

# Tyler H. Chang – CV / RESUME

Mathematics and Computer Science Division, Argonne National Laboratory

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## EXPERIENCE

- Jun 2020 - Present.      **Postdoctoral appointee: Argonne National Laboratory**, MCS Division
- Built a machine learning framework (in Python) for steering scientific experiments, used internally and externally
  - Deployed scientific machine learning and optimization software on HPC systems and in wet-lab environments
- Aug 2016 - May 2020.      **Research fellow: Virginia Tech**, Dept. of Computer Science
- Designed parallel algorithms and software for machine learning, optimization, and computational geometry
  - Achieved 3x reduction in performance variability in a leadership-class HPC at Argonne using above methods
- 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

<b>Skills:</b>	machine learning, data analysis, high-performance computing, numerical software
<b>Languages (expert):</b>	Python, Fortran
<b>Languages (proficient):</b>	C, C++, Java, Matlab
<b>Libraries (expert):</b>	numpy, pandas, scipy, scikit-learn, matplotlib, OpenMP, BLAS, LAPACK
<b>Libraries (proficient):</b>	keras, pytorch, jax, plotly/dash, MPI, CUDA
<b>Tools/Frameworks:</b>	pytest, sphinx, slurm, qsub, CI/CD, GitHub Actions, GitFlow
<b>Markup:</b>	HTML/CSS, GNU Make, TeX/LaTeX/bibTeX

## 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      Primary Prog. Lang: **Python 3**  
**git:** https://github.com/parmoo/parmoo
3. 2022. VTMOOP: 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/VTMOOP
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 AND ACCOLADES

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- 2021. Nominee for Outstanding Dissertation Award, Virginia Tech, Graduate School
- 2019. Davenport Leadership Fellowship, Virginia Tech, College of Engineering
- 2018. US DOE SCGSR Award, DOE Office of Science, Graduate Student Research (SCGSR) Program
- 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
- 2014. ACM International Collegiate Programming Competition (ICPC) site champion

## LEADERSHIP

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### 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

### 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* at SIAM Conference on Optimization (2021); *Geometric Methods for Machine Learning track* at SIAM Conference on Computational Science and Engineering (2021)

### 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)

## SELECTED PUBLICATIONS (FROM 32 INDEXED ON SCHOLAR)

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- 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=8KJS7RPjMqG>
- 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: VTMO: 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

## FUNDING AWARDED

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- 2. Mar 2023 - Sep 2023. **Co-PI**, \$50K/year for 1 year. *A Scalable Multi-Physics Optimization Framework for Particle Accelerator Design*, institutional seed funding (LDRD 2023-0246).
- 1. Jun 2019 - Dec 2019. **Awardee**, \$3K/mo for 6 months. *An Adaptive Weighting Scheme for Multiobjective Optimization*, DOE award (DE-SC0014664).