

# Cassidy K. Buhler (she/her)

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in cassie-buhler

🐙 cassiebuhler.github.io/

👤 cassiebuhler

## EDUCATION

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**Ph.D. Operations & Business Analytics**, *Computational Data Science Minor*  
Drexel University  
*Thesis: Advances in Optimization with Applications to Nature Conservation*

Philadelphia, PA  
09/2019 – 06/2024 (Expected)

**B.S. Mathematics**, *Statistics Emphasis*  
University of Utah

Salt Lake City, UT  
08/2015 – 05/2019

## PUBLICATIONS

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### 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](#).

### REFEREED CONFERENCE PROCEEDINGS

C. K. Buhler and H. Y. Benson, “Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs,” in *Proceedings of the AAAI Conference on Artificial Intelligence*, vol. 38, 2024, pp. 21932–21939. [DOI: 10.1609/aaai.v38i20.30195](#).

C. K. Buhler and H. Y. Benson, “Optimal land conservation decisions for multiple species,” in *Proceedings of the 52nd Northeast Decision Science Institute Annual Conference*, vol. 52, Washington, D.C., 2023, pp. 808–816.

### UNDER REVIEW

C. K. Buhler, H. Y. Benson, and D. F. Shanno, “Regularized step directions in nonlinear conjugate gradient methods,” *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*, Working paper. [DOI: 10.48550/arXiv.2306.12639](#).

C. K. Buhler and H. Y. Benson, “Regularized nonlinear conjugate gradient methods for machine learning,” Working paper.

## RESEARCH EMPLOYMENT

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### Doctoral Research Fellow

09/2019 – 06/2024

Drexel University | Decision Sciences & MIS Department

- Led research projects that applied optimization methods and models to machine learning and land conservation.
- Developed an open-source decision-making tool for spatial conservation planning that allows for more complex decision inputs than existing models. This framework utilized mixed-integer nonlinear programming to select protected areas that minimize a species’ predicted extinction risk.
- Advanced unconstrained optimization methods for nonlinear programming by improving the step direction calculation in nonlinear conjugate gradient methods. When solving large instances of machine learning problems, the algorithm exhibited a reduced iteration count compared to existing methods.

### Research Assistant

08/2018 – 08/2021

University of Utah | Mathematics Department

- Collaborated on an interdisciplinary team in order to mathematically model the response of castration-resistant prostate cancer under various treatment regimens.
- Simulated biological dynamics as differential equations, formulating models with differing mechanism complexity.
- Evaluated modern treatment regimens under this scheme and disseminated findings to academic and medical audiences.

### Computer Scientist Intern

05/2018 – 08/2018

United States Air Force | Hill Air Force Base

- Conducted research related to improving software for USAF aircraft in the Software Engineering Group.
- Executed data analysis and data visualization to present and deliver insights to team leadership.

## TEACHING

### Instructor

09/2019 – 06/2024

Drexel University | Decision Sciences & MIS Department

- Created, organized, and delivered instructional materials for undergraduate and PhD classes/workshops.
- Earned two student-nominated teaching awards and obtained course evaluation scores above college and department averages.

Course	Level	Quarter	Skills
BSAN 360: Programming for Data Analytics	U	Winter 2022	R
Ph.D. Programming Bootcamp	PhD	Summer 2021; Summer 2022	Python
MIS 200: Management Information Systems (Recitation Section)	U	Fall 2019; Fall 2020; Winter 2021	MS Access; Excel; HTML

\*Undergraduate (U)

### Teaching Assistant

09/2019 – 06/2024

Drexel University | Decision Sciences & MIS Department

- Served TA for 25+ classes, assisting undergraduate, MS, MBA, Executive MBA, and PhD students.

Course	Level	Quarter	Skills
BSAN 360: Programming for Data Analytics	U	Spring 2021	R
BSAN 601: Business Analytics for Managers	MS; MBA	Spring 2024	Excel
MIS 612: Aligning Information Systems & Business Strategies	EMBA; MBA	Fall 2023	-
MIS 625: Management of Information Technology Operations	MBA	Fall 2023	-
OPM 200: Operations Management	U	Spring 2020; Fall 2021; Spring 2023	-
OPM 341: Supply Chain Management	U	Spring 2021; Spring 2022; Fall 2022	Excel
OPM 344: Revenue Management	U	Fall 2022	Excel
OPR 320: Linear Models for Decision Making	U	Summer 2020; Spring 2021	Excel
STAT 201: Intro to Business Statistics	U	Winter 2020; Spring 2020; Fall 2021; Summer 2022; Spring 2023; Winter 2024	Excel
STAT 202: Business Statistics II	U	Summer 2021; Spring 2023	Excel
STAT 205: Statistical Inference I	U	Spring 2020; Fall 2021	Excel
STAT 206: Statistical Inference II	U	Summer 2021	Excel
STAT 510: Intro to Statistics for Business Analytics	MBA	Summer 2023; Winter 2024	Excel
STAT 642: Data Mining for Business Analytics	MS; PhD	Winter 2023	R

\*Undergraduate (U)

### Computer Lab Assistant & Mathematics Tutor

01/2018 – 05/2019

University of Utah | T. Benny Rushing Mathematics Student Center

- Tutored math and provided programming support for courses that required using computer applications.
- Assisted professors and instructors with grading coursework.
- Subjects: Intermediate Algebra, College Algebra, Calculus, Linear Algebra, Applied Statistics.
- Programming Languages: MATLAB, Python, & R.

## SOFTWARE

### Derivative-Free Optimization for Land Conservation

<https://github.com/cassiebuhler/conservation-dfo>

</> R, Python, RAMAS.

### Conmin-CG: Hybrid Cubic Regularization of Conjugate Gradient Methods

<https://github.com/cassiebuhler/ConminCG>

</> C, MATLAB, and Python.

## SKILLS

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### PROGRAMMING

<i>Language</i>	<i>Libraries/Packages/Toolboxes</i>
<b>Python</b>	PyTorch   TensorFlow   Pandas   BeautifulSoup   scikit-learn   Keras   Seaborn   rasterio
<b>R</b>	tidyverse   ggplot   rgdal   raster   rgeos   SDMTools   deSolve
<b>MATLAB</b>	Deep Learning   Statistics & Machine Learning   Optimization   Financial   Computer Vision

### OPTIMIZATION SOFTWARE

<i>Software</i>	<i>Applications</i>
<b>GUROBI</b>	Quadratic Programming   Linear Programming
<b>Pyomo</b>	Mixed-Integer Nonlinear Programming   Derivative-Free Optimization
<b>CVX</b>	Convex Optimization
<b>CPLEX</b>	Integer Programming   Linear Programming
<b>AMPL</b>	Nonlinear Programming

### COURSEWORK

<i>Subject</i>	<i>Courses</i>
<b>Computer Science</b>	Data Structures & Algorithms   Deep Learning   Artificial Intelligence   Machine Learning   Data Mining
<b>Data Science</b>	Data Acquisition & Pre-Processing   Data Analysis & Interpretation
<b>Statistics</b>	Statistical Inference   Multivariate Analysis   Time Series Analysis
<b>Applied Math</b>	Nonlinear Programming   Linear Programming   Stochastic Optimization   Math Econ   Game Theory

## PRESENTATIONS

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2024	<b>AAAI Conference on Artificial Intelligence (AAAI-24)</b> Poster: Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs.	Vancouver, BC, Canada.
2023	<b>MIT Sloan Rising Scholars Conference</b> Talk: Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs.	Cambridge, MA (Virtual)
2023	<b>INFORMS Annual Meeting</b> Talk: Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs.	Phoenix, AZ.
2023	<b>SIAM Conference on Optimization (OP23)</b> Talk: Reserve design in biodiversity conservation.	Seattle, WA.
2023	<b>NEDSI Annual Conference</b> Talk: Optimal land conservation decisions for multiple species.	Washington, D.C.
2021	<b>INFORMS Annual Meeting</b> Talk: Regularized step directions in conjugate gradient minimization for machine learning.	Anaheim, CA. (Virtual)
2021	<b>SIAM Conference on Optimization (OP21)</b> Talk: Conjugate gradient methods for machine learning.	Virtual.
2020	<b>INFORMS Annual Meeting</b> Talk: Efficient solution of portfolio optimization problems via dimension reduction & sparsification.	Virtual.

## AWARDS & GRANTS

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2024	<b>NCEAS Travel Grant</b> <ul style="list-style-type: none"><li>Funding to attend the <i>Environmental Data Science Summit</i> hosted by <i>National Center for Ecological Analysis and Synthesis</i>.</li></ul>	
2023	<b>MIT Sloan Rising Scholar</b> <ul style="list-style-type: none"><li>Ph.D. and postdoctoral scholars selected to speak at the <i>Rising Scholars Conference</i> hosted by <i>MIT Sloan School of Management</i>.</li></ul>	
2023	<b>Drexel University Graduate Student Travel Subsidy Award</b> <ul style="list-style-type: none"><li>Funding to present at the <i>2023 INFORMS Annual Meeting</i> in Phoenix, AZ.</li></ul>	
2023	<b>Drexel University DEI &amp; Environment and Sustainability Innovation Micro-Grant</b> <ul style="list-style-type: none"><li>Awarded to research projects with contributions to DEI or environmental sustainability.</li><li>Project: "Black-box optimization for reserve design in biodiversity conservation".</li></ul>	
2023	<b>Drexel University Teck-Kah Lim Graduate Student Travel Subsidy Award</b> <ul style="list-style-type: none"><li>Funding to present at the <i>2023 SIAM Conference on Optimization</i> in Seattle, WA.</li></ul>	

## AWARDS & GRANTS (CONTINUED)

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- 2023 **SIAM Student Travel Award**  
• Funding to present at the 2023 *SIAM Conference on Optimization* in Seattle, WA.
- 2023 **ESIIL Travel Grant**  
• Funding to attend the *Innovation Summit* hosted by the *Environmental Data Science Innovation & Inclusion Lab*.
- 2022 **Drexel University Teaching Assistant Excellence Award**  
• Awarded to graduate students based on nominations and evaluations from undergraduate students and faculty.
- 2021 **Drexel University Teaching Assistant Excellence Award (Highly Commended)**  
• Awarded based on nominations/evaluations from undergraduates/faculty. Finalists are recognized as “highly commended”.
- 2021 **SIAM Student Travel Award**  
• Funding to present at the 2021 *SIAM Conference on Optimization*.
- 2019 **University of Utah Undergraduate Research Scholar**  
• Awarded to undergraduate students who have conducted 2 semesters of research, presented at the *Undergraduate Research Symposium*, and published in the *Undergraduate Research Journal*.
- 2019 **University of Utah Research Experience for Undergraduates (REU)**  
• Grant for undergraduate students conducting research with a faculty mentor.  
• Project: “Mathematical Modeling of Adaptive Therapy in Prostate Cancer”. Mentor: Frederick Adler.

## SERVICE

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- 2023 **Session Chair** *INFORMS Annual Meeting*  
Session: Nonlinear Optimization in Machine Learning.
- 2023 **Session Organizer** *SIAM Conference on Optimization*  
Session: Nonlinear Optimization and Applications.
- 2023 **Session Chair** *NEDSI Annual Conference*  
Session: Land, Sand, and Plastic Management.
- 2022 **Panelist** *Drexel University*  
Session: Teaching Assistance Orientation Session.
- 2019 **Mathematics Tutor - Volunteer** *Utah Prison Education Project*  
Tutored students who are incarcerated in a Salt Lake Community College math course.

## ORGANIZATIONS

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**AAAI:** Association for the Advancement of Artificial Intelligence

**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  
✉ adler [at] math [dot] utah [dot] edu