

# Cassidy K. Buhler (she/her)

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in cassie-buhler

🐙 cassiebuhler.github.io/

🐙 cassiebuhler

## EDUCATION

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|------|--|---|
| 2024 | <b>Ph.D. Operations &amp; Business Analytics</b><br><b>Minor: Computational Data Science</b><br>Thesis: Advances in Optimization with Applications to Nature Conservation<br><i>Expected Graduation: June 2024</i> | <b>Drexel University</b><br>Philadelphia, PA    |
| 2019 | <b>B.S. Mathematics</b><br><i>Statistics Emphasis</i>  | <b>University of Utah</b><br>Salt Lake City, UT |

## 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

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|----------------|---|---------------------------|
| 2019 – Present | <b>Doctoral Research Fellow</b><br><i>Department of Decision Sciences &amp; MIS</i> <ul style="list-style-type: none"><li>• Led research projects that applied optimization methods and models to address challenges in machine learning and land conservation.</li><li>• 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.</li><li>• 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.</li></ul> | <b>Drexel University</b>  |
| 2018 – 2021    | <b>Research Assistant</b><br><i>Department of Mathematics</i> <ul style="list-style-type: none"><li>• Developed math models to study the response of castration-resistant prostate cancer under various treatment regimens.</li><li>• Simulated biological dynamics as differential equations, formulating models with differing mechanism complexity.</li><li>• Evaluated modern treatment regimens under this scheme and disseminated findings to academic and medical audiences.</li></ul>   | <b>University of Utah</b> |

## 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 – **Instructor** **Drexel University**  
Present *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 – **Teaching Assistant** **Drexel University**  
Present *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
BSAN 601: Business Analytics for Managers	MBA	Spring 2024	-
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 – **Computer Lab & Mathematics Assistant** **University of Utah**  
2019 *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

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### 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

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

### OPTIMIZATION SOFTWARE

Software	Applications
<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

Subject	Courses
<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

## AWARDS & GRANTS

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- 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)

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- 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

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- 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)

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- 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

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- 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

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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  
✉ hvb22 [at] drexel [dot] edu

**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