

Steven Diamond

Education

- 2020 **PhD in Computer Science**, *Stanford University*, GPA 4.0.
- 2019 **MS in Computer Science**, *Stanford University*, GPA 4.0.
- 2014 **BS in Computer Science**, *Stanford University*, GPA 4.0.

Research highlights

Stanford University.

- Domain-specific languages (DSLs) for optimization
 - Developed CVXPY, a widely used open-source DSL for convex optimization, embedded in Python.
 - Formulated DSLs for structured nonconvex optimization, using convex optimization as a subroutine.
- Matrix-free optimization
 - Created a GPU accelerated framework for efficiently solving general convex optimization problems involving structured matrices.
 - Invented a provably convergent algorithm for matrix-free preconditioning.
- Computational imaging
 - Proposed an end-to-end optimization approach for designing imaging systems, based on wave optics.
 - Investigated deep image reconstruction networks that incorporate knowledge of the image formation model through unrolled optimization.

Publications

Journal

- [1] M. Schaller, G. Banjac, **S. Diamond**, A. Agrawal, B. Stellato, and S. Boyd. Embedded code generation with CVXPY. *IEEE Control Systems Letters*, 2022.
- [2] P. Yin, **S. Diamond**, B. Lin, and S. Boyd. Network optimization for unified packet and circuit switched networks. *Optimization and Engineering*, 21(1):159–180, 2020.
- [3] F. Heide, M. O’Toole, K. Zang, D. Lindell, **S. Diamond**, and G. Wetzstein. Non-line-of-sight imaging with partial occluders and surface normals. *ACM Transactions on Graphics*, 2019.
- [4] A. Agrawal, **S. Diamond**, and S. Boyd. Disciplined geometric programming. *Optimization Letters*, Mar. 2019.
- [5] **S. Diamond**, R. Takapoui, and S. Boyd. A general system for heuristic solution of convex problems over nonconvex sets. *Optimization Methods and Software*, 33(1):165–193, 2018.

- [6] F. Heide, **S. Diamond**, D. Hallac, and G. Wetzstein. Sub-picosecond photon-efficient 3D imaging using single-photon sensors. *Scientific Reports*, 2018.
 - [7] A. Agrawal, R. Verschueren, **S. Diamond**, and S. Boyd. A rewriting system for convex optimization problems. *Journal of Control and Decision*, 5(1):42–60, 2018.
 - [8] D. Hallac, C. Wong, **S. Diamond**, R. Sasic, S. Boyd, and J. Leskovec. SnapVX: A network-based convex optimization solver. *Journal of Machine Learning Research*, 18(4):1–5, 2017.
 - [9] S. Boyd, E. Busseti, **S. Diamond**, R. Kahn, K. Koh, P. Nystrup, and J. Speth. Multi-period trading via convex optimization. *Foundations and Trends in Optimization*, 3(1):1–76, 2017.
 - [10] **S. Diamond** and S. Boyd. Stochastic matrix-free equilibration. *Journal of Optimization Theory and Applications*, 172(2):436–454, 2016.
 - [11] **S. Diamond** and S. Boyd. Matrix-free convex optimization modeling. In B. Golden, editor, *Optimization and Its Applications in Control and Data Sciences*, volume 115 of *Springer Optimization and Its Applications*, pages 221–264. Springer, 2016.
 - [12] **S. Diamond** and S. Boyd. CVXPY: A Python-embedded modeling language for convex optimization. *Journal of Machine Learning Research*, 17(83):1–5, 2016.
- [Conference](#)
- [13] **S. Diamond**, V. Sitzmann, F. Julca-Aguilar, S. Boyd, G. Wetzstein, and F. Heide. Dirty Pixels: Optimizing image classification architectures for raw sensor data. *Proceedings of ACM SIGGRAPH*, 2021.
 - [14] A. Agrawal, B. Amos, S. Barrat, S. Boyd, **S. Diamond**, and J. Z. Kolter. Differentiable convex optimization layers. In *Advances in Neural Information Processing Systems*, 2019.
 - [15] V. Sitzmann, **S. Diamond**, Y. Peng, X. Dun, S. Boyd, W. Heidrich, F. Heide, and G. Wetzstein. End-to-end optimization of optics and image processing for achromatic extended depth of field and super-resolution imaging. *ACM SIGGRAPH*, 2018.
 - [16] M. O’Toole, F. Heide, D. Lindell, K. Zang, **S. Diamond**, and G. Wetzstein. Reconstructing transient images from single-photon sensors. In *Proceedings of IEEE CVPR*, 2017.
 - [17] M. Wytock, **S. Diamond**, F. Heide, and S. Boyd. A new architecture for optimization modeling frameworks. In *Proceedings of the Workshop on Python for High-Performance and Scientific Computing*, pages 36–44, 2016.
 - [18] X. Shen, **S. Diamond**, M. Udell, Y. Gu, and S. Boyd. Disciplined multi-convex programming. In *Proceedings of the Chinese Conference on Decision and Control*, 2016. Best student paper.

- [19] X. Shen, **S. Diamond**, Y. Gu, and S. Boyd. Disciplined convex-concave programming. In *Proceedings of the IEEE Conference on Decision and Control*, 2016.
- [20] F. Heide, **S. Diamond**, M. Nießner, J. Ragan-Kelley, W. Heidrich, and G. Wetzstein. ProxImaL: Efficient image optimization using proximal algorithms. In *Proceedings of ACM SIGGRAPH*, volume 35, pages 1–15, 2016.
- [21] **S. Diamond** and S. Boyd. Convex optimization with abstract linear operators. In *Proceedings of the IEEE International Conference on Computer Vision*, pages 675–683, 2015.
- [22] A. Ali, Z. Kolter, **S. Diamond**, and S. Boyd. Disciplined convex stochastic programming: A new framework for stochastic optimization. In *Proceedings of the Conference on Uncertainty in Artificial Intelligence*, pages 62–71, 2015.
- [23] M. Udell, K. Mohan, D. Zeng, J. Hong, **S. Diamond**, and S. Boyd. Convex optimization in Julia. In *Proceedings of the 1st Workshop for High Performance Technical Computing in Dynamic Languages*, pages 18–28, 2014.
[Preprint and in submission](#)
- [24] **S. Diamond**, S. Boyd, D. Greenberg, M. Kochenderfer, and A. Ang. Optimal claiming of Social Security benefits. *arXiv preprint arXiv:2106.00125*, 2021.
- [25] **S. Diamond**, V. Sitzmann, F. Heide, and G. Wetzstein. Unrolled optimization with deep priors. *Preprint*, 2017. <https://arxiv.org/abs/1705.08041>.

Talks and Tutorials

- 2020 Differentiable Convex Optimization Layers, Viaduct, Menlo Park.
- 2020 Differentiable Convex Optimization Layers, Netflix, Los Gatos.
- 2019 A Rewriting System for Convex Optimization Problems, ICCOPT, Berlin.
- 2019 A Rewriting System for Convex Optimization Problems, Theorem, San Francisco.
- 2018 Convex Optimization in Python with CVXPY, Two Sigma, New York.
- 2018 Convex Optimization in Python with CVXPY, SciPy 2018, Austin.
- 2018 Convex Optimization in Python with CVXPY, Intuit, Mountain View.
- 2017 A Graph-Based Architecture for Optimization Modeling Frameworks, JuMP workshop, Boston.
- 2017 Matrix-Free Convex Optimization and Modeling (poster), Optimization and Statistical Learning, Les Houches, France.
- 2017 Session keynote: Convex Optimization with Abstract Linear Operators, AAI, San Francisco
- 2016 Disciplined Convex-Concave Programming, INFORMS, Nashville.
- 2016 Convex Optimization in Python with CVXPY, BlackRock, San Francisco.
- 2016 ProxImaL: Efficient Image Optimization using Proximal Algorithms, SIGGRAPH, Anaheim.
- 2016 Stochastic Matrix-Free Equilibration, CUHKSZ, Shenzhen.

- 2015 Convex Optimization in Python with CVXPY, Twitter, San Francisco.
- 2014 Convex Optimization in Python with CVXPY, ETH Zürich, Switzerland.
- 2014 Convex Optimization in Python with CVXPY, TCM 2014, Leuven, Belgium.
- 2014 Convex Optimization in Python with CVXPY, TEMPO Course on Robust Optimal Control, Freiburg, Germany.

Teaching

- 2019 Convex Optimization I, Instructor, Stanford University (EE364a).
- 2019 Convex Optimization II, TA, Stanford University (EE364b).
- 2019 Convex Optimization I, TA, Stanford University (EE364a).
- 2018 Artificial Intelligence, TA, Stanford University (CS221).
- 2016 Convex Optimization Short Course, IMT, Lucca.
- 2016 Convex Optimization Short Course, ShanghaiTech, Shanghai.
- 2016 Convex Optimization Short Course, CUHKSZ, Shenzhen.
- 2014 Introduction to Matrix Methods, TA, Stanford University (EE103).
- 2014 Convex Optimization II, TA, Stanford University (EE364b).

Work experience

- 2019 – **BlackRock**, AI Labs Researcher, Palo Alto, CA.
- Present
 - o Developed a framework for portfolio optimization with public and private assets.
 - o Invented a novel tax-aware approach to optimal financial planning.
- 2018 **Google**, Computational Photography Researcher, Mountain View, CA.
 - o Explored frameworks for recovering depth and color from a monochrome camera.
- 2016 **BlackRock**, Quantitative Researcher, San Francisco, CA.
 - o Compiled a general framework for state-of-the-art optimization based quantitative trading.
- 2014 **Qadium**, DARPA Plan X Intern, Palo Alto, CA.
 - o Created a Docker based network simulator for analyzing DDOS attacks.

Awards

- 2015 NSF Graduate Research Fellowship Program.
- 2014 Terman Award, Stanford University.
- 2013 Tau Beta Pi, Stanford University.