Tianyi Liu (刘添翼) | Dr.-Ing.

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Tianyi-Liu-3 • SAJ8bL8AAAAJ
Nationality: Chinese (work visa not required in EU – EU permanent resident)

Education

Technical University of Darmstadt — **Darmstadt, Germany**
Dr.-Ing. in Elect. Eng. and Inform. Technol., with distinction — *Oct. 2018 – Sept. 2024*
Thesis: A Parallel Successive Convex Approximation Framework with Smoothing Majorization for Phase Retrieval
Advisor: Prof. Marius Pesavento
Co-referee: Prof. Stefan Ulbrich

Technical University of Darmstadt — **Darmstadt, Germany**
M.Sc. in Elect. Eng. and Inform. Technol., with distinction — *Oct. 2016 – July 2018*
Recipient of the Best Master Student Award from the Dept. ETIT
Erasmus Double Degree Program between Technical University of Darmstadt and Politecnico di Torino

Politecnico di Torino — **Turin, Italy**
M.Sc. in Communications and Computer Networks Eng., cum laude — *Sept. 2015 – July 2018*

Politecnico di Torino — **Turin, Italy**
B.Sc. in Telecommunications Engineering — *Sept. 2014 – July 2015*
Double Degree Program PoliTong between Politecnico di Torino and Tongji University

Tongji University — **Shanghai, China**
B.Eng. in Electronics and Information Engineering — *Sept. 2011 – June 2015*

Research Experience

Communication Systems Group, TU Darmstadt — **Darmstadt, Germany**
Postdoctoral Research Associate — *Nov. 2024 – April 2025*

Communication Systems Group, TU Darmstadt — **Darmstadt, Germany**
Doctoral Research Associate — *Sept. 2018 – Aug. 2024*

Research Interests

- Sparse signal processing
- Parallel optimization methods: Focusing on nonconvex and nonsmooth problems
- Sensor array signal processing: Direction-of-Arrival estimation
- Game theory: Generalized Nash equilibrium
- Graph 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 — **Darmstadt, Germany**
Best Master Student Award — *2018*

Participated Projects

- German Research Foundation (DFG), "The Partial relaxation method in direction-of-arrival estimation: Design and analysis", PI: Prof. Marius Pesavento, €300K, 2019–2025
- DFG priority program on Compressed Sensing in Information Processing (CoSIP), "Exploiting structure in compressed sensing using side constraints: From analysis to system design – Funding phase II", PI: Prof. Martin Haardt, Prof. Marc Pfetsch, Prof. Marius Pesavento, €300K for each group, 2018–2021

Research Skills

Programming: MATLAB, Julia, Python, C/C++, Bash/Zsh, Git

Literature Management: Markdown, LaTeX, Obsidian, Zotero, Neovim

Professional Skills Training

Attendance at the IEE-SPS/EURASIP Summer School on Network- and Data-Driven Learning *2019*

Academic Service

IEEE Signal Processing Letter
Reviewer *2024*

Elsevier Signal Processing
Reviewer *2023*

Teaching Experience

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

[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.

Languages

Chinese: Mother tongue
English: Fluent
Italian: Moderate
German: Moderate

Referees

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