

## Madeleine Udell

227 Frank H.T. Rhodes Hall  
207 Hoy Road, Ithaca NY 14853  
415-729-4115  
udell@cornell.edu

<https://people.orie.cornell.edu/mru8/>

- Academic Employment**     **Cornell University**     Ithaca, NY  
Assistant Professor, Richard and Sybil Smith Sesquicentennial Fellow     July 2016 –  
Department of Operations Research and Information Engineering Graduate field member  
in Operations Research, Computer Science, Applied Mathematics, and Electrical and Com-  
puter Engineering
- California Institute of Technology**     Pasadena, CA  
Postdoctoral Fellow, Center for the Mathematics of Information     June 2015 – June 2016
- Education**     **Stanford University**     Stanford, CA  
Ph.D. in Computational and Mathematical Engineering     June 2015  
GPA: 4.0.  
Thesis: *Generalized Low Rank Models*. Advisor: Stephen Boyd.
- Yale University**     New Haven, CT  
B.S. in Mathematics and Physics     June 2009  
*Summa cum Laude*, with honors in mathematics and honors in physics.  
GPA: 3.95.  
Thesis: *Local Parametrizations via Laplacian Eigenfunctions*. Advisor: Peter W. Jones.
- Papers**
- J. Chen, N. Kallus, X. Mao, G. Svacha, and M. Udell. Fairness under unawareness: As-  
sessing disparity when protected class is unobserved. In *FAT\*: Conference on Fairness,  
Accountability, and Transparency*, 2019.
- Y. Sun, Y. Guo, J. A. Tropp, and M. Udell. Tensor random projection for low memory  
dimension reduction. 2018.
- Y. Sun, Y. Guo, C. Luo, J. A. Tropp, and M. Udell. A sketching-based tensor approximation  
algorithm for streaming data. 2018.
- J. A. Tropp, A. Yurtsever, M. Udell, and V. Cevher. More practical sketching algorithms  
for low-rank matrix approximation. Technical Report 2018-01, California Institute of Tech-  
nology, Pasadena, California, 2018.
- C. Yang, Y. Akimoto, D. W. Kim, and M. Udell. OBOE: Collaborative filtering for automl  
initialization. *arXiv preprint arXiv:1808.03233*, 2018.
- S. Zhou, S. Gupta, and M. Udell. Limited memory kelly’s method converges for composite  
convex and submodular objectives. In *Advances in Neural Information Processing Systems*,  
2018.
- N. Kallus, X. Mao, and M. Udell. Causal inference with noisy and missing covariates via  
matrix factorization. In *Advances in Neural Information Processing Systems*, 2018.
- Sengupta, Nandana, M. Udell, N. Srebro, and J. Evans. Matrix factorization for missing  
value imputation and sparse data reconstruction. *In preparation*, 2017.
- L. Ding and M. Udell. Frank-wolfe style algorithms for large scale optimization. In *Large-  
Scale and Distributed Optimization*. Springer, 2018.

- M. Udell and O. Toole. Optimal design of efficient rooftop photovoltaic arrays. *Under revision at INFORMS Interfaces*, 2017.
- J. A. Tropp, A. Yurtsever, M. Udell, and V. Cevher. Fixed-rank approximation of a positive-semidefinite matrix from streaming data. In *Advances in Neural Information Processing Systems*, 2017.
- M. Udell and A. Townsend. Why are big data matrices approximately low rank? *SIAM Mathematics of Data Science (SIMODS)*, to appear, 2018.
- M. Paradkar and M. Udell. Graph-regularized generalized low rank models. In *CVPR Workshop on Tensor Methods in Computer Vision*, 2017.
- A. Yurtsever, M. Udell, J. A. Tropp, and V. Cevher. Sketchy decisions: Convex low-rank matrix optimization with optimal storage. In *International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2017.
- X. Shen, S. Diamond, M. Udell, Y. Gu, and S. Boyd. Disciplined multi-convex programming. In *Chinese Control and Decision Conference (CCDC)*, 2017.
- N. Kallus and M. Udell. Dynamic assortment personalization in high dimensions. *Under revision at Operations Research*, 2016.
- J. A. Tropp, A. Yurtsever, M. Udell, and V. Cevher. Practical sketching algorithms for low-rank matrix approximation. *SIAM Journal of Matrix Analysis and Applications (SIMAX)*, 38(4):1454–1485, 2017.
- D. Davis, B. Edmunds, and M. Udell. The sound of APALM clapping: Faster nonsmooth nonconvex optimization with stochastic asynchronous PALM. In *Advances in Neural Information Processing Systems*, 2016.
- A. Schuler, V. Liu, J. Wan, A. Callahan, M. Udell, D. Stark, and N. Shah. Discovering patient phenotypes using generalized low rank models. *Pacific Symposium on Biocomputing (PSB)*, 2016.
- N. Kallus and M. Udell. Revealed preference at scale: Learning personalized preferences from assortment choices. In *The 2016 ACM Conference on Economics and Computation*, New York, NY, USA, 2016. ACM.
- N. Kallus and M. Udell. Learning preferences from assortment choices in a heterogeneous population. In *ICML Workshop on Computational Frameworks for Personalization*, 2016.
- M. Udell. Generalized low rank models, 2015.
- H. Mehmood, M. Udell, and J. Cioffi. Revenue maximization for broadband service providers using revenue capacity. *IEEE Global Communications Conference*, 2015.
- M. Udell and S. Boyd. PCA on a data frame, 2015.
- M. Udell and S. Boyd. Beyond principal component analysis (PCA). *Biomedical Computation Review*, 2014.
- M. Udell, K. Mohan, D. Zeng, J. Hong, S. Diamond, and S. Boyd. Convex optimization in Julia. *SC14 Workshop on High Performance Technical Computing in Dynamic Languages*, 2014.
- E. Lee, M. Udell, and S. Wong. Factorization for analog-to-digital matrix multiplication. *ICASSP*, 2015.

- M. Udell, C. Horn, R. Zadeh, and S. Boyd. Generalized low rank models. *Foundations and Trends in Machine Learning*, 9(1), 2016.
- M. Udell, C. Horn, R. Zadeh, and S. Boyd. Generalized low rank models. *NIPS Workshop on Distributed Machine Learning and Matrix Computations*, 2014.
- M. Udell and S. Boyd. Maximizing a sum of sigmoids, 2013.
- M. Udell and S. Boyd. Bounding duality gap for separable problems with linear constraints. *Computational Optimization and Applications*, 64(2):355–378, 2016.
- P. LePendu, Y. Liu, S. Iyer, M. Udell, and N. Shah. Analyzing patterns of drug use in clinical notes for patient safety. *Proceedings of the AMIA Summits on Translational Science*, 2012:63, 2012.
- M. Udell and R. Takapoui. Linear bandits, matrix completion, and recommendation systems. *NIPS Workshop on Large Scale Matrix Analysis and Inference*, 2013.
- E. Birch, M. Udell, and M. Covert. Incorporation of flexible objectives and time-linked simulation with flux balance analysis. *Journal of Theoretical Biology*, 345:12–21, 2014.

<b>Software</b>	<b>LowRankModels.jl</b>	2014
	<i>Software for generalized low rank models in Julia</i>	
	<a href="http://www.github.com/madeleineudell/LowRankModels.jl">www.github.com/madeleineudell/LowRankModels.jl</a>	
	<b>Convex.jl</b>	2014
	<i>Software for convex optimization in Julia.</i>	
	<a href="http://www.github.com/cvxgrp/Convex.jl">www.github.com/cvxgrp/Convex.jl</a>	
<b>Software</b>	<b>SigmoidalProgramming.jl</b>	2014
	<i>Software for sigmoidal programming in Julia.</i>	
	<a href="http://www.github.com/madeleineudell/SigmoidalProgramming.jl">www.github.com/madeleineudell/SigmoidalProgramming.jl</a>	
	<b>ParallelSparseMatMul.jl</b>	2014
	<i>Software for shared-memory parallel sparse matrix multiplication in Julia.</i>	
	<a href="http://www.github.com/madeleineudell/ParallelSparseMatMul.jl">www.github.com/madeleineudell/ParallelSparseMatMul.jl</a>	
<b>Software</b>	<b>SigOpt</b>	2012
	<i>Software for sigmoidal programming in Python.</i>	
	<a href="http://www.github.com/cvxgrp/sigopt">www.github.com/cvxgrp/sigopt</a>	
	<b>Patents</b>	<b>M. Udell and O. Toole. Optimal Design of Residential Photovoltaic Arrays.</b>
	<i>Application No. 62/400,542, filed on September 27, 2016.</i>	
<b>Industry Experience</b>	<b>Technical Advisor</b>	Santa Monica, CA
	<i>Retina AI</i>	Fall 2017 –
	Advised on technical solutions for problems in e-commerce, including retention analysis, sales force optimization, and customer segmentation.	
	<b>Technical Advisor</b>	Palo Alto, CA
	<i>Aurora Solar</i>	Fall 2014 –
	Designed optimization algorithms tailored for problems in the solar industry, including design of efficient rooftop photovoltaic array configurations. Compared to designs produced by solar installation experts, the resulting optimized designs deliver the same energy output at lower cost for more than 70% of homes.	
<b>Industry Experience</b>	<b>Senior Research Scientist</b>	San Francisco, CA
	<i>Qadium</i>	Fall 2012 – Spring 2015

Won grants exceeding \$6.5M from DARPA for research in data analytics and cybersecurity.

**Lead Data Scientist** Arlington, VA  
*DARPA (via Data Tactics)* Summer 2012 – Spring 2013  
Wrote 3 white papers to define mission for \$100M DARPA cybersecurity program.

**Data Scientist** Chicago, IL  
*Obama for America* Fall 2011  
Analyzed graph of 70M Facebook users to identify potential donors and target voter registration campaign.

**Research Scientist** San Mateo, CA  
*Apixio* Summer 2011  
Developed a tool to extract structured information about diseases from the unstructured text of doctors notes.

**Sales and Trading Strategist** New York, NY  
*Goldman Sachs* Summer 2009  
Corrected model of commodities derivatives risk using multiple parameter estimation.

**Market Risk Management Analyst** New York, NY  
*Goldman Sachs* Summer 2008  
Designed and automated a system to evaluate and graph mutual fund risk.

**Teaching** **CS+ORIE+STSCI 1380: Data Science for All** Cornell University  
*Co-instructor* Spring 2018

**ORIE 6326: Convex Optimization** Cornell University  
*Instructor* Spring 2017

**ORIE 4741: Learning with Big Messy Data** Cornell University  
*Instructor* Fall 2016-7

**EE 364b: Convex Optimization II** Stanford University  
*Teaching assistant* Spring 2014

**CVX 101: Convex Optimization** EdX Stanford  
*Head teaching assistant* Winter 2014  
Taught 10,000 students worldwide.

**EE 364a: Convex Optimization I** Stanford University  
*Instructor* Summer 2013

**EE 364a: Convex Optimization I** Stanford University  
*Teaching Assistant* Winter 2012

**CME Refresher Course: Discrete Math and Algorithms** Stanford University  
*Instructor* September 2011, September 2012

**CME 305: Discrete Mathematics and Algorithms** Stanford University  
*Teaching Assistant* Winter 2011

**Service** **CAM PhD Admissions Committee** Cornell University  
*Committee Member* 2018

**ORIE Curriculum Review Committee** Cornell University  
*Committee Member* 2017-2018

**ORIE PhD Admissions Committee** Cornell University  
*Committee Member* 2016, 2017

**Committee on the Future of the School of Engineering** Stanford University

*Committee Member* *Fall 2014 – Spring 2015*  
Represented all engineering doctoral students on faculty committee.  
Collaborated on proposal addressing faculty hiring and development, research themes and centers, space and facilities, education and outreach, and interdisciplinary research.

**JuliaOpt** Github  
*Co-owner* *Fall 2014 –*  
The JuliaOpt organization curates high quality optimization software in the Julia language.

**C<sup>2</sup> Computational Consulting** Stanford University  
*Consultant* *Fall 2011 – Spring 2015*  
Helped researchers across the university (in physics, computer science, neuroscience, law, immunology, ...) formulate and solve numerical problems.

**EE Faculty Search Committee** Stanford University  
*Committee Member* *Fall 2014 – Spring 2015*  
Student member on Electrical Engineering broad area search committee.

**Information Systems Laboratory Colloquium** Stanford University  
*Coordinator* *Winter 2012 – Spring 2013*  
Invited and hosted academic speakers for weekly seminar series.

**Committee on Graduate Studies** Stanford University  
*Committee Member* *Fall 2011 – Spring 2013*  
Debated and decided policies for all graduate students at Stanford.  
Approved and reauthorized interdisciplinary graduate programs.

**Graduate Student Housing** Stanford University  
*Community Associate* *Winter 2011 – Spring 2013*  
Planned and led events for 800 graduate students.

**Judicial Affairs** Stanford University  
*Juror* *Fall 2009 – Spring 2010*

**Grants**

**NSF Transdisciplinary Research in Principles of Data Science (TRIPODS) institute** 2017  
Won grant as co-PI to establish TRIPODS institute at Cornell University

**Cornell: Digital Agriculture** 2017  
Won grant for \$214K over three years as co-PI

**DARPA: Composable Robust Structured Data Inference** 2017  
Won grant for \$1.4M over four years as single PI

**Cornell: Cornell Tech Faculty Exchange Grant** 2016  
Won grant for \$3K over one year as co-PI

**Awards**

**Douglas Whitney '61 Engineering Teaching Excellence Award**, Cornell University 2018

**Doing Good with Good OR Student Paper Competition**, INFORMS 2017  
*Second place, for Optimal design of efficient rooftop photovoltaic arrays.*

**Center for the Mathematics of Information Postdoctoral Fellowship** 2015  
California Institute of Technology

**Gerald J. Lieberman Fellowship**, Stanford University 2014  
*Awarded to doctoral students demonstrating the potential to become academic leaders.  
(12 Lieberman Fellows are selected among all doctoral candidates at Stanford each year.)*

**Best Force Multiplier**, DARPA PlanX 2013

**Graduate Research Fellowship**, National Science Foundation 2010

**Gabilan Graduate Fellowship**, Stanford University 2009

<b>Phi Beta Kappa</b> , Yale University	2009
<b>Henry Edwards Ellsworth Prize</b> , Yale University	2009
<i>Awarded for the best senior thesis research paper in the sciences.</i>	
<b>Howard L. Schultz Prize</b> , Yale University	2009
<i>Awarded for excellence, inventiveness and good taste in experimental physics.</i>	
<b>Deforest Senior Mathematical Prize</b> , Yale University	2009
<i>Awarded for proficiency in pure and applied mathematics.</i>	
<b>Marshall Scholarship Finalist</b> , Yale University	2009
<b>Churchill Scholarship Finalist</b> , Yale University	2009
<b>US Physics Olympics Team Member</b>	2005

**Talks and posters**

<b>Rutgers Optimization Seminar</b> , New Brunswick	2018
<i>Low Memory Convex Optimization</i>	
<b>Princeton Optimization Seminar</b> , Princeton	2018
<i>Low Memory Convex Optimization</i>	
<b>UC Davis Mathematics of Data and Decisions Seminar</b> , Davis	2018
<i>Big Data is Low Rank</i>	
<b>Georgia Tech OR Colloquium</b> , Atlanta	2018
<i>Big Data is Low Rank</i>	
<b>Stanford Linear Algebra and Optimization Seminar</b> , Stanford	2018
<i>Low Memory Convex Optimization</i>	
<b>ISMP</b> , Bordeaux	2018
<i>Sketchy Decisions: Convex Optimization with Optimal Storage</i>	
<b>Ecole Polytechnique: Statistics Special Seminar</b> , Paris	2018
<i>Big Data is Low Rank</i>	
<b>DARPA D3M Workshop</b> , Arlington	2018
<i>Composable Robust Structured Data Inference: AutoML, Causal Inference, Big Data is Low Rank</i>	
<b>AI in advancement</b> , Cornell	2018
<i>Panel Discussion</i>	
<b>Penn State OR Colloquium</b> , State College, PA	2018
<i>Big Data is Low Rank</i>	
<b>Cornell Engineering College Council</b> , New York,	2017
<i>The New Educational Paradigm: Data Science</i>	
<b>INFORMS</b> , Houston	2017
<i>Optimal Design of Rooftop Photovoltaic Arrays</i>	
<b>SIMONS Institute</b> , Berkeley	2017
<i>Sketchy Decisions: Convex Optimization with Optimal Storage</i>	
<b>MIT ORC Seminar</b> , Cambridge, MA	2017
<i>Sketchy Decisions: Convex Optimization with Optimal Storage</i>	
<b>Capital One Tech Talk</b> , New York	2017
<i>Low Rank Models for Automatic Machine Learning and Interpretability</i>	
<b>Schonfeld Quantitative Conference</b> , New York	2017
<i>Convex Optimization Modeling</i>	
<b>STRATA</b> , New York	2017
<i>Generalized Low Rank Models</i>	
<b>Two Sigma Tech Talk</b> , New York	2017
<i>Generalized Low Rank Models</i>	
<b>CATALYST Academy Field Session: Operations Research</b> , Cornell	2017
<i>Outreach session to introduce URM high school students to the discipline of OR</i>	
<b>CURIE Academy Field Session: Operations Research</b> , Cornell	2017
<i>Outreach session to introduce female high school students to the discipline of OR</i>	
<b>JuliaCon</b> , Berkeley	2017

<i>Julia: the Type of Language for Mathematical Programming</i>	2017
<b>LCCC workshop on Distributed Optimization (Invited)</b> , Lund	2017
<i>Sketchy Decisions: Convex Optimization with Optimal Storage</i>	
<b>UW Optimization Seminar</b> , Seattle	2017
<i>Sketchy Decisions: Convex Optimization with Optimal Storage</i>	
<b>SIOPT</b> , Vancouver	2017
<i>Sketchy Decisions: Convex Optimization with Optimal Storage</i>	
<b>DARPA D3M Kickoff</b> , Arlington	2017
<i>Composable Robust Structured Data Inference</i>	
<b>Optimization Under Uncertainty Workshop</b> , Duke	2017
<i>Sketchy Decisions: Convex Optimization with Optimal Storage</i>	
<b>Yale Alumni in Science and Engineering Talk</b> , New York	2017
<i>Filling in Missing Data: Elections, ———, Healthcare.</i>	
<b>NYU Numerical Analysis Seminar</b> , New York	2017
<i>Sketchy Decisions: Convex Optimization with Optimal Storage</i>	
<b>Goldman Sachs Tech Talk</b> , New York	2017
<b>CS Brown-Bag Colloquium</b> , Cornell	2017
<b>MIIS (Tutorial and Invited Talk)</b> , Chinese University of Hong Kong, Shenzhen	2016
<b>NIPS</b> , Barcelona	2016
<b>INFORMS</b> , Nashville	2016
<b>SCAN Seminar</b> , Cornell	2016
<b>CAM Colloquium</b> , Cornell	2016
<b>ICCOPT</b> , Tokyo	2016
<b>SIAM Annual Meeting</b> , Boston	2016
<b>JPL Seminar</b> , Pasadena	2016
<b>DARPA ISAT Workshop on the Future of Storage</b> , New York	2016
<b>Kaiser Permanente</b> , Oakland	2016
<b>TDA 2016</b> , Leuven	2016
<b>CMI Seminar (I)</b> , California Institute of Technology	2015
<b>CMI Seminar (II)</b> , California Institute of Technology	2015
<b>DARPA SIMPLEX program meeting</b> , Stanford University	2015
<b>H2O World</b> , Santa Clara	2015
<b>Uber Tech Talk</b> , San Francisco	2015
<b>INFORMS</b> , Philadelphia	2015
<b>Applied Math Seminar</b> , UCLA	2015
<b>Sandia National Lab Seminar</b> , Livermore	2015
<b>ISMP</b> , Pittsburgh	2015
<b>Optimization in Julia</b> , JuliaCon, Cambridge	2015
<b>Google Tech Talk</b> , Mountain View	2015
<b>Biomedical Informatics Seminar</b> , Stanford University	2015
<b>Palantir Tech Talk</b> , Palo Alto	2015
<b>Twitter Tech Talk</b> , San Francisco	2015
<b>ICME PhD Oral Examination</b> , Stanford University	2015
<b>H2O Tech Talk</b> , Santa Clara	2015
<b>Civis Analytics Tech Talk</b> , Chicago	2015
<b>TTIC Seminar</b> , Toyota Technical Institute of Chicago	2015
<b>IBM T. J. Watson Research Seminar</b> , Yorktown Heights	2015
<b>Hutchin Hill Capital Seminar</b> , New York	2015
<b>ORIE Seminar</b> , Cornell University	2015
<b>IEOR Seminar</b> , UC Berkeley	2015
<b>CMS Seminar</b> , California Institute of Technology	2015
<b>Heinz College Seminar</b> , Carnegie Mellon University	2015
<b>Mobilize Seminar</b> , Stanford University	2014

<b>Distributed Machine Learning Workshop</b> , NIPS, Montreal	2014
<b>HPTCDL Workshop</b> , SC14, New Orleans	2014
<b>INFORMS</b> , San Francisco	2014
<b>ICME Seminar</b> , Stanford University	2014
<b>Bay Area Julia Users Meetup</b> , San Francisco	2014
<b>BlackRock SAE Tech Talk</b> , Stanford University	2014
<b>Modern Massive Data Sets (MMDS)</b> , UC Berkeley	2014
<b>JuliaCon</b> , Chicago	2014
<b>Verizon Labs Tech Talk</b> , Palo Alto	2014
<b>IPAM Workshop on Mathematics of Politics</b> , UCLA	2013
<b>Workshop on Large Matrices</b> , NIPS, Lake Tahoe	2013
<b>IPAM Workshop on Optimization</b> , UCLA	2013
<b>ICME Seminar</b> , Stanford University	2013
<b>Marin Software Tech Talk</b> , San Francisco	2013
<b>Political Psychology Research Seminar</b> , Stanford University	2013
<b>ICME Student Seminar</b> , Stanford University	2010

**Languages**    **Scripting:** Python, Julia, R, Matlab, Bash, Javascript  
**Text:** L<sup>A</sup>T<sub>E</sub>X, Jupyter notebooks, Google docs, Microsoft Office  
**Parallel computing:** Python, Julia, Spark, Hadoop  
**Workflow:** Git, GitHub, BitBucket  
**Human:** English, French, Spanish, Italian

**Numbers**    **Erdős number:** 3  
**Bacon number:** 3  
**Erdős-Bacon number:** 6

**Hobbies**    Harp, backpacking, barefoot running, foraging, ergonomics, carbon sequestration.