

Tyler H. Chang

Argonne National Laboratory
Mathematics and Computer Science (MCS) Division
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Primary Interests

Optimization, machine learning, algorithms, and parallel computing.

Education

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

B.S., May 2016, Computer Science & Mathematics, Virginia Wesleyan University, *Summa Cum Laude*

Recent Research Experience

(Jun 2020 – Present) **Postdoc: Argonne National Lab**, Math. and Computer Science (MCS) Division

- R&D in multiobjective optimization, parallel computing, and scientific software
- Working on applications in accelerator physics, material manufacturing, and density functional theory

(Aug 2016 – May 2020) **Cunningham Fellow: Virginia Tech**, Dept. of Computer Science

- R&D in numerical analysis, math software, algorithms, parallel computing, and data science
- Math & algorithms team in VarSys: A NSF-funded study of HPC performance variability

(Jun 2019 – Dec 2019) **SCGSR Awardee: Argonne National Lab**, MCS Division

- R&D in multiobjective optimization, funded via U.S. D.O.E. (see awards for details)

(Feb 2016 – Aug 2016) **Research Assistant: Old Dominion University**, Dept. of Computer Science

- R&D in GPU computing and parallelization of NASA's FUN3D CFD kernel on NVIDIA GPUs

Awards

Nominee for Outstanding Dissertation Award (2021). Finalist for Virginia Tech's graduate school wide Outstanding Dissertation Award. Nominated by CS Dept. faculty.

Cunningham Doctoral Fellow (2016–2020). The Cunningham doctoral fellowship is a Virginia Tech graduate school wide award, guaranteeing 4 years of research funding.

Davenport Leadership Fellow (2016–17 & 2019–20). The Davenport leadership fellowship is a supplemental award given by Virginia Tech, College of Engineering on a per-year basis.

DOE SCGSR Awardee (2019). One of 70 proposals funded by the United States Dept. of Energy, Office of Science Graduate Student Research program, during the 2018, 2nd call for proposals.

Pratt Fellow (2017–18 & 2018–19). The Pratt fellowship is a supplemental award given by Virginia Tech, College of Engineering on a per-year basis.

Publicly Available Software

DELAUNAYSPARSE is a software package for computing the Delaunay interpolant in medium to high dimensions. Both serial and parallel drivers are available with interfaces in Fortran, C/C++, Python 3.6+, and command line. Download: <https://vtopt.github.io/DelaunaySparse>. Role: lead developer.

QAML is a Python package for embedding polynomial sum of squares minimization problems on the D-Wave quantum annealer. Download: <https://github.com/tchlux/qaml>. Role: developer.

Pending Software

ParMOO is a Python library and framework for solving large-scale multiobjective simulation optimization problems, while exploiting any available problem structure. Integrates with `libEnsemble` for portable, scalable parallelism. Code not yet publicly available. Role: lead developer.

VTMOP is a solver and framework for computationally expensive blackbox multiobjective optimization problems with continuous variables and 2+ objectives. Written in Fortran; a Python interface is also available through `libEnsemble`. Role: lead developer.

Selected Publications (from 18 total)

Tyler H. Chang, Jeffrey Larson, and Layne T. Watson. Multiobjective optimization of the variability of the high-performance Linpack solver. In Proc. 2020 Winter Simulation Conference (WSC), pp. 3081–3092. 2020. DOI: 10.1109/WSC48552.2020.9383875

Tyler H. Chang, Layne T. Watson, Thomas C. H. Lux, Ali R. Butt, Kirk W. Cameron, and Yili Hong. Algorithm 1012: DELAUNAYSPARSE: Interpolation via a sparse subset of the Delaunay triangulation in medium to high dimensions. ACM Transactions on Mathematical Software (TOMS), Vol. 46, No. 4, Article No. 38, pp. 1–20. 2020. DOI: 10.1145/3422818

Tyler H. Chang, Jeffrey Larson, Layne T. Watson, and Thomas C. H. Lux. Managing computationally expensive blackbox multiobjective optimization problems with `libEnsemble`. In Proc. 2020 Spring Simulation Conference (SpringSim '20), Article No. 31, pp. 1–12. 2020. DOI: 10.22360/springsim.2020.hpc.001

Tyler H. Chang, Thomas C. H. Lux, and Sai Sindhura Tipirneni. Least-squares solutions to polynomial systems of equations with quantum annealing. Quantum Information Processing, Vol. 18, No. 12, Article No. 374. 2019. DOI: 10.1007/s11128-019-2489-x

Professional Activities

Referee: For The Visual Computer Journal (2021); ACM Trans. Math. Softw. (2021); Super Computing (2021); Quantum Information Processing (2021); Math. and Computer Applications (2021); JMLR (2019); IEEE SoutheastCon (2018 – 2020).

Session Chair: SIAM Conference on Optimization (2021); SIAM Conference on Computational Science and Engineering (2021); IEEE SoutheastCon (2018).

Counselor / Founding Member: Virginia Tech CS Graduate Counsel (Fall, 2017 – Fall, 2019). Organizing professional and social events for current and prospective graduate students.