Cassidy K. Buhler (she/her)

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Education

Ph.D. Operations & Business Analytics, *Computational Data Science Minor* — Philadelphia, PA
Drexel University — 09/2019 – 06/2024 (Expected)
Thesis: Advances in Optimization with Applications to Nature Conservation

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

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

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)** *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.

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 (OP21)** *Virtual.*
Talk: Conjugate gradient methods for machine learning.

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

Awards & Grants

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

2023 **MIT Sloan Rising Scholar**
- Ph.D. and postdoctoral scholars selected to speak at the *Rising Scholars Conference* hosted by *MIT Sloan School of Management*.

2023 **Drexel University Graduate Student Travel Subsidy Award**
- Funding to present at the *2023 INFORMS Annual Meeting* in Phoenix, AZ.

2023 **Drexel University DEI & Environment and Sustainability Innovation Micro-Grant**
- 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**
- Funding to present at the *2023 SIAM Conference on Optimization* 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