

# Tianyi Liu (刘添翼) | Dr.-Ing.

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Nationality: Chinese (work visa not required in EU – EU permanent resident)

## 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*

*Recipient of the Best Master Student Award from the Dept. ETIT*

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

**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 – April 2025*

### 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*

*2024*

*IEEE SPS Student Travel Grant for the IEEE CAMSAP 2019*

*2019*

*Finalist of the EUSIPCO 2019 Best Student Paper Contest*

*2019*

**Dept. ETIT, TU Darmstadt**

*Best Master Student Award*

**Darmstadt, Germany**

*2018*

## Academic Service

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**IEEE Signal Processing Letter**

*Reviewer*

2024

**Elsevier Signal Processing**

*Reviewer*

2023

## Teaching Experience

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**Teaching Assistant at TU Darmstadt**.....

**18-pe-2080 Graph Signal Processing, Learning and Optimization**

*Instructor: Prof. Marius Pesavento*

WS 2020/21 – WS 2024/25

**18-pe-2070 Matrix Analysis and Computations**

*Instructor: Prof. Marius Pesavento*

SS 2019 – SS 2024

**18-pe-2050 Project Seminar: Procedures for Massive MIMO and 5G**

*Instructor: Prof. Marius Pesavento*

SS 2020

**18-pe-2030 MIMO Communication and Space-Time Coding**

*Instructor: Prof. Marius Pesavento*

WS 2018/19 – WS 2019/20

## Supervised Student Projects

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- [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

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### 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.

## Referees

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**Prof. Marius Pesavento:** Communication Systems Group, TU Darmstadt, Germany

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**Prof. Marc Pfetsch:** Optimization and Operations Research, TU Darmstadt, Germany

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**Prof. Yonina Eldar:** Faculty of Math & CS, Weizmann institute of Science, Isreal

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