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RESEARCH INTERESTS

Scientific Computing: Direct solvers and preconditioners for sparse and dense linear systems, low-rank and butterfly compression, randomized matrix and tensor algorithms, high-performance computing, autotuning, Bayesian optimization, scientific machine learning, as well as their applications to fusion simulation, accelerator modeling, seismic modeling, optical computing, quantum chemistry, quantum computing, bio-science, nuclear physics, power grid and inverse problem applications.

Computational Electromagnetics: Fast integral and differential equation solvers for large-scale electromagnetic problems, multi-resolution algorithms for transient scattering, multi-physics and multi-scale modeling, inverse scattering, and high-frequency ansatz.

POSITIONS

- Staff Scientist, Lawrence Berkeley National Laboratory, Jul. 2025 - Present
- Career Research Scientist, Lawrence Berkeley National Laboratory, Feb. 2022 - Jun. 2025
- Career-Track Research Scientist, Lawrence Berkeley National Laboratory, Aug. 2019 - Jan. 2022
- Postdoctoral Fellow, Lawrence Berkeley National Laboratory, Aug. 2017 - Jul. 2019
- Postdoctoral Fellow, University of Michigan, June 2015 - July 2017
- Research Assistant, University of Michigan, Sept. 2010 - May 2015
- Teaching Assistant, Shanghai Jiao Tong University, Mar. 2009 - June 2009

EDUCATION

- Ph.D., Electrical Engineering, University of Michigan, May 2015
Advisor: [Eric Michielssen](#)
- M.S., Mathematics, University of Michigan, Nov. 2014
- M.S., Electrical Engineering, University of Michigan, May 2013
- B.S., Electrical Engineering, Shanghai Jiao Tong University, June 2010

HONORS AND AWARDS

- Best Paper Award, 26th IEEE International Workshop on Parallel and Distributed Scientific and Engineering Computing (PDSEC 2025)
- ACES Early Career Award, Applied Computational Electromagnetics Society, 2025
- LBNL SPOT Award, 2024
- Young Scientists Award, 3rd URSI Atlantic Radio Science Meeting (AT-AP-RASC), 2022
- Sergei A. Schelkunoff Transactions Prize Paper Award, IEEE Antennas and Propagation Society, 2018
- 1st Place in Student Paper Competition, 12th International Workshop on Finite Elements for Microwave Engineering, 2014
- 2nd Place in Student Paper Competition, 28th Annual Review of Progress in Applied Computational Electromagnetics, 2012
- Rackham Travel Grant, University of Michigan, 2012 to 2014
- Outstanding Graduate Award, Shanghai Jiao Tong University, 2010
- Third Prize in National Electronic Contest, China, 2009

MEDIA COVERAGE

- LBNL CSA news, “A Powerful Machine Learning Algorithm that Nudges Gold Atoms Closer Together”

	<ul style="list-style-type: none"> • AIP Publishing Showcase, “Faster and Smarter Machine Learning for Fusion Energy Simulations”
SOFTWARE DEVELOPMENT	<ul style="list-style-type: none"> • Lead, ButterflyPACK: https://github.com/liuyangzhuan/ButterflyPACK • Lead, GPTune: https://github.com/gptune/GPTune • Lead, STFNO: https://github.com/liuyangzhuan/STFNO • Core developer, SuperLU_DIST: https://github.com/xiaoyeli/superlu_dist • Core developer, STRUMPACK: https://github.com/pghysels/STRUMPACK
REVIEWER EXPERIENCE	<p>Proposals</p> <ul style="list-style-type: none"> • DOE SBIR/STTR proposals • Dutch Research Council (NWO) proposals • Israel Science Foundation (ISF) proposals • LBNL LDRD proposals • LBNL red team reviewer • NNSA PATH program <p>Conference Proceedings</p> <ul style="list-style-type: none"> • PC member for SCAsia 2025 • PC member for IEEE International Conference on High Performance Computing, Data, and Analytics (HiPC) 2024 • PC member for International Parallel and Distributed Processing Symposium (IPDPS) 2023, 2024 • PC member for IEEE Cluster 2021 • PC member for International Conference on Parallel Processing (ICPP) 2021, 2023 • PC member for Supercomputing (SC) 2021, 2022 • IEEE AP-S/URSI Symposium 2021, 2022, 2023 • PC member for SIAM Conference on Parallel Processing for Scientific Computing (PP), 2022, 2023 <p>Journals</p> <ul style="list-style-type: none"> • Editorial board member for Frontiers in High Performance Computing • AIP Physics of Plasma • Communications in Computational Physics • CCF Transactions on High Performance Computing • CSIAM Transactions on Applied Mathematics • Journal of Computational Physics • ACM Transactions on Mathematical Software • Applied and Computational Harmonic Analysis • The Journal of the Acoustical Society of America • SIAM Journal of Scientific Computing • SIAM Journal on Matrix Analysis and Applications • Mathematical Reviews of AMS • IEEE Transaction on Antennas and Propagation • IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control • IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems • IEEE Antennas and Propagation Magazine • IEEE Transaction on Microwave Theory and Techniques • IEEE Transactions on Parallel and Distributed Systems • IEEE Antennas and Wireless Propagation Letters • IEEE Journal on Multiscale and Multiphysics Computational Techniques • International Journal of Numerical Modelling: Electronic Networks, Devices and Fields

- Concurrency and Computation: Practice and Experience
- Journal of Applied Computational Electromagnetics Society
- International Journal of Antennas and Propagation
- The Open Electrical and Electronic Engineering Journal
- Journal of Microwaves, Optoelectronics and Electromagnetic Applications
- Mathematics of MDPI
- Digital Discovery Journal

SESSION
ORGANIZER

- Co-chair for “Sparse Matrix and Tensor Algorithms and Their Applications,” SIAM Conference on Computational Science and Engineering, 2025
- Co-chair for the technical program committee, ACES 2025 Conference, 2025
- Chair for “Fast Algorithms,” ACES 2024 Conference, May 2024
- Chair for “Fast Algorithms,” IEEE NEMO Conference, Aug 2023
- Publication chair for IEEE NEMO Conference, 2023
- Committee Member for “DOE SciDAC FASTMath Seminar Series”, 2021, 2022
- Chair for “Low-Rank Compression-Based Fast Sparse Direct Solvers,” SIAM Conference on Parallel Processing for Scientific Computing, 2020
- Chair for “Fast and Accurate Integral Methods for Highly Oscillatory Phenomena,” SIAM Conference on Computational Science and Engineering, 2019
- Chair for “Time-Domain Computational Methods for Complex Electromagnetic and Multiphysics Problems,” IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, 2019
- Chair for “Parallel Sparse Triangular Solve on Emerging Platforms,” SIAM Conference on Applied Linear Algebra, 2018
- Chair for “Acceleration Techniques for Integral Equations,” IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, 2017.
- Chair for “Time-Domain Numerical Methods,” IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting, 2012
- Judge for the 10th Annual Engineering Graduate Symposium, University of Michigan, 2015
- Steering Committee for “Celebrating Maxwell’s Equations: 150 Years” workshop, 2015.
- Chapter Treasurer for IEEE Southeastern Michigan Section, Chapter IV, 2011-2016.
- Secretary for Technical Activities Committee, IEEE Southeastern Michigan Section, 2015-2016.

BOOK
CHAPTERS

- [1] **Y. Liu**, and E. Michielssen “Parallel fast time-domain integral-equation methods for transient electromagnetic analysis,” in *Parallel algorithms in computational science and engineering*. Birkhauser, 2020.

PREPRINTS

- [1] S. Ockerman, A. Perez Dieguez, T. Aikman, Y. Cho, **Y. Liu**, and K. Ibrahim, “Parallelizing HPC tuning searches: unveiling the potential of the speculation strategy in Bayesian optimization” *Int. Journal of High Performance Computing Applications*, (submitted).
- [2] N. Hasan, V. Sabino, A. J. Walenciak, **Y. Liu**, and L. Gomez, “Modeling pyramidal neurons using bidomain BEM and hierarchical matrix approximation” *IEEE Transactions on Biomedical Engineering*, (submitted).
- [3] X. Jia, **Y. Liu**, M. Wang, and A. C. Yucel, “A hybrid tensor-FFT-accelerated volume integral equation solver for magneto-quasi-static analysis of multiscale voxelized geometries” *IEEE Transactions on Antennas and Propagation*, (submitted).
- [4] N. Singh, E. Solomonik, X. S. Li, and **Y. Liu**, “Butterfly matrix completion” *Numerical Linear Algebra with Applications*, (submitted).

- [1] P. M. Kielstra, T. Shi, H. Luo, J. Qian, and **Y. Liu**, “A linear-complexity tensor butterfly algorithm for compressing high-dimensional oscillatory integral operators,” *SIAM J. Multiscale Model Simul.*, vol. 23, pp. 864-893, 2025. doi:[10.1137/24M1707821](https://doi.org/10.1137/24M1707821).
- [2] Z. Wang, T. Shi, Weiliang L., Heather K, **Y. Liu**, X. S. Li, and M. Head-Gordon, “Regularized second order Møller-Plesset theory: Linear scaling implementation and assessment on large-molecule problems,” *J. Chem. Theory Comput.*, vol. 12, pp. 12084-12097, 2025. doi:[10.1021/acs.jpcllett.1c03468](https://doi.org/10.1021/acs.jpcllett.1c03468).
- [3] M. Rahman, Z. Bai, J. King, C. Sovinec, X. Wei, S. Williams, and **Y. Liu**, “Sparsified time-dependent Fourier neural operators for fusion simulations,” *Physics of Plasmas*, vol. 31, pp. 123902, 2024. doi:[10.1063/5.0232503](https://doi.org/10.1063/5.0232503).
- [4] W. Boukaram, **Y. Liu**, P. Ghysels, and X. S. Li, “Adaptive sketching based construction of H2-matrices on GPUs” *IEEE International Parallel and Distributed Processing Symposium*, 2025.
- [5] N. Ding, B. Austin, **Y. Liu**, N. Mehta, S. Farrell, J. P. Blaschke, L. Oliker, H. A. Nam, N. J. Wright, and S. Williams, “Workflow Roofline Model for End-to-end Workflow Performance Analysis,” in *The International Conference for High Performance Computing, Networking, Storage, and Analysis*, pp. 1-15, 2024. doi:[10.1109/SC41406.2024.00071](https://doi.org/10.1109/SC41406.2024.00071).
- [6] T. Shi, Z. Wang, A. Aldossary, **Y. Liu**, X. S. Li, and M. Head-Gordon, “Local second order Møller-Plesset theory with a single threshold using orthogonal virtual orbitals: a distributed memory implementation,” *J. Chem. Theory Comput.*, vol. 20, pp. 8010–8023, 2024. doi:[10.1021/acs.jctc.4c01016](https://doi.org/10.1021/acs.jctc.4c01016).
- [7] W. Boukaram, Y. Hong, **Y. Liu**, T. Shi, and X. S. Li, “Batched sparse direct solver design and evaluation in SuperLU DIST,” *Int. Journal of High Performance Computing Applications*, vol. 38, pp. 585-598, 2024. doi:[10.1177/10943420241268200](https://doi.org/10.1177/10943420241268200).
- [8] H. Luo, Y. Cho, J. W. Demmel, X. S. Li, and **Y. Liu**, “Hybrid models for mixed variables in Bayesian optimization,” *Journal of Computational and Graphical Statistics*, vol. 33, pp. 855–868, 2024. doi:[10.1080/10618600.2024.2308216](https://doi.org/10.1080/10618600.2024.2308216).
- [9] H. Luo, J. W. Demmel, Y. Cho, X. S. Li, and **Y. Liu**, “Non-smooth Bayesian optimization in tuning problems,” *Int. Journal of High Performance Computing Applications*, vol. 38, pp. 633-657, 2024. doi:[10.1177/10943420241278981](https://doi.org/10.1177/10943420241278981).
- [10] Z. Wang, A. Aldossary, T. Shi, **Y. Liu**, X. S. Li, and M. Head-Gordon, “Local second-order Møller–Plesset theory with a single threshold using orthogonal virtual orbitals: theory, implementation, and assessment,” *J. Chem. Theory Comput.*, vol. 19, pp. 7577–7591, 2023. doi:[10.1021/acs.jctc.3c00744](https://doi.org/10.1021/acs.jctc.3c00744).
- [11] **Y. Liu**, T. Luo, A. Rani, H. Luo, and X. Li, “Detecting resonance of radio-frequency cavities using fast direct integral equation solvers and augmented Bayesian optimization,” *IEEE J. Multiscale Multiphysics Comput. Tech.*, vol. 8, pp. 361-371, 2023. doi:[10.1109/JMMCT.2023.3311322](https://doi.org/10.1109/JMMCT.2023.3311322).
- [12] L. Claus, P. Ghysels, **Y. Liu**, T. Nhan, R. Thirumalaisamy, A. P. S. Bhalla, and X. Li, “Sparse approximate multifrontal factorization with composite compression methods,” *ACM Trans. Math. Softw.*, vol. 49, pp. 1-28, 2023. doi:[10.1145/3611662](https://doi.org/10.1145/3611662).
- [13] X. Li, **Y. Liu**, P. Lin, and P. Sao, “Newly released capabilities in distributed-memory SuperLU sparse direct solver,” *ACM Trans. Math. Softw.*, vol. 49, pp. 1-20, 2023. doi:[10.1145/3577197](https://doi.org/10.1145/3577197).

- [14] W. Sheng, A. C. Yucel, **Y. Liu**, H. Guo, and E. Michielssen, "A domain decomposition based surface integral equation simulator for characterizing EM wave propagation in mine environments," *IEEE Trans. Antennas Propag.*, vol. 71, pp. 5133-5144, 2023. doi:[10.1109/TAP.2023.3256579](https://doi.org/10.1109/TAP.2023.3256579).
- [15] **Y. Liu**, J. Song, R. Burrige, and J. Qian, "A fast butterfly-compressed Hadamard-Babich integrator for high-frequency inhomogeneous Helmholtz equations in variable media," *SIAM J. Multiscale Model Simul.*, vol. 21, pp. 269-308, 2023. doi:[10.1137/21M1450422](https://doi.org/10.1137/21M1450422).
- [16] M. Wang, **Y. Liu**, P. Ghysels, and A. C. Yucel, "VoxImp: impedance extraction simulator for voxelized structures," *IEEE Trans. Comput.-Aided Des. Integr. Circuits Syst.*, vol. 42, pp. 2771-2775, 2022. doi:[10.1109/TCAD.2022.3218768](https://doi.org/10.1109/TCAD.2022.3218768).
- [17] S. B. Sayed, **Y. Liu**, L. J. Gomez, and A. C. Yucel, "A butterfly-accelerated volume integral equation solver for broad permittivity and large-scale electromagnetic analysis," *IEEE Trans. Antennas Propag.*, vol. 70, pp. 3549-3559, 2021. doi:[10.1109/TAP.2021.3137193](https://doi.org/10.1109/TAP.2021.3137193).
- [18] **Y. Liu**, P. Ghysels, L. Claus, and X. Sherry Li, "Sparse approximate multifrontal factorization with butterfly compression for high frequency wave equations," *SIAM J. Sci. Comput.*, vol. 43, pp. S367-S391, 2021. doi:[10.1137/20M1349667](https://doi.org/10.1137/20M1349667).
- [19] **Y. Liu**, Xin Xing, H. Guo, E. Michielssen, P. Ghysels, and X. Sherry Li "Butterfly factorization via randomized matrix-vector multiplications," *SIAM J. Sci. Comput.*, vol. 43, pp. A883-A907, 2021. doi:[10.1137/20M1315853](https://doi.org/10.1137/20M1315853).
- [20] **Y. Liu**, W. Sid-Lakhdar, E. Rebrova, P. Ghysels, and X. Sherry Li, "A parallel hierarchical blocked adaptive cross approximation algorithm," *Int. Journal of High Performance Computing Applications*, vol. 34, pp. 394-408, 2020. doi:[10.1177/1094342020918305](https://doi.org/10.1177/1094342020918305)
- [21] **Y. Liu**, and H. Yang, "A hierarchical butterfly LU preconditioner for two-dimensional electromagnetic scattering problems involving open surfaces," *J. Comput. Phys.*, vol. 401, pp. 109014, 2019. doi:[10.1016/j.jcp.2019.109014](https://doi.org/10.1016/j.jcp.2019.109014)
- [22] H. Guo, **Y. Liu**, J. Hu, and E. Michielssen, "A butterfly-based direct solver using hierarchical LU factorization for PMCHWT equations," *Microw. Opt. Technol. Lett.*, 2018. doi:[10.1002/mop.31166](https://doi.org/10.1002/mop.31166)
- [23] **Y. Liu**, A. C. Yucel, H. Bagci, A. C. Gilbert, and E. Michielssen, "Wavelet-enhanced plane-wave time-domain algorithm for analysis of transient scattering from electrically large conducting objects," *IEEE Trans. Antennas Propag.*, vol. 60, pp. 1381-1387, 2017. doi:[10.1109/TAP.2018.2809555](https://doi.org/10.1109/TAP.2018.2809555)
- [24] A. C. Yucel, W. Sheng, C. Zhou, **Y. Liu**, H. Bagci, and E. Michielssen, "An FMM-FFT accelerated SIE simulator for analyzing EM wave propagation in mine environments loaded with conductors," *IEEE J. Multiscale and Multiphys. Comput. Techn.*, vol. 3, pp. 3-15, 2017. doi:[10.1109/JMMCT.2018.2802420](https://doi.org/10.1109/JMMCT.2018.2802420).
- [25] **Y. Liu**, H. Guo, and E. Michielssen, "A HSS matrix-inspired butterfly-based direct solver for analyzing scattering from two-dimensional objects," *IEEE Antennas Wireless Propag. Lett.*, vol. 16, pp. 1179-1183, 2017. doi:[10.1109/LAWP.2016.2626786](https://doi.org/10.1109/LAWP.2016.2626786)
- [26] H. Guo, **Y. Liu**, J. Hu, and E. Michielssen, "A butterfly-based direct integral equation solver using hierarchical LU factorization for analyzing scattering from large conducting objects," *IEEE Trans. Antennas Propag.*, vol. 65, pp. 4742-4750, 2017. doi:[10.1109/TAP.2017.2727511](https://doi.org/10.1109/TAP.2017.2727511)

- [27] **Y. Liu**, A. Al-Jarro, H. Bagci, and E. Michielssen, "Parallel PWTD-accelerated explicit solution of the time domain electric field volume integral equation," *IEEE Trans. Antennas Propag.*, vol. 64, pp. 2378-2388, 2016. doi:[10.1109/TAP.2016.2546964](https://doi.org/10.1109/TAP.2016.2546964)
- [28] **Y. Liu**, A. C. Yucel, H. Bagci, and E. Michielssen, "A scalable parallel PWTD-accelerated surface integral equation solver for analysis of transient scattering from large-scale objects," *IEEE Trans. Antennas Propag.*, vol. 64, pp. 663-674, 2016. doi:[10.1109/TAP.2015.2508483](https://doi.org/10.1109/TAP.2015.2508483)
- [29] **Y. Liu**, A. C. Yucel, V. Lomakin, and E. Michielssen, "Graphics processing unit implementation of multilevel plane-wave time-domain algorithm," *IEEE Antennas Wireless Propag. Lett.*, vol. 13, pp. 1671-1675, 2014. doi:[10.1109/LAWP.2014.2350967](https://doi.org/10.1109/LAWP.2014.2350967)
- [30] A. C. Yucel, **Y. Liu**, H. Bagci, and E. Michielssen, "Statistical characterization of electromagnetic wave propagation in mine environments," *IEEE Antennas Wireless Propag. Lett.*, vol. 12, pp. 1602-1605, 2013. doi:[10.1109/LAWP.2013.2293288](https://doi.org/10.1109/LAWP.2013.2293288)

PROCEEDINGS
PAPERS

- [1] Y.-K Kan, X. Li, **Y. Liu**, J. Qiang, X. Gu, W. Fung, and Y. Hao, "Advanced modeling and optimization of nuclear physics colliders," in *15th International Particle Accelerator Conference*, pp. 3194-3197, 2024. doi:[10.18429/JACoW-IPAC2024-THPC72](https://doi.org/10.18429/JACoW-IPAC2024-THPC72)
- [2] **Y. Liu**, N. Ding, P. Sao, S. Williams, and X. S. Li, "Unified communication optimization strategies for sparse triangular solver on CPU and GPU clusters," in *The International Conference for High Performance Computing, Networking, Storage, and Analysis*, pp. 1-15, 2023. doi:[10.1145/3581784.3607092](https://doi.org/10.1145/3581784.3607092)
- [3] .G Dinh, I. Valsala, H. Luo, C. Hong, Y. Cho, J. Demmel, X. S. Li, and **Y. Liu**, "Sample-efficient mapspace optimization for DNN accelerators with Bayesian learning," in *Architecture and System Support for Transformer Models*, pp. 1-15, 2023. doi:[10.1145/3581784.3607092](https://doi.org/10.1145/3581784.3607092)
- [4] Y. Cho, J. W. Demmel, J. King, X. S. Li, **Y. Liu**, and H. Luo, "Harnessing the crowd for autotuning high-performance computing applications," in *IEEE International Parallel and Distributed Processing Symposium*, pp. 635-645, 2023. doi:[10.1109/IPDPS54959.2023.00069](https://doi.org/10.1109/IPDPS54959.2023.00069)
- [5] **Y. Liu**, "A comparative study of butterfly-enhanced direct integral and differential equation solvers for high-frequency electromagnetic analysis involving inhomogeneous dielectrics," in *3rd URSI Atlantic Radio Science Meeting (AT-AP-RASC)*, pp. 1-4, 2022. doi:[10.23919/AT-AP-RASC54737.2022.9814197](https://doi.org/10.23919/AT-AP-RASC54737.2022.9814197)
- [6] X. Zhu, **Y. Liu**, P. Ghysels, D. Bindel, and X. S. Li, "GPTuneBand: multi-task and multi-fidelity Bayesian optimization for autotuning exascale applications," in *SIAM PP*, pp. 1-13, 2022. doi:[10.1137/1.9781611977141.1](https://doi.org/10.1137/1.9781611977141.1)
- [7] Y. Cho, J. W. Demmel, X. S. Li, **Y. Liu**, and H. Luo, "Enhancing autotuning capability with a history database," in *IEEE 14th International Symposium on Embedded Multicore/Many-core Systems-on-Chip (MCSoc)*, pp. 249-257, 2021. doi:[10.1109/MCSoc51149.2021.00044](https://doi.org/10.1109/MCSoc51149.2021.00044)
- [8] **Y. Liu**, W. M. Sid-Lakhdar, O. Marques, X. Zhu, C. Meng, J. W. Demmel, and X. S. Li. "GPTune: multitask learning for autotuning exascale applications," in *PPoPP21*, pp. 234-246, 2021. doi:[10.1145/3437801.3441621](https://doi.org/10.1145/3437801.3441621)
- [9] N. Ding, S. Williams, **Y. Liu** and X. S. Li "A message-driven, multi-GPU parallel sparse triangular solver," in *SIAM ACDA*, pp. 147-159, 2021. doi:[10.1137/1.9781611976830.14](https://doi.org/10.1137/1.9781611976830.14)

- [10] G. Chavez, E. Rebrova, **Y. Liu**, P. Ghysels and X. S. Li “Scalable and memory-efficient kernel ridge regression,” in *34th IEEE International Parallel and Distributed Processing Symposium*, pp. 956-965, 2020. doi:[10.1109/IPDPS47924.2020.00102](https://doi.org/10.1109/IPDPS47924.2020.00102)
- [11] N. Ding, S. Williams, **Y. Liu** and X. S. Li “Leveraging one-sided communication for sparse triangular solvers,” in *SIAM Workshop on Combinatorial Scientific Computing*, pp. 93-105, 2020. doi:[10.1137/1.9781611976137.9](https://doi.org/10.1137/1.9781611976137.9)
- [12] **Y. Liu**, M. Jacquelin, P. Ghysels, and X. S. Li, “Highly scalable distributed-memory sparse triangular solve algorithms,” in *SIAM Workshop on Combinatorial Scientific Computing*, pp. 87-96, 2018. doi:[10.1137/1.9781611975215.9](https://doi.org/10.1137/1.9781611975215.9)
- [13] E. Rebrova, G. Chavez, **Y. Liu**, P. Ghysels, and X. S. Li, “A study of clustering techniques and hierarchical matrix formats for kernel ridge regression,” in *Proc. IEEE IPDPSW*, pp. 883-892, 2018. doi:[10.1109/IPDPSW.2018.00140](https://doi.org/10.1109/IPDPSW.2018.00140)
- [14] **Y. Liu**, V. Lomakin, and E. Michielssen, “Graphics processing unit-accelerated implementation of the plane wave time domain algorithm,” *28th Ann. Rev. Prog. Appl. Computat. Electromagn.*, pp. 1-6, 2012. <https://bit.ly/48yFezr>
- [15] J. Liang, **Y. Liu**, W. Zhang, Y. Xu, X. Gan, and X. Wang, “Joint compressive sensing in wideband cognitive networks,” in *IEEE WCNC*, pp. 1-5, 2010. doi:[10.1109/WCNC.2010.5506392](https://doi.org/10.1109/WCNC.2010.5506392)

SELECTED
PRESENTATIONS

- [1] “Green’s Function-based Methods for Modeling Electromagnetic Interaction Between RF Accelerator Cavity and Electron Bunch”, **invited talk**, in *14th International Computational Accelerator Physics Conference*, 2024.
- [2] “Recent Algorithm Developments in the ButterflyPACK Package”, in *ACES Conference*, 2024.
- [3] “Augmenting Linear Solvers in Fusion Codes with Neural Operators”, in *Preconditioning Conference*, 2024.
- [4] “Efficient Fourier Neural Operators for Fusion Simulations”, in *NIMROD Team Meeting*, 2024.
- [5] “Fast Iterative Solvers in Tensor Butterfly Format”, in *18th Copper Mountain Conference on Iterative Methods*, 2024.
- [6] “Butterfly Algorithms: from Matrix to Tensor”, in *SIAM Conference on Parallel Processing for Scientific Computing*, 2024.
- [7] “Efficient Matrix, Tensor, Machine Learning Algorithms for Computational Science and Engineering Applications”, **invited talk**, in *Purdue University Seminar, and Santa Clara University Seminar*, 2024.
- [8] “Unified Communication Optimization Strategies for Sparse Triangular Solver on CPU and GPU Clusters”, in *SC23*, 2023.
- [9] “Butterfly-compressed Hadamard-Babich Integrator for High-Frequency Helmholtz and Maxwell Equations in Inhomogeneous”, in *ICIAM*, 2023.
- [10] “Multi-Scale Modeling of RF Cavity Resonance with Fast Direct Solvers and Bayesian Optimization”, in *IEEE NEMO Conference*, 2023.
- [11] “Babich Ansatz: a Geometrical-Optics-Like Ansatz for Green’s Function of Wave Equations with Variable Coefficients”, **invited talk**, in *DOE FASTMath Seminar*, 2023.
- [12] “Progress on Faster Butterfly Construction Based on Randomized Matrix-Vector Multi-

plication", in *SIAM CSE*, 2023.

- [13] "Fast Direct Solvers for Electromagnetic, Optics, Acoustic, and Elastic Applications", **invited talk**, in *International Conference on Physics and its Applications*, 2022.
- [14] "Butterfly Compressed Babich Integrator for Solving Helmholtz Equations in Inhomogeneous Media", **invited talk**, in *BIRS-CMO Workshop on Outstanding Challenges in Computational Methods for Integral Equations*, 2022.
- [15] "Fast Direct Integral and Differential Equation Solvers for Electromagnetic, Acoustic, and Elastic Applications at All Frequency Ranges", **invited talk**, in *Howard University, Michigan MICDE, UC Berkeley, and Flatiron Seminars*, 2021.
- [16] "Autotuning HPC and ML Applications Using GPTune", **invited talk**, in *Google Research Seminar*, 2021.
- [17] "Butterfly-based Hierarchically Semi-separable Matrix for Integral Equation Solvers", in *URSI GASS*, 2021.
- [18] "Optimal-Complexity Butterfly Algorithm Based on Randomized Matvec", in *SIAM CSE*, 2021.
- [19] "A Fast Direct IE Solver for Characterization of Accelerator Cavities with Waveguide Ports", in *ICCEM*, 2020.
- [20] "Butterfly-based Multifrontal Preconditioner for Wave Equations", in *HPC China*, 2020.
- [21] "Multitask Learning and Multi-Armed Bandit-Based Bayesian Optimization for HPC Applications", in *NYSDS*, 2020.
- [22] "Parallel butterfly-based Sherman–Morrison–Woodbury inversion," in *SIAM Conference on Parallel Processing for Scientific Computing*, 2020.
- [23] "A blocked adaptive cross approximation algorithm and its hierarchical generalization," in *Copper Mountain Conference On Multigrid Methods*, 2019.
- [24] "Enhancing scalability of parallel sparse triangular solve in SuperLU," in *SIAM Conference on Applied Linear Algebra*, 2018.
- [25] "Parallel butterfly-based direct solvers for highly oscillatory problems," in *SIAM Conference on Parallel Processing for Scientific Computing*, 2018.
- [26] "A HSS-type butterfly-based direct integral equation solver for 3D perfect electrically conducting objects," in *IEEE Int. Symp. AP-S/URSI*, 2017.
- [27] "A new MLMDA-based direct integral equation solver for electrically perfect conducting objects," in *IEEE Int. Symp. AP-S/URSI*, 2016.
- [28] "A wavelet-based PWTD algorithm-accelerated time domain surface integral equation solver," in *IEEE Int. Symp. AP-S/URSI*, 2015.
- [29] "Parallel time domain solvers for electrically large transient scattering problems," **invited talk**, in *EUCAP*, 2014.
- [30] "Solving very large scattering problems using a parallel PWTD-enhanced surface integral equation solver," in *IEEE Int. Symp. AP-S/URSI*, 2013.
- [31] "Parallel, explicit, and PWTD-enhanced time domain volume integral equation solver," in *IEEE Int. Symp. AP-S/URSI*, 2013.
- [32] "A scalable parallel implementation of the plane wave time domain algorithm on graphics processing unit-augmented clusters," in *IEEE Int. Symp. AP-S/URSI*, 2012.

TUTORIALS
PRESENTED

- [1] "Direct solvers for sparse and dense systems in electromagnetics and multiphysics simulations.", Short course in *ACES Conference*, May 2024
- [2] "Rank-structured fast direct solvers for electromagnetics and multiphysics simulations.", Short course in *IEEE NEMO Conference*, June 2023
- [3] "SuperLU and STRUMPACK: GPU accelerated sparse factorization solvers", Tutorial in *Exascale Computing Project Annual Meeting*, May. 2023
- [4] "Autotuning ECP Codes Using the GPTune Package", Tutorial in *Exascale Computing Project Annual Meeting*, May. 2023
- [5] "GPU Capable Sparse Direct Solvers", Tutorial in *Exascale Computing Project Annual Meeting*, May. 2022
- [6] "Performance Autotuning of ECP Applications with Gaussian Process-Based and Cloud Database-Enhanced GPTune Package", Tutorial in *Exascale Computing Project Annual Meeting*, May. 2022
- [7] "GPTune: Performance Autotuner for ECP Applications", Tutorial in *Exascale Computing Project Annual Meeting*, Apr. 2021
- [8] "STRUMPACK / SuperLU: fast parallel direct linear solvers and preconditioners", Tutorial in *Exascale Computing Project Annual Meeting*, Feb. 2020
- [9] "Fast parallel direct linear solvers and preconditioners", Tutorial in *SC19*, Nov. 2019
- [10] "Scalable direct solvers for electromagnetics and multiphysics simulations.", Short course in *IEEE NEMO Conference*, May 2019