

Tianyi Liu (刘添翼) | Dr.-Ing.

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Education

Technical University of Darmstadt

Dr.-Ing. in Elect. Eng. and Inform. Technol., with distinction

Thesis: A Parallel Successive Convex Approximation Framework with Smoothing Majorization for Phase Retrieval

Advisor: Prof. Marius Pesavento

Co-referee: Prof. Stefan Ulbrich

Darmstadt, Germany

Oct. 2018 – Sept. 2024

Technical University of Darmstadt

M.Sc. in Elect. Eng. and Inform. Technol., with distinction

Erasmus Double Degree Program between Technical University of Darmstadt and Politecnico di Torino

Thesis: A Scalable Graph-based Mixed-Integer Linear Programming Approach for the Examination Timetabling Problem

Darmstadt, Germany

Oct. 2016 – July 2018

Politecnico di Torino

M.Sc. in Communications and Computer Networks Eng., cum laude

Turin, Italy

Sept. 2015 – July 2018

Politecnico di Torino

B.Sc. in Telecommunications Engineering

Double Degree Program PoliTong between Politecnico di Torino and Tongji University

Turin, Italy

Sept. 2014 – July 2015

Tongji University

B.Eng. in Electronics and Information Engineering

Shanghai, China

Sept. 2011 – June 2015

Research Experience

Communication Systems Group, TU Darmstadt

Postdoctoral Research Associate

Darmstadt, Germany

Nov. 2024 – Present

Communication Systems Group, TU Darmstadt

Doctoral Research Associate

Darmstadt, Germany

Sept. 2018 – Aug. 2024

Research Interests

- Sparse Signal Processing
- Parallel Optimization Methods
- Sensor Array Signal Processing
- Graph Topology Inference

Honors and Awards

Finalist of the IEEE SAM 2024 Best Student Paper Contest

July 2024

Finalist of the EUSIPCO 2019 Best Student Paper Contest

Sept. 2019

Dept. ETIT, TU Darmstadt

Best Master Student Award

Darmstadt, Germany

July 2018

Teaching

Teaching Assistant at TU Darmstadt	
18-pe-2080 Graph Signal Processing, Learning and Optimization	
<i>Instructor: Prof. Marius Pesavento</i>	<i>WS 2020/21 – WS 2024/25</i>
18-pe-2070 Matrix Analysis and Computations	
<i>Instructor: Prof. Marius Pesavento</i>	<i>SS 2019 – SS 2024</i>
18-pe-2050 Project Seminar: Procedures for Massive MIMO and 5G	
<i>Instructor: Prof. Marius Pesavento</i>	<i>SS 2020</i>
18-pe-2030 MIMO Communication and Space-Time Coding	
<i>Instructor: Prof. Marius Pesavento</i>	<i>WS 2018/19 – WS 2019/20</i>

Supervised Student Projects

- [1] A. Ahmad, “Distributed nonlinear polynomial graph filter and its output graph spectrum,” Project seminar, Technische Universität Darmstadt, Darmstadt, Dec. 2022.
- [2] A. Sorg, “Direction of arrival estimation in the multiple measurement model using sparse reconstruction,” M.S. thesis, Technische Universität Darmstadt, Darmstadt, Nov. 2022.
- [3] Y. Zhang, “Advanced optimization methods for direction-of-arrival estimation with correlated sources,” M.S. thesis, Technische Universität Darmstadt, Darmstadt, Mar. 2022.
- [4] S. Rajurkar, “Resource allocation in wireless networks using graph convolutional neural networks,” M.S. thesis, Technische Universität Darmstadt, Darmstadt, Nov. 2021.
- [5] H. S. Saka, “Sparse graph Laplacian learning with real-world data,” Bachelor thesis, Technische Universität Darmstadt, Darmstadt, Apr. 2021.
- [6] Y. Zhang, “Sparse graph Laplacian learning with real-world data,” M.S. thesis, Technische Universität Darmstadt, Darmstadt, May 2021.
- [7] S. Ben Abid, “Parallel optimization methods for graph topology learning and tracking,” Bachelor thesis, Technische Universität Darmstadt, Darmstadt, Mar. 2020.
- [8] F. Bonakdar, “Sparse reconstruction and prediction of mobility patterns in traffic networks,” M.S. thesis, Technische Universität Darmstadt, Darmstadt, Jun. 2020.
- [9] M. Grytz, “Implementation of a block coordinate descent graph learning algorithm and its application to real-world problems,” Studienarbeit, Technische Universität Darmstadt, Darmstadt, Oct. 2020.
- [10] H. S. Saka, “Optimization algorithms for graph Laplacian estimation via ADMM and MM,” Project seminar, Technische Universität Darmstadt, Darmstadt, Sep. 2020.
- [11] D. Jaoua, “Parallel optimization methods for sparse signal recovery from non linear mixtures,” M.S. thesis, Technische Universität Darmstadt, Darmstadt, 2019.
- [12] S. U. Rehman, “Implementation of a parallel algorithm for sparse optimization on a graphical processing unit,” M.S. thesis, Technische Universität Darmstadt, Darmstadt, Jul. 2019.
- [13] X. Wang, “Implementation of parallel optimization for nondifferentiable nonconvex problems on GPU architecture,” M.S. thesis, Technische Universität Darmstadt, Darmstadt, Sep. 2019.

Publications

- Theses**.....
- [T1] T. Liu, “A parallel successive convex approximation framework with smoothing majorization for phase retrieval,” Ph.D. dissertation, Technische Universität Darmstadt, Darmstadt, Oct. 2024. DOI: 10.26083/tuprints-00028201.

- [T2] T. Liu, “A scalable graph-based mixed-integer linear programming approach for the examination timetabling problem,” M.S. thesis, Politecnico di Torino, Turin, Jul. 2018.

Book Chapters

- [B1] K. Ardah, M. Haardt, T. Liu, F. Matter, M. Pesavento, and M. E. Pfetsch, “Recovery under side constraints,” in *Compressed sensing in information processing*, G. Kutyniok, H. Rauhut, and R. J. Kunsch, Eds., Cham: Springer International Publishing, 2022, pp. 213–246, ISBN: 978-3-031-09745-4.

Preprints

- [P1] T. Liu, S. P. Deram, K. Ardah, M. Haardt, M. E. Pfetsch, and M. Pesavento, *Gridless parameter estimation in partly calibrated rectangular arrays*, Jun. 2024. DOI: 10.48550/arXiv.2406.16041. arXiv: 2406.16041 [eess].
- [P2] T. Liu, F. Matter, A. Sorg, M. E. Pfetsch, M. Haardt, and M. Pesavento, *Maximum a posteriori direction-of-arrival estimation via mixed-integer semidefinite programming*, Oct. 2024. DOI: 10.48550/arXiv.2311.03501. arXiv: 2311.03501.

Journal Articles

- [J1] R. Müller, G. Allevato, M. Rutsch, C. Haugwitz, T. Liu, M. Kupnik, and M. Pesavento, “A tensor model for the calibration of air-coupled ultrasonic sensor arrays in 3D imaging,” *Signal Processing*, p. 109 812, Nov. 2024, ISSN: 0165-1684. DOI: 10.1016/j.sigpro.2024.109812.
- [J2] T. Liu, A. M. Tillmann, Y. Yang, Y. C. Eldar, and M. Pesavento, “Extended successive convex approximation for phase retrieval with dictionary learning,” *IEEE Transactions on Signal Processing*, vol. 70, pp. 6300–6315, 2022, ISSN: 1941-0476. DOI: 10.1109/TSP.2022.3233253.

Conference Proceedings

- [C1] T. Liu, S. P. Deram, K. Ardah, M. Haardt, M. E. Pfetsch, and M. Pesavento, “Gridless parameter estimation in partly calibrated rectangular arrays,” in *ICASSP 2024 - 2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Apr. 2024, pp. 8796–8800. DOI: 10.1109/ICASSP48485.2024.10446959.
- [C2] T. Liu and M. Pesavento, “Blind phase-offset estimation in sparse partly calibrated arrays,” in *2024 IEEE 13rd Sensor Array and Multichannel Signal Processing Workshop (SAM)*, Jul. 2024, pp. 1–5. DOI: 10.1109/SAM60225.2024.10636507.
- [C3] T. Liu, F. Matter, A. Sorg, M. E. Pfetsch, M. Haardt, and M. Pesavento, “Joint sparse estimation with cardinality constraint via mixed-integer semidefinite programming,” in *2023 IEEE 9th International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, Herradura, Costa Rica, Dec. 2023, pp. 106–110. DOI: 10.1109/CAMSAP58249.2023.10403415.
- [C4] Y. Zhang, T. Liu, and M. Pesavento, “Direction-of-arrival estimation for correlated sources and low sample size,” in *2023 31st European Signal Processing Conference (EUSIPCO)*, Sep. 2023, pp. 1559–1563. DOI: 10.23919/EUSIPCO58844.2023.10290019.
- [C5] T. Liu, A. M. Tillmann, Y. Yang, Y. C. Eldar, and M. Pesavento, “A parallel algorithm for phase retrieval with dictionary learning,” in *IEEE International Conference on Acoustics, Speech and Signal Processing*, Jun. 2021, pp. 5619–5623. DOI: 10.1109/ICASSP39728.2021.9413991.
- [C6] X. Wang, T. Liu, M. Trinh-Hoang, and M. Pesavento, “GPU-accelerated parallel optimization for sparse regularization,” in *2020 IEEE 11th Sensor Array and Multichannel Signal Processing Workshop (SAM)*, Jun. 2020, pp. 1–5. DOI: 10.1109/SAM48682.2020.9104328.
- [C7] T. Liu, M. Trinh-Hoang, Y. Yang, and M. Pesavento, “A block coordinate descent algorithm for sparse Gaussian graphical model inference with laplacian constraints,” in *IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing*, Dec. 2019, pp. 236–240. DOI: 10.1109/CAMSAP45676.2019.9022643.

- [C8] T. Liu, M. Trinh-Hoang, Y. Yang, and M. Pesavento, “A parallel optimization approach on the infinity norm minimization problem,” in *2019 27th European Signal Processing Conference (EUSIPCO)*, A Coruna, Spain: IEEE, Sep. 2019, pp. 1–5, ISBN: 978-90-827970-3-9. DOI: 10.23919/EUSIPCO.2019.8902548.