Tyler H. Chang – CV

Numerical Optimization and Scientific Machine Learning, Senior Research Engineer

Mountain View, CA, USA
https://thchang.github.io https://github.com/thchang

Interests

Numerical optimization, scientific machine learning, high-performance and parallel computing, and open source software

Experience

Jun 2024 - Present.	**Senior Research Engineer: Siemens Digital Industry Software**, EDA / HAV Division
Jun 2020 - May 2024.	**Postdoctoral appointee: Argonne National Laboratory**, MCS Division
Aug 2016 - May 2020.	**Research fellow: Virginia Tech**, Dept. of Computer Science
Feb 2016 - Aug 2016.	**Research assistant: Old Dominion University**, Dept. of Computer Science

Education

Ph.D., May 2020, Computer Science, Virginia Polytechnic Institute & State University (Virginia Tech)

B.S., May 2016, Computer Science & Mathematics (double-major), Virginia Wesleyan University , *summa cum laude*

Publicly Available Software

4. 2022 (latest release 2024). ParMOO: Python library for parallel multiobjective simulation optimization. Release: 0.4.1
   Devs: **T. H. Chang** (lead), S. M. Wild, and H. Dickinson[1] Primary Prog. Lang: `Python 3`
   `git:` https://github.com/parmoo/parmoo
3. 2020 (latest release 2024). 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
2. 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
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

Publications

Peer-Reviewed Journal Articles

13. 2025. **T. H. Chang** and S. M. Wild. Designing a framework for solving multiobjective simulation optimization problems. *To appear in INFORMS Journal on Computing*, 33 pages. `doi:` 10.1287/ijoc.2023.0250
12. 2025. **T. H. Chang**, A. K. Gillette, and R. Maulik. Leveraging interpolation models and error bounds for verifiable scientific machine learning. *Journal of Computational Physics* 524, Article 113726, 23 pages. `doi:` 10.1016/j.jcp.2025.113726
11. 2024. **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. *ACM Transactions on Mathematical Software* 50(2), Article 12, 8 pages. `doi:` 10.1145/3656581
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

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

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

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

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 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

Talks and Presentations

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.

Funding and Awards

Research Funding Raised

3. Declined for FY 2024. **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.
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).

Research Fellowships

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

Other Awards

4. Jan 2021. Nominee for Outstanding Dissertation Award, Virginia Tech, Graduate School
3. Apr 2016. Outstanding Student in Computer Science & Mathematics, Virginia Wesleyan University
2. Feb 2016. ACM International Collegiate Programming Competition (ICPC), winning team for CNU site, VA, USA
1. Feb 2015. ACM International Collegiate Programming Competition (ICPC), winning team for CNU site, VA, USA

Leadership and Other Professional Activities

Teaching Experience

Jan 2022 - Feb 2024.	**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)

Interns Advised

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

Journal Referee

Optimization Methods and Software (2025–Present); Journal of Supercomputing (2024–Present); 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)