# Tyler H. Chang – CV

# Postdoc building Optimization & Learning Software at Argonne National Laboratory

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



#### EXPERIENCE

Jun 2020 - Present. Postdoctoral appointee: Argonne National Laboratory, MCS Division

- Designed and implemented a Python framework for building and deploying multiobjective active learning solvers
- Deployed solvers for diverse applications including neural architecture search and experiment-driven material discovery

Aug 2016 - May 2020. Research fellow: Virginia Tech, Dept. of Computer Science

- 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 funding)

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)



### **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



### TECHNICAL SKILLS

Mathematics skills: numerical optimization, regression & approximation theory, active learning, numerical analysis

Computing skils high-performance computing, open source software design, data structures and algorithms

Languages (expert): Python, Fortran
Languages (proficient): C, C++, Java, Matlab

**Libraries (expert):** numpy, scipy, matplotlib, OpenMP, BLAS, LAPACK

Libraries (proficient): pandas, scikit-learn, plotly/dash, jax, pytorch, keras, MPI, CUDA Tools/Frameworks: pytest, sphinx, slurm, qsub, CI/CD, GitHub Actions, GitFlow

Markup: HTML/CSS, GNU Make, TeX/LaTeX/bibTeX



## PUBLICIY 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 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



### AWARDS

2021.	Northinee for Outstanding Dissertation Award, Virginia Tech, Graduate School
2019.	Davenport Leadership Fellowship, Virginia Tech, College of Engineering
2018.	Pratt Fellowship, Virginia Tech, College of Engineering
2017.	Pratt Fellowship, Virginia Tech, College of Engineering
2016.	Cunningham Doctoral Fellowship, Virginia Tech, Graduate School
2016.	Davenport Leadership Fellowship, Virginia Tech, College of Engineering
2016.	Outstanding Student in Computer Science & Mathematics, Virginia Wesleyan University
2015.	ACM International Collegiate Programming Competition (ICPC) site champion, Newport News, VA, USA
2014.	ACM International Collegiate Programming Competition (ICPC) site champion, Newport News, VA, USA

Namina for Outstanding Discortation Award Virginia Tash Craduate School



# SELECTED PUBLICATIONS (FROM 32 INDEXED ON SCHOLAR)

- 4. 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)*. url: https://openreview.net/forum?id=8KJS7RPjMgG
- 3. 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
- 2. 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
- 1. 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



### LEADERSHIP

### 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

### **Teaching**

Jan 2022 - Present.	Adjunct Professor: College of DuPage, Dept. of Computer Science (Intro to Python Programming)
Jan 2020 - May 2020.	Instructor of Record: Virginia Tech, Dept. of Computer Science (Data Structures & Algorithms)

#### Service

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: Int. Congress on Industrial and Applied Mathematics (ICIAM) 2023; Int. Conf. for HPC, Networking, Storage, and Analysis (Supercomputing) 2021; IEEE SoutheastCon 2020; IEEE SoutheastCon 2019; IEEE SoutheastCon 2018

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



## **FUNDING AWARDED**

- 2. Mar 2023 Sep 2023. **Co-PI (optimization thrust lead)**, \$50K/y for 1 year. *A Scalable Multi-Physics Optimization Framework for Particle Accelerator Design*, institutional seed funding (LDRD 2023-0246).
- 1. Jun 2019 Dec 2019. **Student awardee**, \$3K/mo for 6 months. *An Adaptive Weighting Scheme for Multiobjective Optimization*, US DOE Office of Science, Graduate Student Research Program award (DE-SC0014664).