Tyler H. Chang – CV

Mathematics and Computer Science Division, Argonne National Laboratory

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https://thchang.github.io https://github.com/thchang

Research Interests

Blackbox optimization, scientific machine learning, approximation theory, computational geometry, and open source software

Education

Ph.D., May 2020, Computer Science, Virginia Polytechnic Institute & State University (Virginia Tech)
- Advisor: Layne Watson; Dissertation: Mathematical Software for Multiobjective Optimization Problems

B.S., May 2016, Computer Science & Mathematics (double-major), Virginia Wesleyan University
- Summa cum laude; 8x Dean's list; 4x all-ODAC (conference) for varsity tennis

Research Experience

Jun 2020 - Present. **Postdoctoral appointee: Argonne National Laboratory**, MCS Division
- Designed and implemented a Python framework for building and deploying multiobjective optimization solvers
- Explored trade-offs between accuracy and latency in neural network architecture search on 1000+ node HPCs
- Reduced time and cost of material design by factor of over 100x via active learning in a wet-lab environment

Aug 2016 - May 2020. **Research fellow: Virginia Tech**, Dept. of Computer Science
- Researching novel methods for error-bounded scientific machine learning and statistical regression
- Designed parallel algorithms and software for machine learning, blackbox optimization, and computational geometry
- Achieved 3x reduction in performance variability in leadership-class HPC at Argonne via above techniques

Jun 2019 - Dec 2019. **US DOE SCGSR awardee: Argonne National Laboratory**, MCS Division
- Conducting research in multiobjective optimization software via DOE SCGSR program (see awards)

Feb 2016 - Aug 2016. **Research assistant: Old Dominion University**, Dept. of Computer Science
- Aided in parallelizing NASA's FUN3D CFD kernel on NVIDIA GPUs using CUDA and MPI

Dec 2015 - Jan 2016. **Intern: US Army Research Labs**, Computational Science Division
May 2015 - Aug 2015. **Intern: US Army Research Labs**, Computational Science Division
- Accelerating software for real-time optimal control (summer) & using AR technology for info viz (winter)

Dec 2014 - Jan 2015. **Intern: US Army Research Labs**, Guidance Technology Branch
May 2014 - Aug 2014. **Intern: US Army Research Labs**, Guidance Technology Branch
- Using OpenCV for real-time sensing (summer) & developing software for embedded systems (winter)

Publicly Available Software

4. 2023. ParMOO: Python library for parallel multiobjective simulation optimization. Release: 0.3.1
   Devs: **T. H. Chang** (lead), S. M. Wild, and H. Dickinson[1] Primary Prog. Lang: `Python 3`
   `git:` https://github.com/parmoo/parmoo
3. 2022. VTMOP: Solver for blackbox multiobjective optimization problems.
   Devs: **T. H. Chang** (lead) and L. T. Watson Primary Prog. Lang: `Fortran 2008`
   `git:` https://github.com/vtopt/VTMOP
2. 2020. DelaunaySparse: Interpolation via a sparse subset of the Delaunay triangulation.
   Devs: **T. H. Chang** (lead), T. C. H. Lux, and L. T. Watson Primary Prog. Lang: `Fortran 2003`
   `git:` https://github.com/vtopt/DelaunaySparse
1. 2019. QAML: Quantum annealing math library.
   Devs: T. C. H. Lux (lead), **T. H. Chang**, and S. S. Tipirneni Primary Prog. Lang: `Python 3`
   `git:` https://github.com/tchlux/qaml

[1]= DOE SULI (undergraduate intern) at Argonne in my supervision

Grants and Proposals

Current Grants

1. Mar 2024 - Present. **Key contributor** (Industry collaborator: GE Vernova, Institutional Lead: S. Chaudhuri (UIC/ANL)), $400K/y for 1 year. *High performance computing for development of critical thermodynamic inputs for next generation thermal barrier coatings*, external grant (7 pages + appendices). DOE: HPC4EnergyInnovation Program: Summer 2024 Collaborations for U.S. Manufacturers.

Completed Grants

2. Mar 2023 - Sep 2023. **Co-PI** (PI: G. Chen (ANL)), $50K/y for 1 year (my share: $25K). *A Scalable Multi-Physics Optimization Framework for Particle Accelerator Design*, institutional seed funding (3 pages + appendices). ANL LDRD: 2023 LDRD Seed (LDRD 2023-0246).
1. Jun 2019 - Dec 2019. **Primary awardee** (Advisors: J. Larson (ANL) and L. Watson (VT)), $3K/mo for 6 months. *An Adaptive Weighting Scheme for Multiobjective Optimization*, DOE award for PhD students (3 pages + appendices). DOE SCGSR/ASCR: SCGSR Program 2018 Solicitation 2 (DE-SC0014664).

Not Awarded

8. FY 2024. **Co-PI** (PI: Y. Li (ANL)), 2 years. *Three-dimensional antiferromagnetic memory*, institutional proposal (3 pages + appendices). ANL LDRD: 2024 LDRD Prime.
7. FY 2024. **Key personnel** (PI: C. McDevitt (Florida), Institutional Lead: J. Larson (ANL)), 4 years. *Fusion-PAD: Fusion Plant Analysis and Design*, external grant proposal (20 pages + appendices). DOE-FES/ASCR: SciDAC - FES Partnerships (DE-FOA-0002924).
6. FY 2024. **Key personnel** (PI: J. Monsalve Diaz (ANL)), 2 years. *Codelet-based Energy-aware Architectural Simulation for Future Chiplet-Enabled Supercomputing Systems*, external grant R2 pre-app (3 pages + appendices). DOE ASCR: EXPRESS - 2023 Exploratory Research for Extreme-Scale Science (DE-FOA-0002950).
5. FY 2023. **PI**, 7 months. *Assessing the Quality of Scientific Data Sets for Machine Learning*, institutional proposal (3 pages + appendices). ANL LDRD: 2023 LDRD Seed.
4. FY 2023. **Investigator** (Dir: R. Joseph (GA Tech), Institution Lead: Z. Di (ANL)), 5 years. *Statistical and Mathematical Innovations for Next Generation Facilities*, multi-institute center proposal (20 pages + appendices). DOE ASCR: 2022 Mathematical Multifaceted Integrated Capability Centers (MMICCS) (DE-FOA-0002704).
3. FY 2023. **Key personnel** (PI: G. Chin (PNNL), Institution Lead: T. Munson (ANL)), 3 years. *Visual Analytics for Complex Network Workflows to Accelerate Science into Decision Making*, external grant proposal (16 pages + appendices). DOE ASCR: Data Visualization for Scientific Discovery, Decision-Making, and Comm. (DE-FOA-0002726).
2. FY 2023. **Co-PI** (With: S. Khairy (ANL)), 8 weeks. *Accelerating Multi-Objective Neural Architecture Search*, institutional proposal (1 paragraph + admin info.). ANL CELS: 2022 LDRD Advanced Computing Expedition.
1. FY 2021. **Key personnel** (PI: A. Gillette (LLNL), Institution Lead: Z. Di (ANL)), 3 years. *FAIR Delaunay Benchmarking of Scientific AI Workflows*, external grant proposal (13 pages + appendices). DOE ASCR: FAIR Frameworks for Data and AI Models (LAB 20-2306).

Publications

Publications In-Press

1. **T. H. Chang**, L. T. Watson, S. Leyffer, T. C. H. Lux, and H. M. J. Almohri. Remark on Algorithm 1012: computing projections with large data sets. To appear in ACM Transactions on Mathematical Software.

Publications Under Review

3. **T. H. Chang**, A. K. Gillette, and R. Maulik. Leveraging interpolation models and error bounds for verifiable scientific machine learning. Submitted Apr 2024. Preprint: https://arxiv.org/abs/2404.03586.
2. R. Egele, **T. H. Chang**, Y. Sun, V. Vishwanath, and P. Balaprakash. Parallel multi-objective hyperparameter optimization with uniform normalization and bounded objectives. Submitted Apr 2024. Preprint: https://arxiv.org/abs/2309.14936.
1. **T. H. Chang** and S. M. Wild. Designing a framework for solving multiobjective simulation optimization problems. Submitted Jul 2023. Preprint: https://arxiv.org/abs/2304.06881.

Peer-Reviewed Journal Articles

10. 2023. T. C. H. Lux, L. T. Watson, **T. H. Chang**, and W. I. Thacker. Algorithm 1031: MQSI—Monotone quintic spline interpolation. *ACM Transactions on Mathematical Software* 49(1), Article 6, 17 pages. **doi:** 10.1145/3570157
9. 2023. **T. H. Chang** and S. M. Wild. ParMOO: a Python library for parallel multiobjective simulation optimization. *Journal of Open Source Software* 8(82), Article 4468, 5 pages. **doi:** 10.21105/joss.04468

8. 2023. N. Neveu, **T. H. Chang**, P. Franz, S. Hudson, and J. Larson. Comparison of multiobjective optimization methods for the LCLS-II photoinjector. *Computer Physics Communication* 283, Article 108566, 10 pages. **doi:** 10.1016/j.cpc.2022.108566
7. 2023. Y. Wang, L. Xu, Y. Hong, R. Pan, **T. H. Chang**, T. C. H. Lux, J. Bernard, L. T. Watson, and K. W. Cameron. Design strategies and approximation methods for high-performance computing variability management. *Journal of Quality Technology* 55(1), pp. 88–103. **doi:** 10.1080/00224065.2022.2035285
6. 2022. **T. H. Chang**, L. T. Watson, J. Larson, N. Neveu, W. I. Thacker, S. Deshpande, and T. C. H. Lux. Algorithm 1028: VTMOP: Solver for blackbox multiobjective optimization problems. *ACM Transactions on Mathematical Software* 48(3), Article 36, 34 pages. **doi:** 10.1145/3529258
5. 2021. L. Xu, T. C. H. Lux, **T. H. Chang**, B. Li, Y. Hong, L. T. Watson, A. R. Butt, D. Yao, and K. W. Cameron. Prediction of high-performance computing input/output variability and its application to optimization for system configurations. *Quality Engineering* 33(2), pp. 318–334. **doi:** 10.1080/08982112.2020.1866203
4. 2021. T. C. H. Lux, L. T. Watson, **T. H. Chang**, J. Bernard, B. Li, L. Xu, G. Back, A. R. Butt, K. W. Cameron, and Y. Hong. Interpolation of sparse high-dimensional data. *Numerical Algorithms* 88(1), pp. 281–313. **doi:** 10.1007/s11075-020-01040-2
3. 2020. **T. H. Chang**, L. T. Watson, T. C. H. Lux, A. R. Butt, K. W. Cameron, and Y. Hong. Algorithm 1012: DELAUNAYSPARSE: Interpolation via a sparse subset of the Delaunay triangulation in medium to high dimensions. *ACM Transactions on Mathematical Software* 46(4), Article 38, 20 pages. **doi:** 10.1145/3422818
2. 2020. L. Xu, Y. Wang, T. C. H. Lux, **T. H. Chang**, J. Bernard, B. Li, Y. Hong, K. W. Cameron, and L. T. Watson. Modeling I/O performance variability in high-performance computing systems using mixture distributions. *Journal of Parallel and Distributed Computing* 139, pp. 87–98. **doi:** 10.1016/j.jpdc.2020.01.005
1. 2019. **T. H. Chang**, T. C. H. Lux, and S. S. Tipirneni. Least-squares solutions to polynomial systems of equations with quantum annealing. *Quantum Information Processing* 18(12), Article 374, 17 pages. **doi:** 10.1007/s11128-019-2489-x

Peer-Reviewed Conference and Workshop Papers

15. 2023. G. Chen, **T. H. Chang**, J. Power, and C. Jing. An integrated multi-physics optimization framework for particle accelerator design. *In Proc. 2023 Winter Simulation Conference (WSC 2023), Industrial Applications Track*, 2 pages. Orlando, FL, USA. **doi:** 10.48550/arXiv.2311.09415
14. 2023. M. Garg[2], **T. H. Chang**, and K. Raghavan. SF-SFD: Stochastic optimization of Fourier coefficients for space-filling designs. *In Proc. 2023 Winter Simulation Conference (WSC 2023)*, pp. 3636–3646. Orlando, FL, USA. **doi:** 10.1109/WSC60868.2023.10408245
13. 2023. **T. H. Chang**, J. R. Elias, S. M. Wild, S. Chaudhuri, and J. A. Libera. A framework for fully autonomous design of materials via multiobjective optimization and active learning: challenges and next steps. *In 11th Intl. Conf. on Learning Representation (ICLR 2023), Workshop on Machine Learning for Materials (ML4Materials)*. Kigali, Rwanda. **url:** https://openreview.net/forum?id=8KJS7RPjMqG
12. 2020. **T. H. Chang**, J. Larson, and L. T. Watson. Multiobjective optimization of the variability of the high-performance Linpack solver. *In Proc. 2020 Winter Simulation Conference (WSC 2020)*, pp. 3081–3092. Orlando, FL, USA. **doi:** 10.1109/WSC48552.2020.9383875
11. 2020. **T. H. Chang**, J. Larson, L. T. Watson, and T. C. H. Lux. Managing computationally expensive blackbox multiobjective optimization problems with libEnsemble. *In Proc. 2020 Spring Simulation Conference (SpringSim '20)*, Article 31, 12 pages. Fairfax, VA, USA. **doi:** 10.22360/springsim.2020.hpc.001
10. 2020. T. C. H. Lux, L. T. Watson, **T. H. Chang**, L. Xu, Y. Wang, and Y. Hong. An algorithm for constructing monotone quintic interpolating splines. *In Proc. 2020 Spring Simulation Conference (SpringSim '20)*, Article 33, 12 pages. Fairfax, VA, USA. **doi:** 10.22360/springsim.2020.hpc.003
9. 2020. T. C. H. Lux and **T. H. Chang**. Analytic test functions for generalizable evaluation of convex optimization techniques. *In Proc. IEEE SoutheastCon 2020*, 8 pages. Raleigh, NC, USA. **doi:** 10.1109/SoutheastCon44009.2020.9368254
8. 2020. T. C. H. Lux, L. T. Watson, **T. H. Chang**, L. Xu, Y. Wang, J. Bernard, Y. Hong, and K. W. Cameron. Effective nonparametric distribution modeling for distribution approximation applications. *In Proc. IEEE SoutheastCon 2020*, 6 pages. Raleigh, NC, USA. **doi:** 10.1109/SoutheastCon44009.2020.9368295
7. 2018. **T. H. Chang**, L. T. Watson, T. C. H. Lux, S. Raghvendra, B. Li, L. Xu, A. R. Butt, K. W. Cameron, and Y. Hong. Computing the umbrella neighbourhood of a vertex in the Delaunay triangulation and a single Voronoi cell in arbitrary dimension. *In Proc. IEEE SoutheastCon 2018*, 8 pages. St. Petersburg, FL, USA. **doi:** 10.1109/SECON.2018.8479003
6. 2018. T. C. H. Lux, L. T. Watson, **T. H. Chang**, J. Bernard, B. Li, X. Yu, L. Xu, G. Back, A. R. Butt, K. W. Cameron, Y. Hong, and D. Yao. Nonparametric distribution models for predicting and managing computational performance variability. *In Proc. IEEE SoutheastCon 2018*, 7 pages. St. Petersburg, FL, USA. **doi:** 10.1109/SECON.2018.8478814
5. 2018. **T. H. Chang**, L. T. Watson, T. C. H. Lux, J. Bernard, B. Li, L. Xu, G. Back, A. R. Butt, K. W. Cameron, and Y. Hong. Predicting system performance by interpolation using a high-dimensional Delaunay triangulation. *In Proc. 2018 Spring Simulation Conference (SpringSim '18)*, Article 2, 12 pages. Baltimore, MD, USA. **doi:** 10.22360/springsim.2018.hpc.003
4. 2018. T. C. H. Lux, L. T. Watson, **T. H. Chang**, J. Bernard, B. Li, L. Xu, G. Back, A. R. Butt, K. W. Cameron, and Y. Hong. Predictive modeling of I/O characteristics in high performance computing systems. *In Proc. 2018 Spring Simulation Conference (SpringSim '18)*, Article 8, 10 pages. Baltimore, MD, USA. **doi:** 10.22360/springsim.2018.hpc.009
3. 2018. **T. H. Chang**, L. T. Watson, T. C. H. Lux, B. Li, L. Xu, A. R. Butt, K. W. Cameron, and Y. Hong. A polynomial time algorithm

[2] = NSF MSGI (PhD student intern) at Argonne in my supervision

for multivariate interpolation in arbitrary dimension via the Delaunay triangulation. *In Proc. 2018 ACM Southeast Conference (ACMSE '18)*, Article 12, 8 pages. Richmond, KY, USA. **doi:** 10.1145/3190645.3190680

2. 2018. T. C. H. Lux, L. T. Watson, **T. H. Chang**, J. Bernard, B. Li, X. Yu, L. Xu, G. Back, A. R. Butt, K. W. Cameron, D. Yao, and Y. Hong. Novel meshes for multivariate interpolation and approximation. *In Proc. 2018 ACM Southeast Conference (ACMSE '18)*, Article 13, 7 pages. Richmond, KY, USA. **doi:** 10.1145/3190645.3190687
1. 2017. C. Raghunath, **T. H. Chang**, L. T. Watson, M. Jrad, R. K. Kapania, and R. M. Kolonay. Global deterministic and stochastic optimization in a service oriented architecture. *In Proc. 2017 Spring Simulation Conference (SpringSim '17)*, Article 7, 12 pages. Virginia Beach, VA, USA. **doi:** 10.22360/springsim.2017.hpc.023

Technical Reports and Dissertations

5. 2023. **T. H. Chang**, S. M. Wild, and H. Dickinson[1]. *ParMOO: Python library for parallel multiobjective simulation optimization*. Technical Report Version 0.3.1. Argonne National Laboratory, Lemont, Illinois, USA. **url:** https://parmoo.readthedocs.io/_/downloads/en/latest/pdf/
4. 2020. A. K. Gillette and **T. H. Chang**. *ALGORITHMS: assessing latent space dimension by Delaunay loss*. Technical Report LLNL-CONF-814930. Lawrence Livermore National Laboratory, Livermore, California, USA. **url:** https://www.osti.gov/servlets/purl/1756748
3. 2020. **T. H. Chang**. *Mathematical software for multiobjective optimization problems*. Ph.D. Dissertation. Department of Computer Science, Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, VA, USA. **Dept. of Computer Science Nominee for Outstanding Dissertation Award**. **url:** http://hdl.handle.net/10919/98915
2. 2016. **T. H. Chang**. *GPU saturation for multiple matrix-vector multiplications*. Bachelor's Thesis. Department of Computer Science, Virginia Wesleyan University, Virginia Beach, VA, USA.
1. 2015. **T. H. Chang**. *Implementing the optimal control-based obstacle avoidance (OCOA) algorithm in compiled code*. In ARL Summer Student Research Symposium Compendium of Abstracts vol. 2, ARL-TM-2015A. US Army Research Laboratory, Adelphi, MD, USA. **url:** https://apps.dtic.mil/sti/pdfs/AD1000355.pdf

Talks and Presentations

Upcoming Invitations

1. Jun 2024. Title pending. *The 2nd Derivative-Free Optimization Symposium (DFOS 2024)*, Padova, Italy.

Invited Conference Talks

6. Aug 2023. Data sampling for surrogate modeling and optimization. *The 10th International Congress on Industrial and Applied Mathematics (ICIAM 2023)*, Tokyo, Japan.
5. Jun 2023. Exploiting structures in multiobjective simulation optimization problems. *SIAM Conference on Optimization (OP 2023)*, Seattle, WA, USA.
4. Mar 2023. ParMOO: a Python library for parallel multiobjective simulation optimization. *SIAM Conference on Computational Science and Engineering (CSE 2023)*, Amsterdam, Netherlands.
3. Sep 2022. Geometric considerations when surrogate modeling. *SIAM Conference on Mathematics of Data Science (MDS 2022)*, San Diego, CA, USA.
2. Jul 2021. Surrogate modeling of simulations for multiobjective optimization applications. *SIAM Conference on Optimization (OP 2021)*, virtual event.
1. Mar 2021. Computing sparse subsets of the Delaunay triangulation in high-dimensions for interpolation and graph problems. *SIAM Conference on Computational Science and Engineering (CSE 2021)*, virtual event.

Seminars and Colloquia

5. Sep 2023. The curse of dimensionality. *CAA&CM Argonne Student Visit*, Lemont, IL, USA.
4. July 2023. Toward interpretable machine learning via Delaunay interpolation – challenges and next steps. *Argonne National Laboratory, LANS Seminar Series*, Lemont, IL, USA.
3. Feb 2020. Algorithms and software for Delaunay interpolation and multiobjective optimization. *Sandia National Laboratory, Wind Energy Technology Division Seminar*, virtual event.
2. Feb 2020. Algorithms and software for Delaunay interpolation and multiobjective optimization. *Argonne National Laboratory, Mathematics and Computer Science Division Seminar*, Lemont, IL, USA.
1. Jan 2020. Algorithms and software for Delaunay interpolation and multiobjective optimization. *Sandia National Laboratory, Center for Computing Research Seminar*, Albuquerque, NM, USA.

Tutorials and Guest Lectures

2. Oct 2022. An introduction to multiobjective simulation optimization with ParMOO. *The Science Academy, Science Circle Cohort, guest speaker*, virtual event. Recording: https://www.youtube.com/watch?v=gqha8urlehm.
1. May 2022. An introduction to multiobjective simulation optimization with ParMOO. *University of Chicago, Pritzker School of Molecular Engineering, guest lecture*, virtual event.

Contributed Talks

12. Dec 2023. An integrated multi-physics optimization framework for particle accelerator design. *2023 Winter Simulation Conference (WSC 2023)*, San Antonio, TX, USA.
11. Jul 2022. ParMOO: a parallel framework for multiobjective simulation optimization problems. *Seventh International Conference on Continuous Optimization (ICCOPT 2022)*, Bethlehem, PA, USA.
10. Dec 2020. Multiobjective optimization of the variability of the high-performance Linpack solver. *2020 Winter Simulation Conference (WSC 2020)*, virtual event.
9. May 2020. Managing computationally expensive blackbox multiobjective optimization problems with libEnsemble. *Spring Simulation Conference (SpringSim '20)*, virtual event.
8. Aug 2019. A surrogate for local optimization using Delaunay triangulations. *Sixth International Conference on Continuous Optimization (ICCOPT 2019)*, Berlin, Germany.
7. Apr 2018. Computing the umbrella neighbourhood of a vertex in the Delaunay triangulation and a single Voronoi cell in arbitrary dimension. *IEEE SoutheastCon 2020*, St. Petersburg, FL, USA.
6. Apr 2018. Nonparametric distribution models for predicting and managing computational performance variability. *IEEE SoutheastCon 2020*, St. Petersburg, FL, USA.
5. Mar 2018. A polynomial time algorithm for multivariate interpolation in arbitrary dimension via the Delaunay triangulation. *ACM Southeast Conference (ACMSE '18)*, Richmond, KY, USA.
4. Apr 2017. Global deterministic and stochastic optimization in a service oriented architecture. *Spring Simulation Conference (SpringSim '17)*, Virginia Beach, VA, USA.
3. Apr 2016. GPU saturation for multiple matrix-vector multiplications. *Virginia Wesleyan College, Undergraduate Research Symposium*, Virginia Beach, VA, USA.
2. Aug 2015. Implementing the optimal control-based obstacle avoidance (OCOA) algorithm in compiled code. *ARL Summer Student Research Symposium Compendium of Abstracts*, Aberdeen, MD, USA.
1. Apr 2014. The new Mastermind. *Virginia Wesleyan College, Undergraduate Research Symposium*, Virginia Beach, VA, USA.

Posters and Lightning Talks

10. May 2023. A framework for fully autonomous design of experiments via active learning and multiobjective optimization: challenges and next steps (poster). *11th Intl. Conf. on Learning Representation (ICLR 2023), Workshop on Machine Learning for Materials (ML4Materials)*, Kigali, Rwanda.
9. Oct 2022. ParMOO: a Python library for parallel multiobjective simulation optimization (lightning talk). *FASTMath All-Hands Meeting*, Denver, CO, USA.
8. May 2022. ParMOO: parallel multiobjective optimization in python (poster). *The Argonne, Chicago, Michigan, Northwestern, Toyota, Wisconsin (ACMNTW) Workshop on Optimization and Machine Learning*, Evanston, IL, USA.
7. Nov 2020. Multiobjective optimization of simulations with PARMOO (lightning talk). *Argonne Postdoctoral Research and Career Symposium*, virtual event.
6. Feb 2020. VarSys: managing variability for high performance computers, cloud computing systems, and computer security (poster). *Virginia Tech, Graduate Student Recruitment Weekend, Lab Poster Session*, Blacksburg, VA, USA.
5. Aug 2019. An adaptive weighting scheme for multiobjective optimization (lightning talk). *Argonne National Laboratory, LANS SASSy Seminar Series*, Lemont, IL, USA.
4. Mar 2019. VarSys: managing variability for high performance computers, cloud computing systems, and computer security (poster). *Virginia Tech, Graduate Student Recruitment Weekend, Lab Poster Session*, Blacksburg, VA, USA.
3. Sep 2018. A polynomial time algorithm for multivariate interpolation in arbitrary dimension via the Delaunay triangulation (lightning talk). *Virginia Tech, CS GSC: Lightning Talks*, Blacksburg, VA, USA.
2. Mar 2018. VarSys: managing variability for high performance computers, cloud computing systems, and computer security (poster). *Virginia Tech, Graduate Student Recruitment Weekend, Lab Poster Session*, Blacksburg, VA, USA.
1. Aug 2014. Real-time target identification in Matlab with OpenCV (poster). *US Army Research Laboratories, Summer Student Poster Symposium*, Aberdeen, MD, USA.

Awards and Fellowships

Research Fellowships

Aug 2016 - May 2020.	Cunningham Doctoral Fellowship, Virginia Tech, Graduate School, guaranteed research funding
Aug 2019 - May 2020.	Davenport Leadership Fellowship, Virginia Tech, College of Engineering, $4k supplemental award
Aug 2018 - May 2019.	Pratt Fellowship, Virginia Tech, College of Engineering, $4k supplemental award
Aug 2017 - May 2018.	Pratt Fellowship, Virginia Tech, College of Engineering, $4k supplemental award
Aug 2016 - May 2017.	Davenport Leadership Fellowship, Virginia Tech, College of Engineering, $4k supplemental award

Awards

Jan 2021.	Nominee for Outstanding Dissertation Award, Virginia Tech, Graduate School

Apr 2016.	Outstanding Student in Computer Science & Mathematics, Virginia Wesleyan University
Feb 2016.	ACM International Collegiate Programming Competition (ICPC), winning team for CNU site, VA, USA
Feb 2015.	ACM International Collegiate Programming Competition (ICPC), winning team for CNU site, VA, USA

Misc. Travel Awards

Feb 2023.	SIAM Early Career Travel Award, $1750 to attend ICIAM 2023
Feb 2021.	SIAM Early Career Travel Award, $160 to cover SIAM CSE 2021 registration
Apr 2020.	Virginia Tech Computer Science Graduate Travel Award, $400 to attend SpringSim 2020
Aug 2019.	Virginia Tech Graduate Student Association Travel Fund, $225 to attend ICCOPT 2019
Jun 2019.	Virginia Tech Computer Science Graduate Travel Award, $600 to attend ICCOPT 2019
Apr 2019.	ICCOPT Travel Grant Program, €450 to attend ICCOPT 2019
Apr 2018.	Virginia Tech Graduate Student Association Travel Fund, $225 to attend IEEE SoutheastCon 2018
Mar 2018.	Virginia Tech Computer Science Graduate Travel Award, $400 to attend IEEE SoutheastCon 2018
Aug 2016.	Virginia Tech Cunningham Travel Fund, $1000 unrestricted travel fund for Cunningham fellow

Teaching Experience

Jan 2022 - Present.	**Adjunct Professor: College of DuPage**, Dept. of Computer and Info. Science (Intro to Python)
Jan 2020 - May 2020.	**Instructor of Record: Virginia Tech**, Dept. of Computer Science (Data structures and algorithms)
Jan 2013 - Dec 2015.	**Subject Tutor: Virginia Wesleyan University** (Calculus, computer science, and statistics)

Advising

Jun 2022 - Aug 2022.	Manisha Garg (UIUC), NSF MSGI (PhD student intern) at Argonne
Jun 2022 - Aug 2022.	Hyrum Dickinson (UIUC), DOE SULI (undergraduate intern) at Argonne

Mentoring

Aug 2022.	Srinivas Eswar (postdoc at Argonne), via Argonne Navigator Program
Mar 2021.	Bosco Ndemeye (PhD student at Univ. of Oregon), via SIAM CSE Mentoring Program

Professional Service and Activities

Journal Referee

INFORMS Journal on Computing (2023–Present); ACM Transactions on Mathematical Software (2021–Present); Quantum Information Processing (2021–Present); The Visual Computer Journal (2021); MDPI: Mathematical and Computer Applications (2021); Journal of Machine Learning Research (2019)

Conference Reviewer

ICIAM (2023); Supercomputing (2021); IEEE SoutheastCon (2018–2020)

Minisymposium Organizer

Multiobjective Optimization Software track in SIAM Conference on Optimization (2021); Geometric Methods for Machine Learning track in SIAM Conference on Computational Science and Engineering (2021)

Professional Membership

ACM (2015–Present); SIAM (2016–Present); MOS (2022–Present)

Institutional Service

Argonne

Nov 2022 - Present.	Organizing Committee, FASTMath Institute Seminar Series
Dec 2022 - Jan 2023.	Hiring Committee, MCS Division
Oct 2022 - Dec 2022.	Technical Reviewer, Sustainable Research Pathways
Mar 2022 - Apr 2022.	Red Team Reviewer, ASCR Pre-proposals

College of DuPage

Jan 2024 - Present.	Member of Computer and Information Science Advisory Board
Aug 2023 - Sep 2023.	Faculty contact for Argonne visit

Virginia Tech

Aug 2017 - May 2020.	Founding Member, Computer Science Graduate Counsel
Dec 2018 - Mar 2019.	Lead Student Organizer, Computer Science Graduate Preview Weekend

Post-Dissertation Courses and Certifications

Jul 2022.	Distributionally Robust Optimization, ICCOPT Summer School
Jul 2022.	Mathematical Optimization in Julia with JuMP, ICCOPT Summer School
Aug 2020.	Probability, Geometry, and Computation in High Dimensions Boot Camp, Simons Institute Workshop

References

Stefan Wild (Director of Applied Mathematics and Computing, Lawrence Berkeley National Lab)
- Postdoctoral supervisor
- Email: wild@lbl.gov

Layne Watson (Professor of Mathematics, Computer Science, and Aerospace Engineering, Virginia Tech)
- Ph.D. advisor
- Email: ltw@cs.vt.edu

Jeffrey Larson (Computational Mathematician, Argonne National Lab)
- Supervisor and internal collaborator
- Email: jmlarson@anl.gov

Andrew Gillette (Computational Scientist, Lawrence Livermore National Lab)
- External collaborator
- Email: gillette7@llnl.gov

Santanu Chaudhuri (Professor of Civil, Material, and Environmental Engineering, University of Illinois Chicago)
- External collaborator
- Email: santc@uic.edu

Kirk Cameron (Professor of Computer Science, Virginia Tech)
- Former project PI
- Email: cameron@cs.vt.edu