Cassidy K. Buhler (she/her)

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Education

2024 **Ph.D. Operations & Business Analytics** — **Drexel University**, Philadelphia, PA
Minor: Computational Data Science
Thesis: Advances in Optimization with Applications to Nature Conservation
Expected Graduation: June 2024

2019 **B.S. Mathematics** — **University of Utah**, Salt Lake City, UT
Statistics Emphasis

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

2019 – Present **Doctoral Research Fellow** — **Drexel University**
Department of Decision Sciences & MIS

- Led research projects that applied optimization methods and models to address challenges in 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.

2018 – 2021 **Research Assistant** — **University of Utah**
Department of Mathematics

- Developed math models to study 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.

Research (continued)

2018 **Computer Scientist Intern** **United States Air Force**
Hill Air Force Base
- Conducted research related to improving software for USAF aircraft in the Software Engineering Group.
- Hired under the Premier College Intern Program and earned a position in the PALACE Acquire program.

Teaching

2019 – Present **Instructor** **Drexel University**
Department of Decision Sciences & MIS
- Created, organized, and delivered instructional materials for undergraduate and PhD classes/workshops.
- Earned two student-nominated awards for teaching performance, along with course evaluation scores above the college and department average.

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)*

2020 – Present **Teaching Assistant** **Drexel University**
Department of Decision Sciences & MIS
- 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
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)*

2018 – 2019 **Computer Lab & Mathematics Assistant** **University of Utah**
T. Benny Rushing Mathematics Student Center
- Provided math and programming assistance for undergraduate classes.
- 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

Awards & Grants

2024 **NCEAS Travel Grant**
National Center for Ecological Analysis and Synthesis (NCEAS)
- Funding to attend the *Environmental Data Science Summit* hosted by *NCEAS* at UC Santa Barbara.

2023 **Rising Scholar**
MIT Sloan School of Management
- Selected from a competitive pool of Ph.D. and postdoctoral scholars to present research at the *Rising Scholars Conference* hosted by *MIT Sloan*.
- One of the first from Drexel University, out of the 225+ Rising Scholars from 2020-2023 cohorts.

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 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**
Society for Industrial and Applied Mathematics (SIAM)
- Funding to present at the *2023 SIAM Conference on Optimization* in Seattle, WA.

2023 **ESIIL Travel Grant**
Environmental Data Science Innovation & Inclusion Lab (ESIIL)
- Funding to attend the *Innovation Summit* hosted by the *ESIIL* at CU Boulder.

2022 **Teaching Assistant Excellence Award**
Drexel University
- Graduate students who exhibit an exemplary commitment to student learning, based on nominations and evaluations from undergraduate students and faculty.

2021 **Teaching Assistant Excellence Award (Highly Commended)**
Drexel University
- Graduate students who exhibit an exemplary commitment to student learning, based on nominations and evaluations from undergraduate students and faculty. Finalists are recognized as "highly commended".

2021 **SIAM Student Travel Award**
Society for Industrial and Applied Mathematics (SIAM)
- Funding to present at the *2021 SIAM Conference on Optimization*.

2019 **Undergraduate Research Scholar**
University of Utah
- Awarded to students who conducted 2 semesters of research, presented at the *Undergraduate Research Symposium*, and published in the *Undergraduate Research Journal*.

2019 **Research Experience for Undergraduates (REU)**
University of Utah
- Grant for undergraduate students conducting research with a faculty member.
- Advisor: Professor Frederick Adler.
- Project: "Mathematical Modeling of Adaptive Therapy in Prostate Cancer".

Presentations

2024 **AAAI Conference on Artificial Intelligence (AAAI-24)**
Vancouver, BC, Canada.
- Poster: Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs.

2023 **MIT Sloan Rising Scholars Conference**
Cambridge, MA (Virtual)
- Talk: Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs.

2023 **INFORMS Annual Meeting**
Phoenix, AZ.
- Talk: Decision-making for land conservation: A derivative-free optimization framework with nonlinear inputs.

2023 **SIAM Conference on Optimization (OP23)**
Seattle, WA.
- Talk: Reserve design in biodiversity conservation.

Presentations (continued)

2023 **NEDSI Annual Conference**
Washington, D.C.
- Talk: Optimal land conservation decisions for multiple species.

2021 **INFORMS Annual Meeting**
Anaheim, CA. (Virtual)
- Talk: Regularized step directions in conjugate gradient minimization for machine learning.

2021 **SIAM Conference on Optimization (OP23)**
Virtual.
- Talk: Conjugate gradient methods for machine learning.

2020 **INFORMS Annual Meeting**
Virtual.
- Talk: Efficient solution of portfolio optimization problems via dimension reduction & sparsification.

Service

2023 **Session Chair**
INFORMS Annual Meeting
- Nonlinear Optimization in Machine Learning Session.

2023 **Session Organizer**
SIAM Conference on Optimization
- Nonlinear Optimization and Applications Minisymposium.

2023 **Session Chair**
NEDSI Annual Conference
- Land, Sand, and Plastic Management Session.

2022 **Panelist**
Drexel University
- Teaching Assistance Orientation Session.

2019 **Volunteer Tutor**
Utah Prison Education Project
- Provided tutoring for a Salt Lake Community College math course to students who are incarcerated.

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

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Drexel University
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Frederick Adler, *Undergraduate Research Advisor*
Professor of Biology and Mathematics
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University of Utah
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