br><i>Working paper</i> .<br><b>Cassidy K. Buhler</b> & Hande Y. Benson  |
|                               | <b>Efficient solution of portfolio optimization problems via dimension reduction and sparsification</b><br><i>Working paper</i> .<br><b>Cassidy K. Buhler</b> & 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>

## 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

<i>Language</i>	<i>Proficiency</i>	<i>Applications</i>
<b>Python</b>	★★★★★	machine learning, data collection, data visualization, mathematical modeling, web scraping
<b>R</b>	★★★★★	data collection, data visualization, mathematical modeling, statistical testing, numerical analysis, spatial data analysis
<b>MATLAB</b>	★★★★★	machine learning, deep learning, data collection, data visualization, mathematical modeling, numerical analysis

### Optimization Software

<i>Solver</i>	<i>Proficiency</i>	<i>Applications</i>
<b>GUROBI</b>	★★★★☆	quadratic programming, linear programming
<b>Pyomo</b>	★★★★☆	mixed-integer nonlinear programming
<b>CVX</b>	★★★☆☆	convex programming
<b>CPLEX</b>	★★★☆☆	integer programming
<b>AMPL</b>	★★★☆☆	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”
- 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.

## Awards & Grants (continued)

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- 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

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2019 –    **Instructor**

Present    *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 –    **Teaching Assistant**

Present    *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.

## Teaching (continued)

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### **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

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- 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

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- 2018 – **Computer Lab Assistant & Mathematics Tutor**  
2019 *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

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- 2023 **Session Chair** Nonlinear Optimization in Machine Learning  
*INFORMS Annual Meeting*
- 2023 **Session Organizer** Nonlinear Optimization and Applications  
*SIAM Conference on Optimization*

## Service (continued)

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- 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

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**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

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**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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