

# Tyler H. Chang

Argonne National Laboratory  
Mathematics & Computer Science (MCS) Division  
9700 S. Cass Ave, Bldg. 240, Lemont, IL 60439

E-mail: [tchang@anl.gov](mailto:tchang@anl.gov)  
Website: <https://thchang.github.io>  
GitHub: <https://github.com/thchang>

## Technical Skills

---

**Languages:** Python, Fortran, C/C++, Java, Matlab  
**OS:** MacOS, Unix/Linux  
**Markup:** HTML/CSS, GNU Make, TeX/LaTeX/bibTeX  
**Libraries:** numpy, pandas, scipy, matplotlib, keras, sklearn, MPI, OpenMP, CUDA, BLAS, LAPACK  
**Tools/Frameworks:** pytest, sphinx, slurm, CI/CD, GitHub Actions, GitFlow

## Relevant Experience

---

- Jun 2020 - Present. **Postdoctoral appointee: Argonne National Laboratory**, MCS Division
- Designed and implemented a Python framework for building and deploying multiobjective optimization solvers
  - Deployed optimization solvers for particle accelerator design, material discovery (see projects), and DFT modeling
- Aug 2016 - May 2020. **Cunningham fellow: Virginia Tech**, Dept. of Computer Science
- Designed parallel algorithms and software for predictive modeling, blackbox optimization, and computational geometry
  - Applied solvers to model and tune HPC systems (see projects) to control performance variability
- Jun 2019 - Dec 2019. **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)

## Education

---

- Ph.D., May 2020, Computer Science, Virginia Polytechnic Institute & State University (Virginia Tech)
- Thesis: Math. Softw. for Multiobjective Optimization Problems; Outstanding Dissertation Award nominee*
- B.S., May 2016, Computer Science & Mathematics (double-major), Virginia Wesleyan University
- Summa cum laude; 2x ACM ICPC site champion; 8x Dean's list; 4x all-ODAC (conference) for varsity tennis*

## Relevant Projects

---

- Oct 2021 - Present.      **Self-Driving Labs, automating material discovery via continuous-flow chemistry**
- Used a Bayesian/active learning framework to steer an automated feed, CFR, and NMR in a user-free feedback loop
  - Discovered ideal mixtures/settings to produce the battery electrolyte 2,2,2-TFMC in a continuous-flow reactor (CFR)
- Sep 2016 - May 2020.      **The VarSys Project, NSF-funded study of performance variability in HPC systems**
- Member of the math and algorithms team on an interdisciplinary project to model and control performance variability
  - Tuned the Linpack solver on the leadership-class HPC Bebop, resulting in a 3x reduction in performance variability

## Selected Publications (from over 24 total)

---

**T. H. Chang** and S. M. Wild. ParMOO: a Python library for parallel multiobjective simulation optimization. *To appear in The Journal of Open Source Software*. JOSS Open Review: <https://github.com/openjournals/joss-reviews/issues/4468>.

2022. **T. H. Chang**, L. T. Watson, J. Larson, N. Neveu, W. I. Thacker, S. Deshpande, and T. C. H. Lux. Algorithm 1028: VTMOPT: Solver for blackbox multiobjective optimization problems. *ACM Transactions on Mathematical Software* 48(3), Article 36, 34 pages.

2020. **T. H. Chang**, J. Larson, and L. T. Watson. Multiobjective optimization of the variability of the high-performance Linpack solver. *Proc. 2020 Winter Simulation Conference (WSC 2020)*, pp. 3081–3092. virtual event.

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.

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. *Proc. 2018 ACM Southeast Conference (ACMSE '18)*, Article 12, 8 pages. Richmond, KY, USA.

## Publicly Available Software

---

2023. **ParMOO**: Python library for parallel multiobjective simulation optimization. Release: 0.2.0

Devs: **T. H. Chang** (lead), S. M. Wild, and H. Dickinson      Primary Prog. Lang: Python 3

git: <https://github.com/parmoo/parmoo>

2022. **VTMOPT**: Solver for blackbox multiobjective optimization problems.

Devs: **T. H. Chang** (sole)      Primary Prog. Lang: Fortran 2008

git: <https://github.com/vtopt/VTMOPT>

2020. **DelaunaySparse**: Interpolation via a sparse subset of the Delaunay triangulation.

Devs: **T. H. Chang** (lead) and T. C. H. Lux      Primary Prog. Lang: Fortran 2003

git: <https://github.com/vtopt/DelaunaySparse>

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>

## Leadership Activities

---

### Students Advised

Jun 2022 - Aug 2022.      Manisha Garg (PhD student at UIUC), intern at Argonne via NSF MSGI program

Jun 2022 - Aug 2022.      Hyrum Dickinson (undergrad at UIUC), intern at Argonne via DOE SULI program