Dr. Sandeep Kumar Singh

Assistant Professor, Motilal Nehru National Institute of Technology Allahabad
Top 2% scientists, by Stanford/Elsevier & Editor, Scientific Reports, Nature.
Ph.D. in Communication Engineering- 5G, B5G and 6G | RIS/IRS | AI/ML; UAV-BS/relay | NOMA | RSMA | OFDM | Massive MIMO | PHY| URLLC; Algorithms | Modeling and Simulation| Radio resource management; Design, performance analysis & optimization; Experienced in MATLAB

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RESEARCH PROJECTS

Prime Minister Early Career Research Grant, Anusandhan National Research Foundation (ANRF), *JUN. 2025 – JUN. 2028*
Multiple Access for Reconfigurable Holographic Surface-aided Near-Field Communication
GRANT: INR 69,24,480/- (69 LAKHS APPROX)

- Developed and analyzed advanced multiple access schemes, including RSMA, NOMA, and hybrid access techniques, for holographic channels.
- Formulated rate, SINR, outage probability, and energy efficiency expressions under near-field spherical-wave propagation.
- Investigated beamforming, interference management, and power allocation strategies in H-RIS–aided networks.
- Performed Monte Carlo simulations (MATLAB/Python) to evaluate spectral and energy efficiency in 6G-oriented scenarios.
- Studied passive RIS-based coverage enhancement for low-power, high-data-rate communication in dense urban environments.
- To design SDR-based experimental frameworks for validating RSMA-enabled H-RIS multiple access concepts.

SEED GRANT, Motilal Nehru National Institute of Technology Allahabad, *Jan. 2024 – Dec. 2025*
RSMA for Aerial Reconfigurable Intelligent Surface (RIS)-assisted Integrated Sensing and Communication (ISAC)
GRANT: INR 5 LAKHS

- Designed a 20X20 Reconfigurable Intelligent Surface
- Analyzing RSMA for RIS-assisted ISAC.

AWARDS AND ACHIEVEMENTS

- Top 2% scientists, listed by Stanford/Elsevier
- Editor, Scientific Reports, Nature
- Organized FDP "Pioneering 6G: Innovations, Applications, and The Road Ahead" Sponsered by Electronics and ICT Academy, Phase II, PDPM IIITDM Jabalpur
- Guest Editor, IEEE Internet of Things Journal
- TPC Chair, IEEE MAC
- Session Chair: IEEE MAPCON 2024 and IEEE ANTS 2023.
- Guest Lectures: VNIT Nagpur, NIT Patna, MANIT Bhopal, IIIT UNA, etc.

WORK EXPERIENCE

Motilal Nehru National Institute of Technology Allahabad, *Prayagraj, India* *Aug.. 2023 – Present.*
Assistant Professor (Grade-II) [MATLAB, MATHEMATICA, Python, LaTeX]

- Regular academic work such as teaching to undergraduate and postgraduate students
- Associated with different technical labs such as Analog and Digital Communication, EDC, Basic Electronics, etc.
- Lead and supervise undergraduate and postgraduate students to coordinate research efforts for increased efficiency
- Collaborate with resources to complete research plans.
- Participate, assist in manuscript writing for publications
- Prepare the project proposals for submission to agencies and foundations that fund research
- Published the outcome of research: edit and prepare manuscripts; present the work in reputed journals

National Sun Yat-sen University, *Kaohsiung, Taiwan* *Mar. 2020 – Aug. 2023*
Postdoctoral Research Associate | Mentor: Prof. Chih-Peng Li *and* Dr. Keshav Singh [MATLAB, MATHEMATICA, Python, LaTeX]

- Designing prototype of RIS and testing its performance for indoor and outdoor environments. The design of a 8X10 RIS has been completed. Currently, we are testing its performance in these scenarios.
- Perform state-of-the-art research on UAV/RIS-aided wireless communication using NOMA/RSMA to a superior standard
- Collaborate with resources to complete research plans.
- Lead and supervise other personnel in the laboratory to coordinate research efforts for increased efficiency
- Participate, assist in manuscript writing for publications
- Prepare the project proposals for submission to agencies and foundations that fund research
- Published the outcome of research: edit and prepare manuscripts; present the work in reputed journals

Visvesvaraya National Institute of Technology, *Nagpur, India* *Jul. 2019 – Dec. 2019*
Adjunct Assistant Professor of Practice [ADS,PSPICE,AWR,Cadence, Mentor Graphics]

- Regular academic work such as teaching to undergraduate and postgraduate students
- Organized technical workshops, short term training programs and coordinated the same
- Associated with different technical labs such as radio frequency circuit design (RFCD), EDC, Digital Communication, Analog Communication, Computer network etc.

EDUCATION

Visvesvaraya National Institute of Technology, *Nagpur, India* — *Jan. 2014 – Jun. 2019*
Ph.D. in Electronics and Communication Engineering | Wireless Communication — Advisor: Dr. A. S. Gandhi
Thesis: "Preamble based Synchronization in OFDM based MIMO, Massive MIMO and Full Duplex systems"

Motilal Nehru National Institute of Technology Allahabad, *Prayagraj, India* — *Jun. 2011 – May. 2013*
M.Tech. in Micro-Electronics and VLSI Design — Advisor: Dr. Manish Tiwari
Thesis: "Performance analysis and designing of bootstrapped CMOS inverter"

Rajiv Gandhi Proudyogiki Vishwavidyalaya, *Bhopal, India* — *Jul. 2006 – Jun. 2010*
B.E. in Electronics and Communication Engineering
Major Project: "MIMO Transceiver using VHDL Programming"

SKILLS

Mathematics: Probability Theory, Linear algebra, Modelling and Simulation, Optimization, and Monte Carlo Simulation.
Wireless Communication: Communication Systems, Cellular & Mobile Communication, Information Theory & Coding, Statistical Signal Analysis, Advanced data structures & algorithms, Detection and Estimation Theory.
Platforms: Hands-on experience in `NI USRP` platform, `WiCOMM-T` universal communication platform, `GSM/GPRS` based communication platform, Scientech `SDR` platform, Vector Network Analyzer, Spectrum and Signal Analyzer, Waveform Generator.

Selected PUBLICATIONS

• A. Mukhopadhyay, K. Singh, F. -S. Tseng, **S. K. Singh**, K. Dev and C. Pan, A Tutorial on Near-Field Driven 6G Networks, in *IEEE Communications Surveys & Tutorials, Mar. 2025*

• S. Singh, K. Singh, **S. K. Singh**, H. Shin and T. Q. Duong, Multiple Access for Holographic Reconfigurable Intelligent Surface (HRIS)-Aided Near-Field Communications, in *IEEE Internet of Things Journal, vol. 12, no. 21, pp. 44678-44691, Nov. 2025*

• S. Singh, R. Allu, K. Singh, **S. K. Singh** and M. L. Ku, Green Multi-Active RIS-Aided Secure Full-Duplex IoT Networks With Imperfect CSI: A Power Minimization Approach, in *IEEE Internet of Things Journal, vol. 12, no. 8, pp. 10932-10947, April, 2025*

• MA Ajay, K. Agrawal, **S. K. Singh**, K. Singh, S. Prakriya and C. -P. Li, Performance of Battery-Assisted EH Full-Duplex NOMA Network with FBL Driven Mode Switching Under Imperfect CSI and SIC, in *IEEE Transactions on Communications, vol. 73, no. 6, pp. 4486-4502, June 2025*

• **S. K. Singh**, K. Agrawal, K. Singh, S. Prakriya and C. -P. Li, SWIPT for Battery-Assisted Full-Duplex Relaying Networks With Finite Blocklength Codes, in *IEEE Transactions on Communications, vol. 73, no. 5, pp. 3013-3030, May 2025*

• S. Singh, A. Raviteja, K. Singh, **S. K. Singh**, A. Kaushik and M. -L. Ku, Secrecy Rate Maximization for Active RIS-Aided Robust Uplink NOMA Communications, in *IEEE Wireless Communications Letters, vol. 13, no. 11, pp. 2960-2964, Nov. 2024*

• P Langde, TK Jain, MR Parate, **SK Singh**, A journey of terahertz communication: An IRS integration perspective, in *Physical Communication, vol. 68, pp. 10572, Feb. 2025*

• R. K. Thenua, A. S. Gandhi, **S. K. Singh**, Sum rate maximization for RIS-assisted NOMA-enabled underlay AmBC-CR networks, in *Physical Communication, vol. 64, Jun. 2024*

• V. Sharma, A. Paul, **S. K. Singh**, K. Singh and S. Biswas, Robust Transmission for Energy-Efficient Sub-Connected Active RIS-Assisted Wireless Networks: DRL versus Traditional Optimization, in *IEEE Transactions on Green Communications and Networking, Feb. 2024*

• V. Sharma, R. Allu, **S. K. Singh**, K. Singh, T. Q. Duong and T. A. Tsiftsis, Robust Transmission Design in Multiobjective RIS-Aided SWIPT IoT Communications, in *IEEE Internet of Things Journal, vol. 11, no. 10, pp. 18605-18618, 15 May, 2024*

• P. Saikia, K. Singh, **S. K. Singh**, W. -J. Huang, C. -P. Li and S. Biswas, Beamforming Design in Vehicular Communication Systems With Multiple Reconfigurable Intelligent Surfaces: A Deep Learning Approach, in *IEEE Access, vol. 11, pp. 100832-100844, 2023*

• P. Saikia, S. Pala, K. Singh, **S. K. Singh** and W. -J. Huang, Proximal Policy Optimization for RIS-Assisted Full Duplex 6G-V2X Communications, in *IEEE Transactions on Intelligent Vehicles, vol. 9, no. 7, pp. 5134-5149, July 2024.*

• J. Yaswanth, **S. K. Singh**, K. Singh and M. F. Flanagan, Energy-Efficient Beamforming Design for RIS-Aided MIMO Downlink Communication With SWIPT, in *IEEE Transactions on Green Communications and Networking, vol. 7, no. 3, pp. 1164-1180, Sept. 2023.*

• K. Singh, F. Karim, **S. K. Singh**, Prabhat Kumar Sharma, Shahid Mumtaz, and M. F. Flanagan, Performance Analysis of RIS-Assisted Full-Duplex Communications with Infinite and Finite Blocklength Codes, in *IEEE Transactions on Communications*, April 2023.

• K. Singh, **S. K. Singh**, C. P. Li, On the Performance Analysis of RIS-Assisted Infinite and Finite Blocklength Communication in Presence of an Eavesdropper, in *IEEE Open Journal of the Communications Society*, March 2023.

• F. Karim, **S. K. Singh**, K. Agrawal, K. Singh, S. Prakriya and M. F. Flanagan, On the Performance of STAR-RIS-aided NOMA at Finite Blocklength, in *IEEE Wireless Communications Letters*, February 2023.

• **S. K. Singh**, K. Agrawal, K. Singh, B Clerckx and C. P. Li, RSMA for Hybrid RIS-UAV-aided Full-Duplex Communications with Finite Blocklength Codes under Imperfect SIC, in *IEEE Transactions on Wireless Communications*, January 2023.

• R. Allu, O. Taghizadeh, **S. K. Singh**, K. Singh, and C. P. Li, Robust Beamformer Design in Active RIS-Assisted Multiuser MIMO Cognitive Radio Networks, in *IEEE Transactions on Cognitive Communications and Networking*, January 2023.

• **S. K. Singh**, K. Agrawal, K. Singh, Y. M. Chen and C. P. Li, Performance Analysis and Optimization of RSMA Enabled UAV-Aided IBL and FBL Communication with Imperfect SIC and CSI, in *IEEE Transactions on Wireless Communications*,

November 2022.

• **S. K. Singh**, K. Agrawal, K. Singh, and C. P. Li, Ergodic Capacity and Placement Optimization for RSMA-Enabled UAV-Assisted Communication, in *IEEE Systems Journal*, November 2022.

• K. Singh, P. C. Wang, S. Biswas, **S. K. Singh**, S. Mumtaz, C. P. Li, Joint Active and Passive Beamforming Design for RIS-Aided IBFD IoT Communications: QoS and Power Efficiency Considerations, in *IEEE Transactions on Consumer Electronics*, November 2022.

• **S. K. Singh**, K. Agrawal, K. Singh, C. P. Li and Z. Ding, NOMA Enhanced Hybrid RIS-UAV-assisted Full-Duplex Communication System with Imperfect SIC and CSI, in *IEEE Transactions on Communications* , October 2022.

• **S. K. Singh**, K. Agrawal, K. Singh, A. Bansal, C. P. Li and Z. Ding, On the Performance of Laser-Powered UAV-Assisted SWIPT Enabled Multiuser Communication Network with Hybrid NOMA, in *IEEE Transactions on Communications* , vol. 70, no. 6, pp. 3912-3929, June 2022.

• **S. K. Singh**, K. Agrawal, K. Singh, C. P. Li and M. S. Alouini, NOMA Enhanced UAV-Assisted Communication System With Nonlinear Energy Harvesting, in *IEEE Open Journal of the Communications Society*, vol. 3, pp. 936-957, May 2022.

• V. Sharma, J. Yaswanth, **S. K. Singh**, S. Biswas, K. Singh and F. Khan, A Pricing-Based Approach for Energy-Efficiency Maximization in RIS-aided Multi-user MIMO SWIPT-enabled Wireless Networks, in *IEEE Access*, Mar. 2022.

• **S. K. Singh**, K. Agrawal, K. Singh and C. P. Li, Outage Probability and Throughput Analysis of UAV-Assisted Rate-Splitting Multiple Access, in *IEEE Wireless Communications Letters*, vol. 10, no. 11, Aug. 2021.

• **S. K. Singh**, K. Agrawal, K. Singh, C. -P. Li and W. -J. Huang, On UAV Selection and Position-Based Throughput Maximization in Multi-UAV Relaying Networks, in *IEEE Access*, vol. 10, Aug. 2020.

• **S. K. Singh** and A. S. Gandhi, Preamble Based Timing Offset Estimation and Correction in OFDM Assisted Massive MIMO Systems in the Presence of Inter-User-Interference, in *Wireless Personal Communications*, vol. 106, Feb. 2019.

• **S. K. Singh**, A.P. Rathkanthiwar and A. S. Gandhi, New Algorithm for Time and Frequency Synchronization in MIMO-OFDM Systems, in *Wireless Personal Communications*, vol. 96, Mar. 2017.

• S. Singh, A. Raviteja, K. Singh, **S. K. Singh**, A. Kaushik and M. -L. Ku, Active RIS-aided Uplink for Robust and Secure Multi-User Private Industrial Network, in *IEEE 100th Vehicular Technology Conference (VTC2024-Fall), Washington, DC, USA, 2024.*

• S. Singh, A. Mukhopadhyay, R. Allu, K. Singh and **S. K. Singh**, Robust Resource Allocation for Secure Multiple Active RIS-Aided Full Duplex Communications, in *International Symposium on Multimedia and Communications Technology (ISMAC), Tagbilaran, Philippines, 2025.*

• S. Singh, K. Singh, **S. K. Singh**, H. Shin and T. Q. Duong, Maximizing Sum-Rate in Holographic Active RIS-Aided Uplink Near-Field Communications, in *IEEE International Conference on Communications, Montreal, QC, Canada, 2025.*

• S. Singh, K. Singh, **S. Kumar Singh**, A. Kaushik and T. Q. Duong, RSMA for Reconfigurable Holographic Surface-aided Downlink Near-Field Communication, in *IEEE International Conference on Communications Workshops (ICC Workshops), Montreal, QC, Canada, 2025.*

• A. Srivastava, M. R. Parate, **S. Kumar Singh** and S. Tripathi, Hexagonal Stub Based Microstrip Patch Antenna for Ku Band Application, in *Third International Conference on Microwave, Antenna and Communication (MAC), Bhopal, India, 2025.*

• M. A. Reza, H. Verma, A. Yadav, T. Singh and **S. K. Singh**, Millimeter Wave Dielectric Resonator Antenna for 5G Communications with U-shaped ground cavity, in *Third International Conference on Microwave, Antenna and Communication (MAC), Bhopal, India, 2025.*

• N. K. Nishad, S. Kumar, K. Agrawal and **S. K. Singh**, End-to-End BER for M-QAM-driven FD Relay Network under Nakagami-m Fading, in *Second International Conference on Microwave, Antenna and Communication (MAC), Dehradun, India, 2024.*

• P. Langde, T. Kumar Jain, M. Parate and **S. Kumar Singh**, Performance Analysis of Holographic Surface Assisted Downlink NOMA with User Mobility, in *Second International Conference on Microwave, Antenna and Communication (MAC), Dehradun, India, 2024.*

• F. Nassar, K. Singh, S. Prakriya, **S. K. Singh**, C. -P. Li and Z. Ding, Backscatter-Enabled RIS-Assisted NOMA ISAC, in *IEEE International Conference on Communications Workshops (ICC Workshops), Denver, CO, USA, 2024.*

• K. Singh, H. Albinsaid, **S. K. Singh**, C. Pan and S. Biswas, DRL-Based Beamforming Design in RIS-Aided Multi-user Wireless Networks, in *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS), Jaipur, India, 2023.*

• R. Yadav, S. Kurma, **S. K. Singh**, C. -P. Li and M. Parate, DRL-Based Transmission Design for Distributed STAR-RIS-aided Communications, in *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS), Jaipur, India, 2023.*

• P. Saikia, G. -Y. Wang, K. Singh, **S. K. Singh**, C. -P. Li and S. Biswas, Intelligent Online Caching Strategy in 6G-Enhanced Automated Vehicular Communications, in *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS), Jaipur, India, 2023.*

• V. Sharma, A. Paul, **S. K. Singh**, K. Singh, S. Biswas and M. -L. Ku, DRL-Based Robust Transmission for Sub-Connected Active RIS-Assisted Communications, in *IEEE Global Communications Conference, Kuala Lumpur, Malaysia, 2023.*

• B. Hazarika, K. Singh, **S. K. Singh**, C. Pan and T. Q. Duong, Asynchronous Federated Learning-Based Resource Management in URLLC-IoV Networks, in *IEEE Global Communications Conference, Kuala Lumpur, Malaysia, 2023.*

• V. Sharma, R. Allu, **S. K. Singh**, K. Singh and T. A. Tsiftsis, RIS-Aided SWIPT Green Communications Under Imperfect CSI, in *IEEE Global Communications Conference, Kuala Lumpur, Malaysia, 2023.*

• F. Karim, **S. K. Singh**, K. Singh, S. Prakriya and C. -P. Li, Performance Analysis for RSMA-Empowered STAR-RIS-Aided

Downlink Communications, in *IEEE 34th Annual International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), Toronto, ON, Canada*

• F. Karim, **S. K. Singh**, K. Singh and F. Khan, STAR-RIS-aided Full Duplex Communications with FBL Transmission, in *IEEE Wireless Communications and Networking Conference (WCNC), Glasgow, United Kingdom, 2023*

• S. Pala, P. Saikia, **S. K. Singh**, K. Singh and C. -P. Li, Design of RIS-assisted Full Duplex 6G-V2X Communications, in *IEEE Wireless Communications and Networking Conference (WCNC), Glasgow, United Kingdom, 2023*

• V. Sharma, P. Saikia, **S. K. Singh**, K. Singh, W. -J. Huang and S. Biswas, FEEL-enhanced Edge Computing in Energy Constrained UAV-aided IoT Networks, in *IEEE Wireless Communications and Networking Conference (WCNC), Glasgow, United Kingdom, 2023*

• **S. K. Singh**, K. Agrawal, K. Singh, B. Clerckx, C. P. Li, RSMA Enhanced RIS-FD-UAV-aided Short Packet Communications under Imperfect SIC, in *IEEE Globecom Workshops (GC Wkshps), 2022.*

• **S. K. Singh**, K. Agrawal, K. Singh, C. P. Li and Z. Ding, A NOMA-enabled Hybrid RIS-UAV-aided Full-Duplex Communication System, accepted in *Joint European Conference on Networks and Communications & 6G Summit*, 2022, pp. 529-534.

• J. Yaswanth, **S. K. Singh**, K. Singh Design of Power-Efficient SWIPT-enabled RIS-assisted MIMO Communications, in *IEEE Global Communications Conference (GLOBECOM), 2022.*

• R. Teja, **S. K. Singh**, O. Taghizadeh, K. Singh, C. P. Li Energy-Efficient Precoder Design in RIS-Assisted Multiuser MIMO Cognitive Radio Networks, in *IEEE Global Communications Conference (GLOBECOM), 2022.*

• F. Karim, B. Hazarika **S. K. Singh**, and K. Singh, Multi-RIS assisted Full Duplex Wireless Communication System, in *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2022.*

• **S. K. Singh**, K. Singh, C. P. Li and K. Agrawal, UAV-Assisted Hybrid Communication System with NOMA and Nonlinear Energy Harvesting, *IEEE 94th Vehicular Technology Conference (VTC2021-Fall), 2021*

• **S. K. Singh**, K. Agrawal, K. Singh, C. P. Li and W. J. Huang, Position based Throughput Maximization of Multi-UAV-assisted Relay Networks, *IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS), 2020*