

Cassidy K. Buhler (she/her)

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in cassie-buhler

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EDUCATION

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

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. 21 932–21 939. [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

Doctoral Research Fellow

Drexel University | Decision Sciences & MIS Department

09/2019 – 06/2024

- 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

University of Utah | Mathematics Department

08/2018 – 08/2021

- 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

United States Air Force | Hill Air Force Base

05/2018 – 08/2018

- 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

PROGRAMMING

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

OPTIMIZATION SOFTWARE

Software	Applications
GUROBI	Quadratic Programming Linear Programming
Pyomo	Mixed-Integer Nonlinear Programming Derivative-Free Optimization
CVX	Convex Optimization
CPLEX	Integer Programming Linear Programming
AMPL	Nonlinear Programming

COURSEWORK

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

PRESENTATIONS

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

AWARDS & GRANTS

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

AWARDS & GRANTS (CONTINUED)

- 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

- 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

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

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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