Stephen Becker

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***Research topics**: optimization, machine learning, signal processing, imaging, inverse problems in quantum information, PDE-constrained optimization, tensor factorizations, and randomized numerical linear algebra*

Date: 2/17/2023

Education

California Institute of Technology **Pasadena, CA**
Ph.D., Applied & Computational Mathematics *2005–2011*
Advisor: Emmanuel Candès

Wesleyan University **Middletown, CT**
B.A.'s, Math (high honors), and physics (high honors) *2001–2005*
Physics thesis advisor: Francis Starr. Mathematics honors talk advisor: Wai Kiu "Billy" Chan.
Included study abroad in "Budapest Semesters in Math," 2003

Academic Positions

Institut Montpelliérain Alexander Grothendieck (IMAG) **Montpellier, France**
Visitor (unpaid), University of Montpellier *Fall 2022*
During sabbatical from CU Boulder

University of Colorado **Boulder, CO**
Associate Professor, Dept. Applied Math *2021–present*
Prof. in Electrical Engineering by courtesy

University of Colorado **Boulder, CO**
Assistant Professor, Dept. Applied Math *2014–2021*
Prof. in Electrical Engineering by courtesy

IBM Research **T. J. Watson research center, Yorktown Heights, NY**
Goldstine Postdoctoral Fellow *2013–2014*

Fond. Sciences Math. de Paris **Laboratoire Jacques-Louis Lions, Paris, France**
Postdoctoral Fellow, UPMC Paris 6 *2011–2013*
Prof. Patrick Combettes (host)

Papers and talks

A dagger† indicates a student author. Reverse chronological order.

Journal publications (published or in press)

39. *Comparison of spatial encodings for ultrasound imaging*, N. Bottenus, J. Spainhour†, S. Becker. **IEEE**

Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, 70(1) pp 52–63. DOI link

38. *Modeling massive multivariate spatial data with the basis graphical lasso*, M. Krock, W. Kleiber, D. Hammerling, S. Becker, **Journal of Computational and Graphical Statistics**, 2023. arXiv #2101.02404, DOI link

37. *Spectral estimation from simulations via sketching*, Z. Huang†, S. Becker, in **J. Computational Physics** vol 447, Dec 2021, 110686. arXiv #2007.11026, DOI link

36. *A study of scalar optically-pumped magnetometers for use in magnetoencephalography without shielding*, R. Clancy†, V. Gerginov, O. Alem, S. Becker, and S. Knappe; in **Physics in Medicine and Biology** vol 66 175030, Sept 2021. arXiv #2105.02316, DOI link

35. *A stochastic subspace approach to gradient-free optimization in high dimensions*, D. Kozak†, S. Becker, A. Doostan, L. Tenorio, in **Computational Optimization and Applications**, vol 79 pp 339–368, 2021. arXiv #2003.02684, earlier version arXiv #1904.01145, DOI link

34. *Bounds for the tracking error of first-order methods for time-varying optimization*, L. Madden†, S. Becker, E. Dall'Anese, in **J. Optimization Theory and Applications**, vol 189 pp 437–457, 2021. arXiv #2003.02400, DOI link

33. *ℓ_1-regularized maximum likelihood estimation with focused-spot illumination quadruples the diffraction-limited resolution in fluorescence microscopy*, J. Xing, S. Chen, S. Becker, J.-Y. Yu, C. Cogswell, **Optics Express** 28(26) 39413–39429, 2020. DOI link

32. *Randomization of Approximate Bilinear Computation for Matrix Multiplication*, O. Malik†, S. Becker, Nov 2020 to **International Journal of Computer Mathematics: Computer Systems Theory** (IJCM:CST), vol 46(76). arXiv #1905.07439, DOI link

31. *Fast Randomized Matrix and Tensor Interpolative Decomposition Using CountSketch*, O. Malik†, S. Becker, **Advances in Computational Mathematics**, vol 46 (76) 2020. arXiv #1901.10559, DOI link

30. *Nonstationary Modeling With Sparsity for Spatial Data via the Basis Graphical Lasso*, M. Krock, W. Kleiber, S. Becker, **J. Computational and Graphical Statistics**, 2020. arXiv #1902.06877, DOI link

29. *Resolvability of Hamming Graphs*, L. Laird, R. Tillquist, S. Becker, M. Lladser, **SIAM J. Discrete Mathematics**, vol 34(4), pp. 2063–2081, 2020. arXiv #1907.05974, DOI link

28. *Robust Least Squares for Quantized Data Matrices*, R. Clancy†, S. Becker, **Signal Processing**, vol 176, Nov 2020. arXiv #2003.12004, DOI link

27. *Analyzing the super-resolution characteristics of focused-spot illumination approaches*, J.-Y. Yu, V. Narumanchi, S. Chen, J. Xing, S. Becker, C. Cogswell, **Journal of Biomedical Optics**, vol 25(5), 056501, 2020. DOI link

26. *Guarantees for the Kronecker Fast Johnson-Lindenstrauss Transform Using a Coherence and Sampling Argument*, O. Malik†, S. Becker. **Linear Algebra and its Applications**, vol 602(1), pp. 120-127, October 2020. DOI link, arXiv #1911.08424

25. *Efficient Solvers for Sparse Subspace Clustering*, F. Pourkamali-Anaraki†, S. Becker, J. Folberth†, **Signal Processing**, 172(107548), July 2020. DOI link, arXiv #1804.06291

24. *Optimization and Learning with Information Streams: Time-varying Algorithms and Applications*, E. Dall'Anese, A. Simonetto, S. Becker, L. Madden†. **IEEE Signal Processing Magazine**, vol 37(3), pp. 71–83, May 2020. DOI link, arXiv #1910.08123

23. *Safe Feature Elimination for Non-Negativity Constrained Convex Optimization*, J. Folberth†, S. Becker, **J. Optimization Theory and Applications (JOTA)**, vol 184, pp. 931–952, 2020. DOI link, arXiv #1907.10831

22. *Improved Fixed-Rank Nystrom Approximation via QR Decomposition: Practical and Theoretical Aspects*, F. Pourkamali-Anaraki†, S. Becker, **Neurocomputing**, 363(21), pp. 261–272, 2019. DOI link, arXiv #1708.03218

21. *On Quasi-Newton Forward–Backward Splitting: Proximal Calculus and Convergence*, S. Becker, J. Fadili, P. Ochs, **SIAM J. Optimization** 29(4), 2445-2482, 2019. DOI link, arXiv #1801.08691

20. *Stochastic Lanczos estimation of genomic variance components for linear mixed models*, R. Border†, S. Becker. **BMC Bioinformatics**, 20(411), 2019, pp. 1–16. DOI link

19. *Adapting Regularized Low-Rank Models for Parallel Architectures*, D. Driggs†, A. Aravkin, S. Becker. **SIAM J. Scientific Computing** vol 41(1), pp. A163–A189, Jan 2019. DOI link, arXiv #1702.02241

18. *Template Polyhedra and Bilinear Optimization*, J. Gronski†, M.-A. Ben Sassi, S. Becker, S. Sankaranarayanan. **Formal Methods in System Design (FORM)**, 2018, pp. 1–37. DOI link

17. *Achieving superresolution with illumination enhanced sparsity*, J.-Y. Yu, S. Becker, J. Folberth†, B. F. Wallin, S. Chen, and C. J. Cogswell. **Optics Express** vol 26(8), pp. 9850–9865 (2018). DOI link

16. *Preconditioned Data Sparsification for Big Data with Applications to PCA and K-means*, F. Pourkamali-Anaraki†, S. Becker, **IEEE Trans. Info. Theory** vol 63(5), pp. 2954 – 2974 (2017). DOI link arXiv #1511.00152

15. *Efficient Adjoint Computation for Wavelet and Convolution Operators*, J. Folberth†, S. Becker, **IEEE Signal Processing Magazine**, vol 33(6), pp. 135–147 (2016). DOI link, arXiv #1707.02018

14. *Dual Smoothing Techniques for Variational Matrix Decomposition*, S. Becker and A. Aravkin, pp. 3-1 – 3-34, in "Robust Low-Rank and Sparse Matrix Decomposition: Applications in Image and Video Processing", T. Bouwmans, N. Aybat, E. Zahzah, eds. CRC Press, 2016. **(book chapter)** arXiv #1603.00284

13. *Designing Statistical Estimators That Balance Sample Size, Risk, and Computational Cost*, J. J. Bruer, J. A. Tropp, V. Cevher, S. Becker. **IEEE J. Selected Topics in Signal Processing**, 9 (2015), no. 4, 612–624. DOI link

12. *Convex optimization for big data: Scalable, randomized, and parallel algorithms for big data analytics*, V. Cevher, S. Becker, and M. Schmidt, **IEEE Signal Processing Magazine** 31 (2014), no. 5, 32–43. DOI link, arXiv #1411.0972

11. *An Algorithm for Splitting Parallel Sums of Linearly Composed Monotone Operators, with Applications to Signal Recovery*, S. Becker and P. L. Combettes, **J. Nonlinear and Convex Analysis** 15 (2014), no. 1, 137–159. arXiv #1305.5828

10. *Improving IMRT delivery efficiency with reweighted l1-minimization for inverse planning*, H. Kim, S. Becker, R. Lee, S. Lee, S. Shin, E. Candès, L. Xing, and R. Li, **Medical physics** 40 (2013), no. 7, 071719. DOI link

9. *A Compressed Sensing Parameter Extraction Platform for Radar Pulse Signal Acquisition*, J. Yoo, C. Turnes, E. Nakamura, C. Le, S. Becker, E. Sovero, M. Wakin, M. Grant, J. Romberg, A. Emami-Neyestanak, E. Candès, **IEEE J. Emerging Sel. Topics Circuits Systems (JETCAS)**, 2(3) pp. 626–638. 2012.

8. *A Non-Uniform Sampler for Wideband Spectrally-Sparse Environments*, M. Wakin, S. Becker, E. Nakamura, M. Grant, E. Sovero, D. Ching, J. Yoo, J. Romberg, A. Emami-Neyestanak, E. Candès, **IEEE J. Emerging Sel. Topics Circuits Systems (JETCAS)**, 2(3) pp. 516–529. 2012.

7. *Dynamical Behavior Near a Liquid–Liquid Phase Transition in Simulations of Supercooled Water*, P. H. Poole, S. R. Becker, F. Sciortino, F. W. Starr, **J. Physical Chemistry B**, Vol. 115 No. 48, August 2011. arXiv #1105.5295

6. *Templates for Convex Cone Problems with Applications to Sparse Signal Recovery*, S. Becker, E. Candès, M. Grant, **Mathematical Programming Computation**, Vol. 3 No. 3, July 2011, `http://tfocs.stanford.edu` arXiv #1009.2065

5. *NESTA: A Fast and Accurate First-order Method for Sparse Recovery*, S. Becker, J. Bobin, and E. Candès, **SIAM J. Imaging Sciences**, Vol. 4 No. 1, Jan 2011. DOI link, arXiv #0904.3367

4. *Quantum State Tomography via Compressed Sensing*, D. Gross, Y-K. Liu, S. Flammia, S. Becker, and J. Eisert, **Physical Review Letters**, Vol. 105 No. 15, October 2010. DOI link, arXiv #0909.3304

3. *Relation between the Widom line and the breakdown of the Stokes-Einstein relation in supercooled water*, P. Kumar, S.V. Buldyrev, S.R. Becker, P.H. Poole, F.W. Starr, and H.E. Stanley, **Proc. National Academy of Science**, Vol. 104, 9575–9579 (2007).

2. *Fractional Stokes-Einstein and Debye-Stokes-Einstein relations in a network forming liquid*, S. R. Becker, P.H. Poole and F. W. Starr, **Physical Review Letters**, Vol. 97 No. 5., August 2006.

1. *The Dynamics of Falling Dominoes*, S. Wagon, A. Pontarelli, S. Becker and W. Briggs, **UMAP Journal**, Vol. 26 No. 1, 2005, pp. 37–48.

Refereed Conference Papers (competitive journal-equivalent conferences, peer-reviewed)

10. *A Sampling Based Method for Tensor Ring Decomposition*, O. Malik†, S. Becker. International Conference on Machine Learning (**ICML**), 2021. arXiv #2010.08581

9. *Low-rank Tucker decomposition of large tensors using TensorSketch*, O. Malik†, S. Becker. Advances in Neural Information Processing Systems (**NIPS/NeurIPS**), Dec. 2018, Montreal, Canada.

8. *Randomized Clustered Nystrom for Large-Scale Kernel Machines*, F. Pourkamali-Anaraki†, S. Becker, M. Wakin. Conference on Artificial Intelligence **(AAAI)**, San Francisco, Feb 2018. arXiv #1612.06470

7. *Robust Compressed Least Squares*, S. Becker, M. Petrik, B. Kawas. Conference on Artificial Intelligence **(AAAI)**, San Francisco, Feb 6–9 2017. arXiv #1510.04905

6. *Time–data tradeoffs by aggressive smoothing*, J. J. Bruer, J. A. Tropp, V. Cevher, and S. Becker, Advances in Neural Information Processing Systems (**NIPS/NeurIPS**), 2014, pp. 1664–1672.

5. *QUIC & dirty: A quadratic approximation approach for dirty statistical models*, C.-J. Hsieh, I. S. Dhillon, P. K. Ravikumar, S. Becker, and P. A. Olsen, Advances in Neural Information Processing Systems (**NIPS/NeurIPS**), 2014.

4. *A variational approach to stable principal component pursuit*, A. Aravkin, S. Becker, V. Cevher, and P. Olsen, Uncertainty in Artificial Intelligence (**UAI**), (Quebec City), 2014. arXiv #1406.1089

3. *A proximal splitting method for inf-convolutive variational models in image recovery*, S. Becker and P. L. Combettes, *accepted in* International Conference on Image Processing (**ICIP**), (September 2013, Melbourne).

2. *Sparse Projections onto the Simplex*, S. Becker, V. Cevher, C. Koch, A. Kyrillidis, International Conference on Machine Learning (**ICML**), (June 2013, Atlanta), spotlight presentation. arXiv #1206.1529

1. *A Quasi-Newton Proximal Splitting Method*, S. Becker and J. Fadili, Advances in Neural Information Processing Systems (**NIPS/NeurIPS**), Dec 2012, Lake Tahoe, awarded a spotlight presentation.

Refereed Conferences (moderately competitive)

11. *A Strategy for Synthetic Aperture Sequence Design Using Numerical Optimization*, J. Spainhour†, S. Becker, Nicholas Bottenus. **IEEE International Ultrasonics Symposium**, Oct 10-13 '23 Venice. DOI link

10. *Superresolution photoacoustic tomography using random speckle illumination and second order moments*, O. Malik†, V. V. Narumanchi, S. Becker, T. Murray. In 2021 IEEE Workshop on Applications of Signal Processing to Audio and Acoustics **WASPAA** 2021. arXiv #2105.03809 DOI link

9. *Stochastic Gradient Langevin Dynamics with Variance Reduction*, Z. Huang†, S. Becker, in **International Joint Conference on Neural Network (IJCNN)** 2021. arXiv #2102.06759

8. *Nuclear Norm Based Spectrum Estimation for Molecular Dynamics Simulations*, Shuang Li, S. Becker, M. B. Wakin. Accepted in the **Asilomar Conference on Signals, Systems, and Computers** (Nov. 1-4, 2020). DOI link

7. *Perturbed Proximal Descent to Escape Saddle Points for Non-convex and Non-smooth Objective Functions*, Z. Huang†, S. Becker. **INNS Big Data and Deep Learning**, Genoa, Italy, 16-18 April 2019. DOI link, arXiv #1901.08958

6. *A Randomized Approach to Efficient Kernel Clustering*, F. Pourkamali-Anaraki†, S. Becker. IEEE Global Conference on Signal and Information Processing (**GlobalSIP**), accepted as lecture (not poster), Washington D.C., Nov 2016. arXiv #1608.07597

5. *Efficient Dictionary Learning via Very Sparse Random Projections*, F. Pourkamali-Anaraki†, S. Becker, S. M. Hughes, in Sampling and Approximation Theory (**SampTA**) 2015. arXiv #1504.01169

4. *Metric learning with rank and sparsity constraints*, B. Bah, V. Cevher, S. Becker, and B. Gözcü, Proceedings of the 2014 IEEE International Conference on Acoustics, Speech, and Signal Processing (**ICASSP**), 2014.

3. *Randomized Singular Value Projection*, S. Becker, V. Cevher, A. Kyrillidis, in Sampling and Approximation Theory (**SampTA**) 2013, Bremen Germany. arXiv #1303.0167

2. *A 100MHz-2GHz 12.5x sub-Nyquist Rate Receiver in 90nm CMOS*, J. Yoo, S. Becker, M. Loh, M. Monge, E. Candès, A. Emami-Neyestanak, Radio Frequency Integrated Circuts Symposium (**RFIC**), (May 2012, Montreal, Canada).

1. *Design and implementation of a fully integrated compressed-sensing signal acquisition system*, J. Yoo, S. Becker, M. Monge, M. Loh, E. Candès, A. Emami-Neyestanak, Proceedings of the 2012 IEEE International Conference on Acoustics, Speech, and Signal Processing (**ICASSP**), (March 2012, Kyoto, Japan).

Conferences (less competitive), Workshop Papers, Posters, Extended abstracts

16. *Versatile fidelity estimation with confidence*, A. Seshadri†, M. Ringbauer, R. Blatt, T. Monz and S. Becker. **QIP (Quantum Information Processing)**, as poster, Ghent, February 6–10 2023.

15. *Broadband Spectroscopic Imaging Using Dual Frequency Comb Spectroscopy and Compressive Sensing*, E. Strong, S. Coburn, A. Anderson, R. Cole, J. Gopinath, S. Becker, G. Rieker. In **CLEO** (Laser Science to Photonic Applications), San Jose, May 2022.

14. *Computational super-resolution microscopy: leveraging noise model, regularization and sparsity to achieve highest resolution*, J.Xing, S. Chen, S. Becker, J.-Y. Yu, and C. Cogswell. In **SPIE BiOS**, San Francisco, Feb 2020. DOI link

13. *One-Pass Sparsified Gaussian Mixtures*, E. Kightley†, S. Becker. In "Special Session" on Machine Learning in Big Data, at the 2019 IEEE International Conference on Big Data (**IEEE BigData 2019**) Dec 9-12, 2019, Los Angeles, CA

12. *Online Sparse Subspace Clustering*, L. Madden†, S. Becker, E. Dall'Anese. In 2nd **IEEE Data Science Workshop**, June 2019 Minneapolis

11. *Estimating Active Subspaces with Randomized Gradient Sampling*, F. Pourkamali-Anaraki†, S. Becker. In **SIAM Workshop on Dimension Reduction** Pittsburgh, PA, July 2017

10. *Surpassing Diffraction-Limited Resolution by Limiting the Illumination Field and Applying Image Analysis*, J.-Y. Yu, J. Xing, S. Chen, B. F. Wallin, J. Folberth†, S. Becker, R. H. Cormack, U. Herzfeld, and C. J. Cogswell. In **FOM2017** Bordeaux, France, April 2017

9. *Scanning EPIC Microscopy: Toward Simultaneous Super-Resolution of Continuous 3D Fluorescent Structures at Speed*, C. J. Cogswell, J.-Y.Yu, S. Chen, J. Xing, R. H. Cormack, J. Folberth†, S. Becker. In **FOM2017** Bordeaux, France, April 2017

8. *Is There an Optimized Point Spread Function for 3D Super-resolution Imaging?*, S. Chen, J.-Y. Yu, J. Xing, S. Becker, C. J. Cogswell. In Three-Dimensional Microscopy Conference, **SPIE Photonics West**, San Francisco, Jan/Feb 2017.

7. *Super-resolving 3D Fluorescent Objects using Reduced Excitation Regions and Numerical Optimization* (poster), S. Chen, J.-Y. Yu, J. Xing, S. Becker, M. Winey, C. J. Cogswell. In **Conference on Quantitative BioImaging (QBI)** in College Station, TX, USA, January 5–7 2017.

6. *PSF Engineering as a Tool for Three-Dimensional Super-Resolution Microscopy* (invited talk), C. J. Cogswell, J.-Y. Yu, S. Chen, J. Xing, R. Cormack, R. Zahreddine, S. Becker. In **Conference on Quantitative BioImaging (QBI)** in College Station, TX, USA, January 5–7 2017.

5. *3D Super-resolution Microscopy using Reduced Excitation Regions and Numerical Optimization* (poster), S. Chen, J.-Y. Yu, J. Xing, S. Becker, M. Winey, C. J. Cogswell. In **Colorado Photonics Industries Association (CPIA) annual meeting**, Boulder CO, November 2016. Poster received first prize award

4. *EPIC microscopy generates 3D images of continuous structures without changing focus*, J.-Y. Yu, S. Chen, J. Xing, R. N. Zahreddine, R. H. Cormack, B. Wallin, S. Becker, U. C. Herzfeld, C. J. Cogswell. In **SPIE Photonics West**, San Francisco, Feb 16 2016.

3. *General Optimization Framework for Robust and Regularized 3D FWI*, S. Becker, L. Horesh, A. Aravkin, E. van den Berg, S. Zhuk, accepted as extended abstract at **EAGE** (Madrid, Spain, June 2015)

2. *Scalable and accurate quantum tomography from fewer measurements*, S. Becker, V. Cevher, **SPARS** (July 2013, Lausanne, Switzerland).

1. *Sparse Projections onto the Simplex*, A. Kyrillidis, S. Becker and V. Cevher, **NIPS Workshop on Discrete Optimization in Machine Learning** (Dec 2012, Lake Tahoe).

Theses

2. *Practical Compressed Sensing: modern data acquisition and signal processing*, Ph.D. dissertation, April 2011, `http://resolver.caltech.edu/CaltechTHESIS:06022011-152525054`.

1. *Translational and Rotational Dynamics of Supercooled Water*, undergraduate physics honor thesis, April 2005, available at `https://amath.colorado.edu/faculty/becker/thesis.pdf`

Invited Talks

§indicates conference minisymposium or equivalent, i.e., unfunded and usually 25 min or less.
All talks 2019 and before were in person. Talks 2020 and later are in person unless indicated as virtual.

46. "Introduction to compressed sensing and matrix completion", 1 hour keynote at Machine Learning for Life Science, Montpellier, Nov 15 2022.
45. "Stochastic methods for derivative free optimization", at Oxford Data Science seminar, Oct 31 2022, Oxford.
44. "High-probability Convergence Bounds for Non-convex Stochastic Gradient Descent, with applications to learning", at Groupe de Recherche "Mathématiques de l'Optimisation et Application", CNRS, Université Côte d'Azur, Nice, Oct 13 2022.
43. "What good is calculus ... and what's going on in Applied Math at CU", K-12 outreach talk at St. Vrain Valley School District's "SuperSTEM" camp for middle and high school students, Longmont, CO. July 20 2022.
42. "High-Probability convergence and algorithmic stability for stochastic gradient descent", seminar talk for ML-MTP : Machine Learning in Montpellier, Theory & Practice, Sept 22 2022, Montpellier France.
41. §"Stochastic Subspace Descent: Stochastic gradient-free optimization, with applications to PDE-constrained optimization", minisymposium talk at International Conference on Continuous Optimization (ICCOPT), Lehigh, PA July 25 – 28 2022.
40. "Optimization for statistical estimators: Applications to quantum fidelity estimation", "Conference on Mathematics for Complex Data", KTH Royal Institute of Technology in Stockholm, June 13-16, 2022. [rescheduled from June 2020]
39. §"High-probability Convergence Bounds for Non-convex Stochastic Gradient Descent, with applications to learning", minisymposium on "Sparsity, Optimisation and Learning" at Curves and Surfaces 2022 (June 20 to 24), Arcachon, France.
38. "Compressed Sensing and Matrix Completion", Institute for Insight seminar, Georgia State, Jan 29 2021. [Virtual]
37. "Algorithmic Stability for generalization guarantees in machine learning", Applied Math seminar, McGill University (Sept 21 2020, Montreal, Canada). [Virtual] (small honorarium).
36. "Stochastic Subspace Descent", Derivative Free Optimization Symposium (DFOS), University of British Columbia, Okanagan Campus (Canada), Aug 10–14, 2020. *UPDATE: postponed, due to COVID-19*

35. "Stochastic Subspace Descent", Nonlinear analysis seminar, North Carolina State University (NCSU), April 29 2020. *UPDATE: canceled, due to COVID-19*
34. "Compressed Sensing and Matrix Completion", CU Boulder's Technology, Cybersecurity & Policy (TCP) seminar series (February 2020, Boulder). video link
33. §"Stochastic Subspace Descent", Joint Mathematical Meetings (JMM), Denver January 2020, minisymposium on DFO.
32. "Randomized tensor decompositions", U Mass Lowell CS Dept Machine Learning seminar (Sept 2019, Lowell, MA)
31. §"Stochastic Subspace Descent", International Conference on Continuous Optimization (ICCOPT), (August 2019, Berlin, Germany)
30. §"Certifying accuracy and uniqueness in ill-conditioned imaging problems", SIAM CS&E (February 2019, Spokane)
29. §"ADMM vs gradient methods and other issues in ill-conditioned imaging problems", International Symposium on Mathematical Programming (ISMP), (July 2018, Bordeaux, France)
28. "Imaging, Optimization, and Randomness", University of Colorado Boulder, Dept of Applied Math **colloquium**, March 3 2018.
27. §"Parallel Algorithms for Robust PCA Using Marginalization", SIAM Conference on Optimization (May 2017, Vancouver, Canada)
26. "Efficient robust PCA algorithms for the GPU",
    - Colorado State University, Fort Collins, Dept. of Math, applied math seminar, Feb 2 2017.
    - U. North Carolina Chapel Hill, Dept. of Stat. and Operations Research **colloquium**, Nov 21 2016.
25. "Subsampling large datasets via random mixing", Colorado School of Mines, Dept. of Applied Math and Statistics **colloquium**, Sept 2 2016.
24. "Applications of randomized sketching to subsampling, robust regression and linear algebra", Simons Seminar, UT Austin. Nov 20 2015.
23. "Matrix Completion and Robust PCA"
    - University of Colorado Boulder, Center for Computational Language and EducAtion Research (CLEAR). Sept 16 2015.
    - University of Colorado Boulder, Institute of Cognitive Science **colloquium**, Boulder, CO. March 6 2015.
    - University of Colorado Boulder, Computer Science department **colloquium**, Boulder, CO. Nov 20 2014.
22. §"Solving Constrained and Non-Smooth Problems with Efficient Dual Techniques", International Symposium on Mathematical Programming (ISMP), Pittsburgh, July 16 2015.
21. §"Matrix-Free Solvers for Robust PCA and Distance Matrix Completion", SIAM Conference on Computational Science and Engineering, Salt Lake City, March 15 2015.
20. "A Quasi-Newton Proximal Splitting Method", Rocky Mountain INFORMS chapter, March 11 2015.
19. "Sketching and Smoothing: robust sketching, and smoothing for time-data trade-offs", Colorado State University, Statistics department **colloquium**, Jan 26 2015
18. §"Robust Compressed Least Squares Regression", NIPS 2014 workshop "Robustness: Out of the Box", Montreal, Canada. Dec 12, 2014.
17. "Optimization for machine learning and compressed sensing", Wesleyan University summer science seminar, Middletown, CT. July 18 2014
16. "A class of quasi-Newton methods for non-smooth/constrained problems",
    - §SIAM Optimization 2014, San Diego, CA. May 22 2014
    - NatImages workshop, Nice, France. July 2012.
15. "The interplay of optimization and randomized linear algebra," Dept. of Industrial and Systems Engineering **colloquium**, Lehigh University, September 18 2013.

14. §"Randomized singular value projection," Fourth International Conference on Continuous Optimization (ICCOPT 2013), Lisbon, Portugal, August 1 2013.
13. "Compressed sensing for quantum tomography,"
    - groupe de travail "Méthodes Mathématiques pour l'Imagerie" (Gabriel Peyré), CEREMADE, université Paris-Dauphine. June 2 2013.
    - groupe de travail "Méthodes Numériques", LJLL, Paris 6. June 3 2013.
    - Seminar on interactions of Computer Science and Mathematics, LIP6 and LJLL at Paris 6. April 15 2013.
12. "Information extraction via optimization,"
    - Applied Math, University of Colorado. November 2013.
    - EECS, Colorado School of Mines. February 2012.
    - Numerical Analysis Group (Mathematical Institute), University of Oxford. January 2012.
11. §"Improved first-order methods: how to handle constraints, non-smoothness, and slow convergence," minisymposium, SIAM Linear Algebra, Valencia Spain. June 2012. Part of the 8-speaker minisymposium I organized at SIAM LA.
10. "A class of quasi-Newton methods for non-smooth/constrained problems, and sparse projections onto the simplex", IPAM "Modern trends in optimization and its applications", reunion conference. June 2012.
9. §"Advances in first-order methods: constraints, non-smoothness and faster convergence," minisymposium, SIAM Imaging Science, Philadelphia. May 2012.
8. "TFOCS: A General Framework for Constrained Optimization,"
    - internal seminar for the JLL lab (Paris 6 University, Paris, France), March 2012.
    - Séminaire Parisien de Statistique (Institut Henri Poincaré, Paris, France), March 2012
    - Séminaire de Probabilités-Statistique (Lab. de Mathématiques de Besançon, Besançon, France), February 2012
    - journée SMAI-SIGMA (Paris 6 University, Paris, France), November 2011
    - EPFL seminar (Lausanne, Switzerland), October 2011
    - GREYC-ENSICAEN imaging seminar (Caen, France), October 2011
    - Laboratoire de Cosmologie et Statistiques seminar (CEA, Gif-sur-Yvette, France), October 2011
    - Sparse Statistics, Optimization and Machine Learning (11w5012) at Banff, Canada. Jan 2011.
7. §"Practical Design of a Random Demodulation Sub-Nyquist ADC," at SPARS 2011, Edinburgh. June 2011.
6. §"TFOCS: Flexible First-order Methods for Rank Minimization," at "Low-rank matrix optimization" minisymposium, SIAM conference on Optimization, Darmstadt, Germany. May 2011.
5. §"First-order methods for constrained linear inverse problems," Canadian Mathematical Society winter meeting, Dec 2010
4. "Templates for convex cone problems," UCLA IPAM "Modern Trends in Optimization and its Applications" seminar series, Nov 2010
3. §"Algorithms for very large scale ℓ_1 minimization," INFORMS, October 2009
2. "A generalization of Mason's Theorem", math honors talk at Wesleyan University, April 2005
1. "Translational and rotational dynamics of supercooled water", condensed matter seminar at Wesleyan University, April 2005

Funding

As PI (total external funding as PI: $958k, of which my share is $779k)

$1.65k, as PI **2022**

CU Office for Outreach and Engagement

"STEM summer camp for middle and high schoolers" Micro Grant

$249k, as PI **2021–'24**
NSF (MPS>PHY). Single investigator
"Direct Estimates and Confidence Intervals for Fidelity of Quantum States", award #2112901, 09/01/2021 – 08/31/2024

$1k, as PI **2021**
CU Office for Outreach and Engagement
"STEM summer camp for middle and high schoolers" Micro Grant

$357k, as PI [my share: about 50%/$178k] **2019–'22**
NSF (MPS>DMS, AMPS-Algorithms for Modern Power Systems). With E. Dall'Anese as Co-PI
"AMPS: Online and Model-Free Optimization of Power and Energy Systems", award # 1923298, 8/1/19 – 7/31/22

$150k, as PI **2018–'22**
NSF (MPS>DMS, Computational Math). Single investigator
"Information Extraction from Scientific Simulations", award # 1819251, 8/1/18 – 7/31/21

$4k, as PI **2018**
CU Office for Outreach and Engagement
"2018 CU/Northrop-Grumman/St.Vrain STEM Camp" Community Impact Grant

$50k, as PI **2018**
Northrop Grumman. Single investigator
"Analytic Techniques for Signal Processing Efficiencies", CY '18

$50k, as PI **2017**
CU Innovative Seed Grant Program (ISGP). With T. Murray as Co-PI
"Blind Structured Illumination Photoacoustic Microscopy with Compressed Sensing", AY '17–'18

$100k, as PI **2017**
Northrop Grumman. Single investigator
"Analytic Techniques for Signal Processing Efficiencies", CY '17

$52k, as PI **2016–'17**
Bloomberg. Spring 2016, unrestricted gift. Single investigator
"Online clustering of time-sensitive data"

As Co-PI or Senior Personnel (total external funding as Co-PI: $2.921m, of which my share is approximately $1.085m)

$1.325m CU Portion, as 1 of 2 Co-PIs at Boulder) [my share: about 45%/$596k] **2022–2027**
DOE ASCR; lead PI A. Christlieb (MSU); 1 of 11 PI/Co-PIs at all institutions; CU PI D. Bortz
"Center for Hierarchical and Robust Modeling of Non-Equilibrium Transport (CHaRMNET)", ($15m total)

$881k, as 1 of 3 Co-PIs [my share: about 25%/$220k] **2021–'24**
DOE ASCR; PI A. Doostan, Co-PIs J. Evans, K. Jansen, S. Becker
"Scalable Data Reduction Techniques for Extreme-Scale Unstructured PDE Simulations"

$365k, as Co-PI [my share: about 45%/$164k] **2018–'22**
NSF (ENG>ECCS, Electronic, Photonic and Magnetic Devices); PI T. Murray
"Photoacoustic Imaging in Optically Diffusive Media Using Structured Illumination", award # 1810314, 8/15/18–8/14/22

1 shared postdoc, as 1 of 4 Co-PIs **2018–'19**
Argonne ALCF Aurora Early Science Program for Data and Learning; PI Ken Jansen
"Data Analytics and Machine Learning for Exascale CFD"

$30k, as 1 of 2 Co-PIs **2018**
CU Imaging Science IRT; PI Carol Cogswell
"A transformative approach to microscopy imaging that links breakthroughs in nanoparticle contrast agent development to innovations in computational optical super-resolution imaging"

$10k, as 1 of 2 Co-PIs **2018**
CU Imaging Science IRT; PI Kelvin Wagner
"Fourier Telescopic Imaging through Turbulence: Self-Cal vs TAFT"

$350k, as Co-PI [my share: about 30%/$105k] **2015–'18**
NSF. PI: Sriram Sankaranarayanan (CU-Boulder)
"SHF: Small: Bilinear Constraint Solving and Optimization for Program Verification and Synthesis Problems", 9/1/2015 – 8/31/2018

200k Swiss Francs, as Sr. Personnel **2013–'16**
Swiss NSF, senior personnel. PI: Volkan Cenver (EPFL, Lausanne)
"Scalable and Accurate Quantum Tomography"

Honors and Awards

- Reviewing awards
  - 2021 Top Reviewer for AISTATS conference
  - 2020 Top Reviewer for ICML conference
  - 2019 Top 400 NeurIPS (formerly NIPS) reviewer (of about 4500) and given free registration
  - 2017 NIPS Reviewer award (75 awards given among 2078 reviewers, `https://nips.cc/Conferences/2017/Awards`)
  - 2015 ICML Reviewer Award (for going "above and beyond in your duties as a reviewer")
- 2020 nominated for Marinus Smith Award (internal CU award, "recognizes faculty and staff members who have had a particularly positive impact on our students")
- 2017 received Marinus Smith Award (internal CU award, "recognizes faculty and staff members who have had a particularly positive impact on our students")
- 2015 **Beale Orchard-Hays Prize** of the Mathematical Optimization Society for 2011 paper co-authored with E. Candès and M. Grant. Details `http://www.mathopt.org/?nav=boh`; prize awarded every three years.
- Herman Goldstine Memorial Postdoctoral Fellowship from the Business Analytics and Mathematical Sciences Department of the IBM Thomas J. Watson Research Center, 2013–2014.
- Postdoc fellowship from Foundation Sciences Mathématiques de Paris, 2011–2013.
- W.P. Carey, co-winner, May 2011, for best dissertation in pure or applied mathematics, California Institute of Technology.
- Undergraduate awards
  - Bertman Prize, May 2005, for a senior physics major at Wesleyan University.
  - Graham Prize, co-winner, May 2005, for excellence in natural science at Wesleyan University.
  - Rice Prize, co-winner, May 2005, for excellence in math by a senior at Wesleyan University.
  - *Phi Beta Kappa*, early induction, November 2004.
  - Various math/physics prizes at Wesleyan, 2002–2004 (Rae Shortt Prize and Van Dyke prize, co-winner, Robertson Prize and Sherman Prize, honorable mention).

Teaching

Legend: Graduate classes are underlined. All classes are full credit (i.e., at CU, 3 credit hours) unless otherwise noted. Number of students is approximate.

Instructor at U. Colorado Boulder

- APPM 8500 *Statistics, Optimization and Machine Learning seminar*. Co-listed with CSCI 7000 (Rafael Frongillo). 1 credit (no teaching credit). Secured funding for external speakers. [Did not teach AY '20/'21 or '22/'23]
  Fall 2016 – Spring 2022
- APPM 5630 *Advanced Convex Optimization*. 25 students. Spring 2023
- APPM 5450 *Applied Analysis II*. 11 students. Spring 2023
- [no teaching due to sabbatical] Fall 2022
- MATH/STAT 4540 / 5540 *Introduction to Time Series*. 60 students. Spring 2022
- APPM 4490-5490 *Theory of Machine Learning*. 15 students. Spring 2022
- APPM/STAT 5650 *Randomized Algorithms*. 9 students. Fall 2021
- APPM 5630 *Advanced Convex Optimization*. 18 students. Spring 2021
- APPM/MATH 4650 *Intermediate Numerical Analysis*. **2 sections** (both about 40 students). Taught remotely due to COVID-19. Fall 2020
- APPM 7400 *Special Topics: Theoretical Machine Learning*. 16 students, plus a few auditing. Last two months taught remotely due to COVID-19. **new course** Spring 2020
- APPM 5440 *Applied Analysis I*. 19 students. Fall 2019
- APPM 4720/5720 *Special Topics: Randomized Algorithms*. 20 students enrolled, plus about 8 auditing. Spring 2019
- APPM 2360 *Differential Equations with Linear Algebra*. **2 sections** (about 80 and 100 students each). Course coordinator for all sections (joint with Bengt Fornberg). Fall 2018
- APPM 4720/5720 *Special Topics: Advanced Convex Optimization*. 10 students enrolled, about 8 auditing. Fall 2018
- APPM 5450 *Applied Analysis II*. 15 students. Spring 2018
- APPM 5440 *Applied Analysis I*. 20 students. Fall 2017
- APPM 1350 *Calculus I*. 120 students. Fall 2017
- APPM 4720/5720 *Special Topics: Advanced Convex Optimization*. 25 students. **new course**, later converted to APPM 5630 Spring 2017
- APPM 2360 *Differential Equations with Linear Algebra*. **2 sections**, both about 130 students. Course coordinator for all sections. Fall 2016
- APPM 5450 *Applied Analysis II*. 20 students. Spring 2016
- APPM 2360 *Differential Equations with Linear Algebra*. 130 students. Spring 2016
- APPM 5450 *Applied Analysis II*. 20 students. Spring 2015

- APPM 5440 *Applied Analysis I*. 20 students. Fall 2014

New courses created at U. Colorado Boulder

- Randomized Algorithms (APPM 5650 / STAT 5650)
- Theory of Machine Learning (APPM 4490/5490)
- Advanced Convex Optimization (APPM 5630)

Invited courses outside of U. Colorado Boulder

- "First-order methods for large scale optimization problems", 6 hours of lectures, AIMS South Africa workshop, part of AIMS Spring School on the Mathematics of Data Science organized by Bubacarr Bah and Holger Rauhut; Muizenberg, Cape Town, South Africa. September 23–27 2019
- "First-order methods for large scale optimisation problems", 8 hours of lectures, CCIMI short-course, given at the University of Cambridge (UK), June 4 – June 15, 2018.

Instructor at the California Institute of Technology

- ACM 11 *Intro to Matlab and Mathematica*, co-instructor, fall quarter 2008. 1 credit.

Teaching Assistant at the California Institute of Technology

- ACM/CS 114 *Parallel Algorithms for Scientific Applications*, winter 2009/10
- ACM 105 *Functional Analysis*, spring 2008
- ACM 11 *Intro to Matlab/Mathematica*, fall 2007
- ACM 104 *Linear Algebra*, winter 2006/07
- ACM 104 *Linear Algebra*, winter 2007/08
- ACM 95/100c *Intro to PDE*, spring 2007
- ACM 105 *Functional Analysis*, fall 2006

Teaching Assistant at Wesleyan University

- *Introductory Physics*, fall 2004
- *Discrete Math*, spring 2004
- *Introductory Calculus*, fall 2002
- *Introductory Physics*, spring 2002
- *Quantum Mechanics*, spring 2004
- *Linear Algebra*, spring 2003
- *Introductory Physics*, fall 2002

Students

Note: ×This formatting indicates co-advised student

Postdocs

1. ×Farhad Pourkamali-Anaraki, March 2017 – June 2018 [co-advised with Michael Wakin (Colorado School of Mines)]. Now tenure-track professor at UC Denver.
2. Jon Belcher, Jan 2022 – **present**.
3. ×Angran Li, Sept 2022 – **present** [jointly co-supervised with A. Doostan]

PhD students (graduated: 7, plus 3 co-advised)

1. Farhad Pourkamali-Anaraki January 2015 – March 2017
   ECE department. Tenure-track at U. Mass Lowell then tenure-track at UC Denver
2. James Folberth September 2015 – October 2018
   Applied math department. Now works at ICR, Inc

3. Jessica Gronski — September 2015 – April 2019
   Applied math department. Now works at United Health Care
4. Eric Kightley — June 2017 – April 2019
   Applied math department. Now works at Amazon
5. [×] David Kozak, *as co-advisor* — Jan 2018 – April 2020
   Applied Math & Stat., Colorado School of Mines (principal advisor: Luis Tenorio). Now VP of Research at Solea Energy
6. Zhishen (Leo) Huang — June 2017 – July 2020
   Applied math department. Postdoc at Michigan State, then scientist at Amazon
7. Osman Malik — June 2017 – 2021
   Applied math department. Now Luis W. Alvarez postdoctoral fellow at Lawrence Berkeley National Labs
8. [×] Erik Johnson, *as co-advisor* — May 2019 – 2021
   Applied math department, (principal advisor: Daniel Larremore in CS). Now bioinformatics Scientist 2 at ArcherDX / Invitae
9. Richard Clancy — Jan 2019 – Apr 2022
   Applied math department. Now scientist at Northrop Grumman
10. [×] Liam Madden, *co-advised* — March 2018 – Apr 2022
    Applied math department, (equal co-advisor: Emiliano Dall'Anese in ECE). Now postdoc at UBC Vancouver
11. [×] Akshay Seshadri — Jan 2019 – **present**
    Physics department (co-advised by Graeme Smith in Physics, Manny Knill at NIST)
12. Kevin Doherty — 2020 – **present**
    Applied math department, (co-advised by Alireza Doostan in Aerospace)
13. Jacob Spainhour — 2021 – **present**
    Applied math department
14. [×] Noki Cheng, *as co-advisor* — 2022 – **present**
    Applied math department (principal advisor: Alireza Doostan in Aerospace)
15. [×] Alex McManus, *as co-advisor* — 2022 – **present**
    Applied math department (principal advisor: Nicholas Dwork at CU Anschutz)

MS students

1. Derek Driggs, Applied math department, BS/MS. June 2015 – Sept 2017. Next position: PhD candidate at Cambridge as a Gates Cambridge Scholar (graduated 2021).
2. Richard Border, MS in applied math (fall 2018), (concurrently worked toward PhD in Psychology and Neuroscience with M. Keller). Now postdoc at UCLA and Harvard.
3. Marc Thomson, MS in applied math (spring 2019). Now at ExxonMobil Research and Engineering.
4. [×] J. Matt Maierhofer, MS in applied math (primarily advised by Michael Mozer, CS dept) (spring 2019)
5. Cooper Simpson, Applied math department, BS/MS. 2021–2022.
6. Spencer Shortt, Math department, MA. 2022 – **present**.

Professional masters students

These students do a "culminating experience" with their advisor rather than a full masters thesis.

1. Jacob Tiede, graduated spring 2021

2. Austin Wagenknecht, graduated fall 2022

Other

Undergraduate research projects, honors theses: Zhuochen (Jaden) Wang '21–'22; Alexey Yermakov '22–'23

Undergraduate research projects, summer: Cheryl Hansen '17–'19, Abby Schmid '17, Ashley Nelson '17, Will Shand '18–'19, Johnathan Tucker '19, Israel Miles '19, Zhuochen (Jaden) Wang '20; Ibrohim Nosirov '22; Claudia Chen '22

Undergraduate research projects via DLA: Derek Driggs ('15–'17, BS/MS), Ben van Court ('15–'16, DLA and UROP), Raymond Duncan ('16), Jeffrey Everett ('17–'18), Korben Smart ('22-'23, joint with N. Bottenus)

Non-thesis graduate research projects (other than as co-advisor or similar): Aswin Karna ('15, MS, ECEE), Naga Elluri ('16, MS, ECEE), Wenqi (Flora) Zhang ('15, PhD), Elizabeth Strong ('21, PhD, ME), Tzu-Chi Yen ('22/'23, PhD, CS), Killian Wood ('22/'23, PhD, Applied Math)

Memberships, Professional Activities, and Scholarly Service

Associate editor (or similar) for journals/conferences

- Transactions on Machine Learning Research (TMLR), action editor since February 2022
- NeurIPS conference, area chair in 2020, 2021 (aka meta-reviewer, similar to associate editor)
- Mathematical Programming Computation (MPC), on editorial board as a Technical Editor since Dec 2019
- ICML, area chair in 2018, 2021 (aka meta-reviewer, similar to associate editor)
- ICLR, area chair in 2020, 2021 (aka meta-reviewer, similar to associate editor)

Reviews for competitive conferences, typical year since 2014:

- ICML (5 to 8 papers, 8 pages each); area chair in 2018, 2021
- NIPS (5 to 7 papers, 8 pages each) [*Note: name changed to NeurIPS around 2018*]; area chair in 2020, 2021
- AISTATS (4 to 6 papers, 8 pages each); area chair in 2021
- ICLR (2 to 6 papers, 8 pages each); area chair in 2020, 2021

Journals reviewed (in no particular order)

43. Mathematical Reviews (AMS) [for summaries/abstracts]
42. Information and Inference: A Journal of the IMA
41. Advances in Computational Mathematics
40. Lecture Notes in Mathematics (2018, 350+ pages)
39. IEEE Trans. Image Processing (IEEE TIP)
38. IEEE Trans. Info. Theory (IEEE TIT)
37. IEEE Trans. Signal Processing (IEEE TSP)
36. IEEE Signal Processing Letters
35. IEEE J. Selected Topics in Signal Processing
34. IEEE Geoscience and Remote Sensing Letters
33. IEEE Sig. Proc. Society best paper award committee
32. SIAM J. Optimization (SIOPT)
31. SIAM J. Imaging Sciences (SIIMS)
30. SIAM J. Scientific Computing (SISC)
29. SIAM J. on Mathematics of Data Science (SIMODS)
28. SIAM J. Matrix Analysis and Applications (SIMAX)

27. Signal Processing
26. Signal Image and Video Processing
25. Optimization Methods and Software
24. J. Machine Learning Research (JMLR)
23. J. Optimization Theory and Applications (JOTA)
22. ISIT 2010 (IEEE International Symposium on Information Theory)
21. Fields Institute Communications Series on Discrete Geometry and Optimization
20. Circuits, Systems & Signal Processing
19. Mathematical Programming Computation (MPC)
18. Mathematical Programming
17. Intl. J. Computer Vision
16. EUSIPCO 2014 conference
15. ICCASP 2014 conference
14. Electronic Transactions on Numerical Analysis (ETNA)
13. Quantum Information Processing (QIP)
12. J. of Math. Imaging and Vision
11. Applied and Computational Harmonic Analysis (ACHA)
10. Physica A
9. LVA ICA 2018
8. Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
7. Soft Computing
6. J. of Computational and Graphical Statistics
5. AIMS Mathematics journal
4. Mathematics of Operations Research
3. Quantum
2. Open Journal of Mathematical Optimization
1. assorted book chapters

Workshops organized

- Co-organize (with my student Osman Asif Malik, and Misha E. Kilmer) a double minisymposium on "Tensor Methods: Theory and Practice", SIAM Conference on Applied Linear Algebra (LA21), May 12-18 2021
- Co-organize (with L. Tenorio), "SIAM Minisymposium on Derivative Free Optimization for High-Dimensional Problems", AMS/MA Joint Mathematical Meetings, Jan 2020, Denver.
- Program committee for "Workshop on Robust Subspace Learning and Computer Vision", RSL-CV, at ICCV 2015 (Santiago, Chile)
- Co-organize (with D. Lorenz) "Solving ill-posed systems via signal-processing techniques" mini-symposium at SIAM Conference on Applied Linear Algebra. June 18-22, 2012 (Valencia, Spain)
- Co-organize (with A. Lozano and A. Aravkin) "Out of the Box: Robustness in High Dimension" workshop at Neural Information Processing Systems (NIPS) conference, December 12 2014 (Montreal, Canada)
- Co-organize (with L. Horesh) "Large-Scale Inversion and Uncertainty Mitigation" mini-symposium at SIAM Conference on Computational Science and Engineering (CSE15), March 14–18 2015, Salt Lake City, UT.
- Organize "Efficient methods for sparse optimization" at International Symposium on Mathematical Programming (ISMP), July 12–17 2015, Pittsburgh, PA.

- Organize "Advances in Large-Scale Nonsmooth Optimization" at fifth International Conference on Continuous Optimization (ICCOPT), Tokyo, Japan. Aug 7–11, 2016.

Misc

- SIAM member (2008-present)
- IEEE member (2010-2020)

Languages

English: Native

French: Conversational

Spanish: Basic

Major software packages

More detailed list (and minor contributions) available at amath.colorado.edu/faculty/becker/software/ and my github page.

6. Sparsified K-means, written in MATLAB and C. Uses new sub-sampling ideas to speed up computation. Released Fall 2015. MIT license. `https://github.com/stephenbeckr/SparsifiedKMeans`. #11 result of 7,000+ total on github when searching for "kmeans" (all languages, "best match", 06/19/2020) and #1 result in Matlab.

5. fastRPCA, written in MATLAB. Solves a new formulation of robust PCA in an efficient manner. Released October 2014. BSD license. `https://github.com/stephenbeckr/fastRPCA`

4. zeroSR1, written in MATLAB. A quasi-Newton approach for for solving optimization programs. Released Feb 2014. BSD license. `http://amath.colorado.edu/faculty/becker/zeroSR1.html`

3. TFOCS, written in MATLAB. Solves wide variety of convex programs via modular first-order algorithms. Released fall 2010. BSD license. `http://tfocs.stanford.edu/`

2. NESTA, written in MATLAB. Solves the "basis pursuit"-type of inverse problem. Released summer 2009. Freely licensed. `https://statweb.stanford.edu/~candes/software/nesta/`

1. SVT, written in MATLAB and C. Solves the "matrix completion" problem. Released fall 2008. Freely licensed. `https://statweb.stanford.edu/~candes/software/svt/code.html`