

Curriculum Vitae

Dr. Rishu Raj

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[Google Scholar](#), [LinkedIn](#)

Areas of Interest

Visible light communication, optical communication, digital twin, 5G+ communication, non-linear optics.

Academic Qualifications

- **Ph.D.* in Visible Light Communication** (July 2016 – Jan 2022)
Department of Electrical Engineering
Indian Institute of Technology Delhi, New Delhi, India
CGPA: 9.5/10
**Selected for direct Ph.D. (without M. Tech.) based on exceptional academic performance.*
- **Bachelor of Technology** (Institute Gold Medallist) in **Electrical Engineering** (2010-2014)
National Institute of Technology Agartala, Tripura, India
CGPA: 9.72/10
- **Intermediate** (12th, CBSE) **Science Stream** (2010)
Hans Raj Model School, New Delhi, India
Percentage: 94.6%
- **Matriculation** (10th, CBSE) (2008)
Oak Grove School, Mussoorie, Uttarakhand, India
Percentage: 96.2%

Work Experience

- **Marie Sklodowska-Curie Post-doctoral Fellow** (June 2024 – till date) at Columbia University, New York, USA & Trinity College Dublin, Ireland (joint appointment).
- **Post-Doctoral Research Fellow** (Oct. 2022 – May 2024) at CONNECT Research Center, Trinity College Dublin, Ireland.
- **Research Scientist, Hardware** (Feb. 2022 – Sept. 2022) at Nav Wireless Technologies Pvt. Ltd., Ahmedabad, Gujarat, India. In this role, I was responsible for the design and implementation of an indoor VLC hardware link, and its commercial prototype.
- **Senior Project Scientist** (Oct. 2021 – Dec. 2021) in the indigenous 5G test bed project supported by the Department of Telecommunications, Ministry of Communications, India. In this project, I was involved in the design, simulation, development and testing of indoor LiFi links.
- **Teaching Assistant** (Aug 2016 – Aug 2021) for the courses Broadband Communication Systems, Digital Communication & Information Theory, and Optical Communication Laboratory at IIT-Delhi: Actively involved in the revamp and redesign of the lab experiments for M. Tech. students specializing in Optoelectronics and Optical Communication. I drafted the new lab manual to be followed by the students while conducting experiments in this lab. As a teaching assistant for the lab course (conducted 6 hours per week), my job was to demonstrate and explain experiments related to optical fiber communication, dense wavelength division multiplexing, wireless optical communication etc. I was also involved in the grading of lab reports and evaluation of projects submitted by the students in this course.
- **Teaching Assistant** (2019 – 2022) for the course ‘Principles of Digital Communications’ held by the *National Program on Technology Enhanced Learning (NPTEL)*: Responsible for preparing lecture notes and clearing doubts of students. I also prepared the question papers for the assignments and examinations conducted in this course. I was involved in grading the evaluations as well.

Publications (as of June 2025)

Journal Papers

- [1] H. Ma, J. Zhang, Z. Gu, **R. Raj**, D. Kilper and Y. Ji, “Self-adaptive auxiliary cube for multi-tenant slicing in multi-layer computing power networks,” *IEEE/OSA Journal of Lightwave Technology*, vol. 43, no. 8, pp. 3663-3684, Apr. 2025. ISSN: 1558-2213. DOI: 10.1109/JLT.2025.3528578 (Impact Factor: 4.1)
- [2] **R. Raj**, K. Jindal and A. Dixit, “Fairness enhancement of non-orthogonal multiple access in VLC-based IoT networks for intravehicular applications,” *IEEE Transactions on Vehicular Technology*, vol. 71, no. 7, pp. 7414-7427, Jul. 2022. doi: 10.1109/TVT.2022.3167091 (Impact Factor: 6.8) ISSN: 1939-9359
- [3] **R. Raj** and A. Dixit, “An energy-efficient power allocation scheme for NOMA-based IoT sensor networks in 6G,” *IEEE Sensors Journal*, vol. 22, no. 7, pp. 7371-7384, Apr. 2022. (Impact Factor: 4.3) ISSN: 1558-1748
- [4] **R. Raj** and A. Dixit, “Outage analysis and reliability enhancement of hybrid VLC-RF networks using cooperative non-orthogonal multiple access,” *IEEE Transactions on Network and Service Management*, vol. 18, no. 4, pp. 4685-4696, Dec. 2021. doi: 10.1109/TNSM.2021.3102987 (Impact Factor: 5.3) ISSN: 1932-4537

- [5] **R. Raj**, S. Jaiswal and A. Dixit, "Dimming-based modulation schemes for visible light communication: Spectral analysis and ISI mitigation," *IEEE Open Journal of the Communications Society*, vol. 2, pp. 1777-1798, 2021. (Impact Factor: 7.9) ISSN: 2644-125X
- [6] **R. Raj**, K. Saxena and A. Dixit, "Passive optical identifiers for VLC-based indoor positioning systems: Design, hardware simulation, and performance analysis," *IEEE Systems Journal*, vol. 15, no. 3, pp. 3208-3219, Sep. 2021. (Impact Factor: 4.4) ISSN: 1937-9234
- [7] **R. Raj**, S. Jaiswal and A. Dixit, "On the effect of multipath reflections in indoor visible light communication links: Channel characterization and BER analysis," *IEEE Access*, vol. 8, pp. 190620-190636, 2020. (Impact Factor: 3.9) ISSN: 2169-3536
- [8] **R. Raj**, N. Kumar, S. Kumar, S. Deb and A. Saha, "Quasi-phase matched broadband difference frequency generation in the mid-infrared region using total internal reflection in a tapered gallium arsenide (GaAs) slab," *Optik - International Journal for Light and Electron Optics*, vol. 126, no. 21, pp. 2917-2924, 2015. (Impact Factor: 3.1) (CiteScore: 6.9) ISSN: 1618-1336

Conference Papers

- [1] U. Tariq, **R. Raj**, and D. Kilper, "Design and analysis of power consumption models for Open-RAN architectures," *IEEE International Conference on Communications (ICC)*, Montreal, Canada, June 2025. (presented)
- [2] S. Xie, **R. Raj**, D. Briantcev, Z. Wang, T. Chen and D. Kilper, "WDM system stimulated Raman scattering spectrum and tilt prediction using CNN-based transfer learning," *IEEE International Conference on Optical Network Design and Modeling (ONDM)*, Pisa, Italy, May 2025. (presented)
- [3] **R. Raj**, S. Xie, Z. Wang, T. Chen and D. Kilper, "Raman tilt prediction for digital twin modelling of ROADM-based transmission systems," *IEEE Future Networks World Forum (FNWF)*, Dubai, UAE, October 2024. (presented)
- [4] **R. Raj et. al.**, "Towards efficient confluent edge networks," *Joint European Conference on Networks and Communications & 6G Summit (EuCNC/6G Summit)*, Antwerp, Belgium, 2024, pp. 1163-1168.
- [5] A. Singh, **R. Raj**, and D. Kilper, "Neural network-based positioning system for localisation and 3D shape detection in crowded IoT networks," *IEEE Applied Sensing Conference (IEEE APSCON)*, Goa, India, 2024, pp. 1-4.
- [6] **R. Raj**, S. Xie, Z. Wang, T. Chen and D. Kilper, "Digital twin modelling of cascaded amplifiers in the COSMOS testbed," *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, Jaipur, India, 2023, pp. 1-6.
- [7] **R. Raj**, S. Xie, Z. Wang, T. Chen and D. Kilper, "Machine learning-based Raman tilt prediction in a ROADM transmission system," *European Conference on Optical Communication (ECOC)*, Glasgow, UK, 2023, pp. 1504-1507.
- [8] P. Chaudhary, **R. Raj**, H. Rawal and H. Soni, "A novel GUI for link budget evaluation of FSO backhaul in dense fog networks for 6G," *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, Gandhinagar, Gujarat, India, 2022, pp. 1-5.
- [9] **R. Raj** and A. Dixit, "On the spectral performance of dimming-based multilevel modulation schemes for VLC systems," *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, Hyderabad, India, 2021, pp. 360-365.
- [10] **R. Raj**, G. Pandey and A. Dixit, "Tunable receiver design for spatially distributed wireless optical sensors in IoT networks," *IEEE International Conference on Communications (ICC)*, Dublin, Ireland, 2020, pp. 1-6.
- [11] S. Jaiswal, **R. Raj** and A. Dixit, "Performance evaluation of multipath VLC links for different transmitter configurations," *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, New Delhi, India, Dec. 2020, pp. 1-6.
- [12] K. Jindal, **R. Raj** and A. Dixit, "On improving the fairness of NOMA-based indoor visible light communication system," *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, New Delhi, India, Dec. 2020, pp. 1-6.
- [13] **R. Raj** and A. Dixit, "Performance evaluation of power allocation schemes for non-orthogonal multiple access in MIMO visible light communication links," *International Conference on Signal Processing and Communications (SPCOM)*, Bangalore, India, 2020, pp. 1-5.
- [14] **R. Raj**, S. Jaiswal and A. Dixit, "Optimization of LED semi-angle in multipath indoor visible light communication links," *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, Goa, India, 2019, pp. 1-6.
- [15] K. Saxena, **R. Raj** and A. Dixit, "A novel optimization approach for transmitter semi-angle and multiple transmitter configurations in indoor visible light communication links," *9th International Conference on Computing, Communication and Networking Technologies (ICCCNT)*, Bangalore, 2018, pp. 1-7.
- [16] **R. Raj**, K. Saxena and A. Dixit, "Analysis of Lambertian order of LEDs for optimum power distribution in diffuse visible light communication links," *14th International Conference on Fiber Optics and Photonics*, IIT Delhi, India, December 12 – 15, 2018.

Patents

- [1] A. Dixit, **R. Raj** and K. Saxena, "System and method for identifying passive optical identifier tags," U.S. Patent No. US 11,274,927 B2, March 2022.
- [2] A. Dixit, **R. Raj** and K. Saxena, "System and method for identifying passive optical identifier tags," Indian Patent No. 493336, July 2020.

Academic Achievements and Awards

1. Awarded the **Marie Skłodowska-Curie Actions Postdoctoral Fellowship** (MSCA-PF) funded by Horizon Europe, the European Union's flagship funding program, in February 2024.
2. Awarded the **Innovative Student Project Award at Doctoral Level** given by the Indian National Academy of Engineering in 2022.
3. Awarded the **Institute Gold Medal of NIT Agartala** for obtaining the highest CGPA (9.72/10.00) among all students across all departments in the college.
4. Awarded by CBSE for being among the **top 0.1% of successful candidates of AISSEE- 2010 in Engineering Drawing** with a perfect score of 100/100 in 2010.
5. Awarded the title of '**most brilliant student**' for being the **top scorer of class 12th board exams** (science stream) in West Delhi.
6. Awarded cash prize by Northern Railway Women's Welfare Organisation for being the **top scorer of class 10th board exams** in Mussoorie and the second highest in the state of Uttarakhand in 2009.
7. Awarded by CBSE for being among the **top 0.1% of successful candidates of AISSE- 2008 in Science** with a perfect score of 100/100 in 2008.
8. **Winner of the Science Exhibition** organised by Rashtriya Indian Military College (RIMC), Dehradun in 2006, for the project on Automatic Railway Crossing.

Academic Responsibilities

- Presented an *invited talk* titled "Digital Twin Modelling of Optical Communication Links," at the Fostering Industry Outreach & Research Collaboration (FIOR'25) organised by Research Ireland in Dublin on 12 February 2025.
- Served as a judge at the ESB Science Blast 2025 organised by the Royal Dublin Society (RDS) at Simmonscourt, Dublin in March 2025.
- Organised "Cybersecurity Escape Room" – Workshop on Data Protection and Cyber Security Awareness at Trinity College Dublin, on 27 September 2024.
- Served as *Exhibit & Demo Chair* in the IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS) held at Jaipur, India in December 2023, and at Guwahati in December 2024.
- Organised a *workshop* titled "*Workshop on Optical Wireless Communication Systems (WOWS)*" in IEEE ANTS 2023 and IEEE ANTS 2024.
- Presented an *invited talk* titled "An energy-efficient power allocation scheme for NOMA-based IoT sensor networks in 6G," at the IEEE Applied Sensing Conference (IEEE APSCON), Bengaluru, India, Jan. 2023.
- Convenor and representative of PhD scholars in the *Co-curricular and Academic Interaction Council (CAIC)* of IIT Delhi for the 2018-2019 session.
- Organised short course on *Optical Fiber/Wireless Communications and Networks* organised at IIT Delhi in December 2016.
- Reviewer for reputed research journals: IEEE Wireless Communication Letters, IEEE Transactions on Wireless Communications, IEEE Transactions on Vehicular Technology, IEEE Access, IEEE Systems Journal, IEEE Sensors Journal, Springer Optical and Quantum Electronics, and SPIE Optical Engineering.
- Reviewer for reputed conferences: IEEE International Conference on Communications (ICC), IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS), and International Conference on Optical Network Design and Modelling (ONDM).

Workshops and Seminars attended

- Workshop on *Visible Light for Broadband Communications: Current Research & Standardization* organized by IIIT Delhi Center of Excellence on LiFi supported by India-EU ICT Standardisation Cooperation Project, in March 2021.
- Seminar on *Broadband and Sustainable Development* organised jointly by The Institution of Engineers India and BSNL on the occasion of "World Telecommunication & Information Society Day" at Agartala in 2014.
- Workshop on *Indian Power Scenario* conducted by Power Grid Corporation of India Ltd. at NIT Agartala in 2013.
- Seminar on *Energy Audit and Power Savings* conducted by Coal India Limited at NIT Agartala in 2013.

Industrial Training Experience

- Vocational Training and Project Work on "Electrical Surface Installations" at *Oil and Natural Gas Corporation (ONGC) Limited*, Agartala in 2013.
- Vocational Training at *National Thermal Power Corporation (NTPC) Limited*, Kahalgaon in 2013.
- Training Course on "Industrial Automation (PLC Programming)" at *Central Tool Room and Training Centre (CTTC)*, Bhubaneswar in 2012.

Professional Memberships

- Institute of Electrical and Electronics Engineers (IEEE)
- Optica (formerly OSA)
- Indian National Academy of Engineering (INAE)