

# Dr. Joshua Jalali, PhD

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## Summary —

PhD in Electrical Engineering with 7+ years of combined experience in wireless communication systems and industrial automation. Specialized in sustainable 6G design, and signal processing. Strong background in digital communications and MIMO-OFDM algorithms, with 20+ publications and one patent application filed. Industry experience includes IMEC, Futurewei, ST Engineering, and hands-on engineering roles at Picanol and Mohawk (IVC Group). Recipient of international grants for research on future wireless networks.

## Skills

**Programming** Python, MATLAB, C, C++, LaTeX, Verilog HDL, VHDL

**Wireless** 5G NR, LTE, 3GPP RAN1, ORAN, MEC, RF, WiFi, LiFi, OFDM, DSP, distributed optimization, network abstraction, LLS, SLS, QuaDRiGa, Simulink, Sionna, NS-3, CVX

**AI/ML** TensorFlow, Keras, Scikit-learn, PyTorch  
**Automation** SCADA, PLC, PID, HMI, STEP 7 (TIA), Studio 5000, WinCC, Proteus, u-Vision IDE

**Software** Git, PyCharm, SAP, Excel, PowerPoint, Eclipse, GNU Toolchain, Wireshark, Mathematica

**Lab Tools** Signal Generator, Spectrum Analyzer, VNA, Oscilloscope

## Experience

### JuliaSpace

Nov 2024 – Present

Founder and Principal Investigator

Chicago, IL, United States

- Founder and principal investigator at JuliaSpace, an innovation-driven company focusing on intelligent wireless infrastructure, shape-adaptive surfaces, and sustainable network design
- Applied for and won the FEPESPA Internet Committee grant from Brazil, supporting applied research in next-generation wireless networks and infrastructure sustainability; the funded proposal focused on decentralized resource allocation optimization techniques for dynamic multi-antenna systems
- Initiated and led grant proposals to national and international agencies to support foundational research in holographic surfaces, THz-band communication, and AI/ML-enabled 6G networks
- Designed and implemented physical-layer simulation testbeds integrating AI-aided beam management and RIS/RHS optimization
- Built modular experimentation environments to test shape-adaptive surface performance in complex urban layouts and UAV-assisted deployments
- Oversaw integration of JuliaSpace prototypes into collaborative academic and industrial R&D projects, including the BEL6GICA initiative and imec ICON-SAMBAS
- Published novel system architectures and optimization frameworks for RHS-enabled communications and joint sensing/communication use cases
- Actively advancing JuliaSpace's mission of bridging theoretical research with practical wireless solutions through interdisciplinary collaborations in academia and industry

### Futurewei Technologies, Inc.

Oct 2022 – May 2025

Senior Engineer

Schaumburg, IL, United States

- Contributed to 3GPP RAN1 standardization efforts for Rel-18, Rel-19, and early 6G studies
- Led link-level simulation efforts for 5G NR physical layer, including wideband XL-MIMO-OFDM systems
- Focused on physical layer enhancements for AI/ML-driven signal processing
- Designed AI/ML frameworks for CSI compression and beam prediction
- Developed advanced machine learning algorithms and diverse sampling techniques to enhance beam management KPIs and reduce beam sweeping overhead for 5G-NR networks
- Evaluated spatial-domain beam prediction performance across multiple network deployment scenarios (e.g., UMi-UMa, UMi-UMi, UMa-UMa) using state-of-the-art ML models, including ResNet, VGG, Vision Transformer (ViT), and Residual-CNN architectures
- Devised proof-of-concept studies demonstrating achievement of target performance thresholds (e.g., accuracy, L1-RSRP-difference) relative to training overheads and associated costs in P1/P2/P3 phases
- Actively contributed to ML-aided beam management discussions at 3GPP RAN1 Working Group meetings, supporting submissions such as TDoc R1-2210843, TDoc R1-2208368, and TDoc R1-2205753
- Addressed both spatial and temporal aspects of CSI modeling
- Built and evaluated machine learning models for user positioning, link reliability prediction, and channel modeling
- Integrated AI pipelines into MATLAB and Python-based link/system simulators to assess performance trade-offs
- Published technical results in top-tier IEEE conferences as part of collaborative R&D with internal and academic partners

**IVC Group (Mohawk/Unilin)****Oct 2021 – Oct 2022***Technical Engineer**Avelgem, Belgium*

- Operated and maintained automation systems in LVT flooring production lines
- Troubleshoot faults in PLCs, VFDs, sensors, and industrial control panels
- Programmed HMIs, servo drives, and robotics using TIA Portal and WinCC
- Performed loop checks, signal tracing, and I/O verification on production equipment
- Led technical personnel teams, managed shift rotations, and assigned daily maintenance tasks
- Assisted with retrofitting legacy systems and integrating new automation modules
- Ensured compliance with safety standards and documented technical procedures

**Picanol NV****Feb 2019 – Oct 2021***Electronics Engineer**Ieper, Belgium*

- Bridged field service and R&D to resolve complex electronic hardware and embedded software issues
- Used Python and MATLAB to analyze machine logs, sensor signals, and production data
- Traveled internationally to provide on-site diagnostic and calibration support for textile machinery
- Documented recurring issues and proposed design changes to improve system reliability
- Supported signal integrity testing, EMC compliance, and PCB debugging for new product lines
- Assisted in prototype validation and firmware updates across product development cycles
- Collaborated with software teams to troubleshoot CAN bus and real-time control communication faults

**IMEC – IDLab****Nov 2020 – Nov 2024***Research Engineer**Antwerp, Belgium*

- Conducted academic research on low-power wireless communication and localization
- Investigated THz communication and RIS-assisted networks for energy efficiency
- Contributed to the SAMBAS project on sustainable B5G/6G network design
- Reviewed for top IEEE journals and conferences; taught Bachelor courses in ICT

**ST Engineering iDirect****May 2018 – Jan 2019***Research Engineer**Sint-Niklaas, Belgium*

- Designed and evaluated probabilistic shaping for capacity-approaching coded modulations
- Implemented bit-metric decoding strategies using C++ for LDPC-coded BICM systems
- Validated performance improvements over AWGN channels without iterative demapping

## Education

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**University of Antwerpen, Belgium***Ph.D. in Applied Engineering**Department of Electronics-ICT, Antwerp, Belgium*

- Dissertation: Resource Allocation for Intelligent Reflecting Surfaces Aided Wireless Networks
- Conducted research at IDLab/imec on low-power wireless systems, THz communication, and RIS
- Contributed to teaching in the Electronics-ICT Bachelor program; reviewed for IEEE journals

**York University, Canada***Research Visitor**Lassonde School of Engineering, Toronto, Canada*

- Awarded prestigious FWO grant to conduct international research during PhD
- Investigated THz-enabled communication systems for integration in 6G networks
- Published a Q1 IEEE Communications Letters article and served as Session Chair for Vehicular Technology conference

**Ghent University, Belgium***M.Sc. in Electrical Engineering – CIT**Department of Telecommunications and Information Processing, Ghent, Belgium*

- Thesis: Resource Allocation for SWIPT in Multi-Service Wireless Networks
- Focused on optimization algorithms and power-efficient communication system design
- Received competitive top-up grant scholarship awarded to top international students

## Publications

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- [20] **J. Jalali**, Mostafa Darabi, and Rodrigo C. de Lamare, *Shape Adaptive Reconfigurable Holographic Surfaces*, submitted to *IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC)*, Surrey, United Kingdom, 2025.
- [19] **J. Jalali**, Hina Tabassum, Jeroen Famaey, Walid Saad, and Murat Uysal, *Placement, Orientation, and Resource Allocation Optimization for Cell-Free OIRS-aided OWC Network*, *IEEE Transactions on Vehicular Technology*, 2025. doi: 10.1109/TVT.2025.3538334.
- [18] Y. Song, **J. Jalali**, Filip Lemic, Natasha Devroye, and Jeroen Famaey, *Miniature UAV Empowered Reconfigurable Energy Harvesting Holographic Surfaces in THz Cooperative Networks*, submitted to *IEEE Internet of Things Journal (IOTJ)*, 2025.
- [17] Filip Lemic, **J. Jalali**, Gerard Calvo Bartra, Alejandro Amat, Jakob Struye, Jeroen Famaey, and Xavier Costa Perez, *Location-based Real-time Utilization of Reconfigurable Intelligent Surfaces for mmWave Integrated Communication and Sensing in full-immersive Multiuser Metaverse Scenarios*, in *Advanced Metaverse Wireless Communication Systems*, IET Digital Library, 2025. doi:10.1049/PBTE112E-ch5.
- [16] **J. Jalali**, Juan Roa, Yifei Song, Renjian Zhao, and Baoling Sheen, *Fast Best Beam Prediction and Overhead Reduction for 6G Networks: A Deep Learning Approach*, *2024 IEEE 99th Vehicular Technology Conference (VTC2024-Spring)*, Singapore, 2024, pp. 01–06. doi: 10.1109/VTC2024-Spring62846.2024.10683207.
- [15] Yifei Song, Juan Roa, Renjian Zhao, Zhigang Rong, Weimin Xiao, **J. Jalali**, and Baoling Sheen, *Variable Code Size Autoencoder (VCSA) Meets CSI Compression in Model Generalization*, *2024 International Conference on Computing, Networking and Communications (ICNC)*, Big Island, HI, USA, 2024, pp. 209–214. doi: 10.1109/ICNC59896.2024.10556024.
- [14] **J. Jalali**, Ata Khalili, Hina Tabassum, Rafael Berkvens, Jeroen Famaey, and Walid Saad, *Energy-Efficient THz NOMA for SWIPT-Aided Miniature UAV Networks*, *IEEE Communications Letters*, vol. 28, no. 5, pp. 1107–1111, May 2024. doi: 10.1109/LCOMM.2024.3372471.
- [13] **J. Jalali**, Maria Bustamante Madrid, Filip Lemic, Hina Tabassum, Jakob Struye, J. Famaey, and X. Pérez, *Location Optimization and Resource Allocation of IRS in a Multi-User Indoor mmWave VR Network*, *2024 IEEE Wireless Communications and Networking Conference (WCNC)*, Dubai, United Arab Emirates, 2024, pp. 1–6. doi: 10.1109/WCNC57260.2024.10570884.
- [12] **J. Jalali**, Filip Lemic, Hina Tabassum, Rafael Berkvens, and J. Famaey, *Toward Energy Efficient Multiuser IRS-Assisted URLLC Systems: A Novel Rank Relaxation Method*, *2023 IEEE Globecom Workshops (GC Wkshps)*, Kuala Lumpur, Malaysia, 2023, pp. 1354–1360. doi: 10.1109/GCWkshps58843.2023.10464825.
- [11] **J. Jalali**, A. Khalili, R. Berkvens, and J. Famaey, *Joint Offloading Policy and Resource Allocation in IRS-aided MEC for IoT Users with Short Packet Transmission*, *2023 IEEE 98th Vehicular Technology Conference (VTC2023-Fall)*, Hong Kong, 2023, pp. 1–7. doi: 10.1109/VTC2023-Fall60731.2023.10333867.
- [10] **J. Jalali**, A. Khalili, A. Rezaei, R. Berkvens, M. Weyn, and J. Famaey, *IRS-Based Energy Efficiency and Admission Control Maximization for IoT Users With Short Packet Lengths*, *IEEE Transactions on Vehicular Technology*, vol. 72, no. 9, pp. 12379–12384, September 2023. doi: 10.1109/TVT.2023.3266424.
- [9] **J. Jalali**, A. Khalili, A. Rezaei, and J. Famaey, *Is Active IRS Useful for mmWave Wireless Networks or Not?*, *2023 International Conference on Computing, Networking and Communications (ICNC)*, Honolulu, HI, USA, 2023, pp. 377–382. doi: 10.1109/ICNC57223.2023.10074428.
- [8] **J. Jalali**, A. Khalili, A. Rezaei, J. Famaey, and W. Saad, *Power-efficient Antenna Switching and Beamforming Design for Multi-User SWIPT with Non-Linear Energy Harvesting*, *2023 IEEE 20th Consumer Communications and Networking Conference (CCNC)*, Las Vegas, NV, USA, 2023, pp. 746–751. doi: 10.1109/CCNC51644.2023.10059879.
- [7] **J. Jalali**, A. Rezaei, A. Khalili, and J. Famaey, *Power-efficient Joint Resource Allocation and Decoding Error Probability for Multiuser Downlink MISO with Finite Block Length Codes*, *2022 25th International Symposium on Wireless Personal Multimedia Communications (WPMC)*, Herning, Denmark, 2022, pp. 232–237. doi: 10.1109/WPMC55625.2022.10014778.
- [6] A. Rezaei, A. Khalili, **J. Jalali**, H. Shafiei, and Q. Wu, *Energy-Efficient Resource Allocation and Antenna Selection for IRS-Assisted Multicell Downlink Networks*, *IEEE Wireless Communications Letters*, vol. 11, no. 6, pp. 1229–1233, June 2022. doi: 10.1109/LWC.2022.3161410.
- [5] **J. Jalali**, A. Kaya, M. Weyn, and R. Berkvens, *Activity Monitoring at an Intersection Using a Sub-GHz Wireless Sensor Network*, *2021 IEEE 94th Vehicular Technology Conference (VTC2021-Fall)*, Norman, OK, USA, 2021, pp. 1–6. doi: 10.1109/VTC2021-Fall52928.2021.9625527.

- [4] S. Bayat, **J. Jalali**, A. Khalili, M. R. Mili, S. Wittevrongel, and H. Steendam, *Optimal Multi-Objective Resource Allocation for D2D Underlying Cellular Networks in Uplink Communications*, *IEEE Access*, vol. 9, pp. 114153–114166, 2021. doi: 10.1109/ACCESS.2021.3100356.
- [3] **J. Jalali**, *Resource allocation for SWIPT in multi-service wireless networks*, M.S. thesis, Ghent Univ., 2020.
- [2] **J. Jalali**, and A. Khalili, *Optimal Resource Allocation for MC-NOMA in SWIPT-Enabled Networks*, *IEEE Communications Letters*, vol. 24, no. 10, pp. 2250–2254, October 2020. doi: 10.1109/LCOMM.2020.3004418.
- [1] **J. Jalali**, A. Khalili, and H. Steendam, *Antenna Selection and Resource Allocation in Downlink MISO OFDMA Femtocell Networks*, *2020 IEEE 91st Vehicular Technology Conference (VTC2020-Spring)*, Antwerp, Belgium, 2020, pp. 1–6. doi:10.1109/VTC2020-Spring48590.2020.9128541.