

Suman Bhunia

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Professional Experience

- 2020–current **Assistant Professor**, *Department of Computer Science and Software Engineering*.
Miami University, Oxford, Ohio USA
- 2018–2020 **Postdoctoral Researcher**, *Dept. of Computer Science and Engineering*.
Texas A&M University, College Station, USA
- 2017–2018 **Postdoctoral Scholar**, *Department of Computer Science*.
University of California, Davis, USA
- 2012–2013 **Research Assistant**, *Department of Computer Science*, John Jay College of Criminal Justice.
City University of New York, New York, USA
- 2011–2012 **Adjunct Lecturer**, *Department of Computer Science*.
City College of City University of New York, New York, USA
- 2010–2011 **Senior Research Fellow**, *Department of Electronics and Telecommunication Engineering*.
Jadavpur University, Kolkata, India

Education

- 2013–present **Ph.D. Candidate in Computer Science**, *University of Nevada, Reno, USA*, *Thesis*: Defense Against Intelligent Attacker in Cognitive Radio Networks, GPA:4.0/4.0.
Advisor: Dr. Shamik Sengupta
- 2008–2010 **Masters of Technology in Distributed and Mobile Computing**, *Jadavpur University, Kolkata, India*, *Thesis*: Performance Evaluation of WiMAX Network in Aspect of Modulation and Coding Schemes and Hand-off using OPNET, GPA:8.39/10.
Advisor: Dr. Iti Saha Misra
- 2004–2008 **Bachelor of Technology in Electronics and Communication Engineering**, *West Bengal University of Technology*, Kolkata, India, GPA:8.36/10.

Awards and Fellowships

- 2018 Outstanding Thesis award from the Department of Computer Science, UNR
- 2017 Outstanding Graduating Graduate Student, UNR (Awarded only one student in the University)
- 2016 Outstanding graduate student of Department of Computer Science, UNR
- 2016 Outstanding Graduate Student by Graduate Student Association of UNR
- 2015 Outstanding International Graduate Student award, Graduate Student Association, UNR
- 2014–2016 International Graduate Student Award, Office of International Students, UNR - two times
- 2011–2013 Two year City University of New York science fellowship
- 2010 Paper entitled "Study of OPNET and performance evaluation of WiMAX network under various terrain conditions in OPNET" won the best student paper award at the National Conference on Microwave and Communication NCMicroCom-2010

Research Interest

- Security Network security, malicious node sensing/detection, cyber-physical security, wireless honeypot, jamming attack, spectrum fingerprinting, IoT Security

- Wireless 6G, Cognitive radio, dynamic spectrum access (DSA), cross-layer optimization, ad hoc, unmanned autonomous systems (UAS)
- Networking QoS and resource management, Distributed Edge Computing, end-to-end performance, testbed implementation

Courses Taught

CS 646 Principles of Computer Operating Systems, (at University of Nevada, Reno) Undergraduate Courses CSE 271 Object-Oriented Programming using Java (at Miami University) CSE 274 Data Abstraction and Data Structures (at Miami University) CS 446 Principles of Computer Operating Systems (at University of Nevada, Reno) CS 201 Digital Design Laboratory (at University of Nevada, Reno) CS 332 Operating System Laboratory (at City College of New York) CS 102 Introduction to Programming (at City College of New York)

Research Projects

- 2013-present **Jamming Avoidance in Dynamic Spectrum Access Networks**, *PhD Dissertation*.
 - Explored honeynet-based defense mechanism for cognitive radio networks under jamming attack.
 - Designed stochastic learning mechanism to perceive attacker's strategy by wireless fingerprint.
 - Formulated queue model with fixed vacation to analyze traffic behavior of cognitive radios.

The effectiveness of the proposed mechanism has been evaluated on a state-of-the-art high spectrum agile radio testbed comprising several USRP software defined radios which are controlled using open source GNURadio.
- 2015-present **Neighbor Discovery in Directional Communication**, *Lead Student*.
 - Proposed line-of-sight (LOS) discovery methods for mobile nodes with full directional transceivers. Works both for directional RF and free-space-optics (FSO) networks.
 - Modified helix equations to optimize neighbor discovery scanning in 3D.

This work has been evaluated with a prototype built with an off-the-shelf robot car, IR transceivers and Raspberry Pi as the controller. In addition, one patent application has been filed in collaboration with M Khan and Dr. M Yuksel.
- 2015-2016 **Jamming Avoidance Multihop 3D UAS Mesh Networks**, *Lead Student*.
 - Examined the performance of adaptive beam nulling as a mitigation technique against jamming attacks in multihop ad hoc networks.
 - Proposed Kalman filter based tracking model to predict movement of the jammer with discrete DoA estimation; and optimized the beam null region based on stochastic model.
 - Built 3D mobility model for UAVs in ns3.
- 2010-2011 **Enhance Performance of Voice Service for Congested Networks**, *Research Fellow*.
 - Proposed optimization mechanism for SIP based VoIP service over wireless networks.
 - Proposed effective adaptive jitter playout buffer algorithm for real-time application.
 - Built MAC layer for cognitive radio in OPNET using Proto-C.
 - Designed cross Layer optimization model of VoIP end-to-end QoS over cognitive radio.
- 2009-2010 **Real Time Traffic over WiMAX**, *Masters Dissertation*.
 - Evaluated performance of WiMAX under mobility, pathloss models, traffic type and scheduling.
 - Investigated VoIP service in WiMAX, WiFi and integrated WiMAX-WiFi networks.
 - Reduced hand-off delay for WiMAX network by integrating MAC and mobile-IP.

Testbed Development and Demonstration

- 2015-present **Dynamic Spectrum Access Testbed with GNURadio**.
 - Implemented frequency agile cognitive radio testbed using USRP, GNU Radio.
 - Inspected performance for channel aggregation, fragmentation, jamming attacks etc.
 - Implemented full duplex transmission using single radio device.
 - Implemented dynamic spectrum selection in multi hop mesh networks.

- 2013-2014 **Mobile Frequency agile Testbed.**
- Built on top of Atheros chips and ath5k as the WiFi driver.
 - Investigated pseudo random channel hopping to mitigate jamming.

Student Advisement

Graduate Students

- 2014-2017 **Paulo Regis**, *PhD student*, pregis@nevada.unr.edu.
Topic: Joint Routing and Position Control in 3D UAV Mesh Networks
- 2016-2017 **Manash Saha**, *MS student*, msaha@nevada.unr.edu.
Topic: LTE-WiFi Coexistence

Undergrad Students

- 2016 **Dat Luu**, dat_luu@nevada.unr.edu.
Topic: Testbed Development for Spectrum Agility in Mesh Networks
- 2016 **Edward Miles**, elmiles93@live.com.
Topic: Testbed development of Jamming Resistant Networks using GNURadio and USRPs

Senior Capstone Project

- 2016-2017 **Jamming Resilient UAV Mesh Networks.**
- Henry Huffman (hhuffman@nevada.unr.edu)
 - Jaime Moreno (jaimemoreno@nevada.unr.edu)
 - Martin Luis Revilla (mrevilla@nevada.unr.edu)
 - Brian Parawan (bparawan@nevada.unr.edu)

International Professional Activities

Session Chair at International Conferences

- 2015 International Symposium on Cyberspace Safety and Security (IEEE CSS) 2015, New York, USA. Track - Active Defense Techniques and Systems

Technical Program Committee

- 2015-2016 International Conference on Information Technology (ICIT), 2015, 2016

Selected Journal/Conference Reviewer

- Journals Computer Communications (Elsevier), Physical Communication (Elsevier), Pervasive and Mobile Computing (Elsevier), Future Generation Computer Systems (Elsevier), International Journal of Communication Systems (Wiley), Wireless Communications and Mobile Computing (Wiley), International Journal of Distributed Sensor Networks (Hindawi)
- Conferences IEEE Globecom, IEEE ICC, IEEE MILCOM, ISCIT, IEEE WoWMoM

Patent Invention Disclosure

- [1] S. Bhunia, M. R. Khan, S. Sengupta, and M. Yuksel. *In-Band Line-of-Sight Discovery for Directional Full-Duplex Transceivers*, U.S. Provisional Patent Application 62/338,953

Peer Reviewed Publications

Journals

- [1] A. Altaweel, R. Stoleru, G. Gu, A. K. Maity, and **S. Bhunia**, "On detecting route hijacking attack in opportunistic mobile networks," *IEEE Transactions on Dependable and Secure Computing*, 2022, (Impact Factor: 6.8).
- [2] A. Altaweel, C. Yang, R. Stoleru, **S. Bhunia**, M. Sagor, M. Maurice, and R. Blalock, "Rsock:

- A resilient routing protocol for mobile fog/edge networks," *Ad Hoc Networks*, vol. 134, p. 102926, 2022, (Impact Factor: 4.8).
- [3] **S. Bhunia**, M. Khan, M. Yuksel, and S. Sengupta, "In-band los discovery using highly directional transceivers," *Ad Hoc Networks*, vol. 91, p. 101875, 2019, (Impact Factor: 4.8).
 - [4] M. Khan, **S. Bhunia**, M. Yuksel, and L. Kane, "Line-of-sight discovery in 3d using highly directional transceivers," *IEEE Transactions on Mobile Computing*, 2019, (Impact Factor: 6.1).
 - [5] **S. Bhunia**, E. Miles, S. Sengupta, and F. Vazquez-Abad, "Cr-honeynet: A cognitive radio learning and decoy based sustenance mechanism to avoid intelligent jammer," *IEEE Transactions on Cognitive Communications and Networking*, vol. 4, no. 3, pp. 567–581, 2018, (Impact Factor: 6.4).
 - [6] **S. Bhunia**, P. A. Regis, and S. Sengupta, "Distributed Adaptive Beam Nulling to Survive Against Jamming in 3D UAV Mesh Networks," *Elsevier Computer Networks*, vol. 137, pp. 83–97, 2018, (Impact Factor: 5.5).
 - [7] S. Mneimneh, **S. Bhunia**, S. Sengupta, and F. Vazquez-Abad, "A game-theoretic and stochastic survivability mechanism against induced attacks in cognitive radio networks," *Elsevier Pervasive and Mobile Computing*, vol. 40, pp. 577–592, 2017, (Impact Factor: 3.8).
 - [8] **S. Bhunia**, V. Behzadan, P. A. Regis, and S. Sengupta, "Adaptive Beam Nulling in Multihop Ad hoc Networks Against a Jammer in Motion," *Elsevier Computer Networks*, vol. 109, pp. 50 – 66, 2016, special issue on Recent Advances in Physical-Layer Security (Impact Factor: 3.0).
 - [9] **S. Bhunia**, S. Sengupta, and F. Vázquez-Abad, "Performance Analysis of CR-honeynet to Prevent Jamming Attack Through Stochastic Modeling," *Elsevier Pervasive and Mobile Computing*, vol. 21, pp. 133–149, 2015, (Impact Factor: 3.8).
 - [10] T. Chakraborty, A. Mukhopadhyay, **S. Bhunia**, I. Misra, and S. Sanyal, "An Optimization Technique for Improved VoIP Performance over Wireless LAN," *Journal of Networks*, vol. 7, no. 3, pp. 480–493, 2012, (Impact Factor: 1.2).
 - [11] **S. Bhunia**, I. Misra, S. Sanyal, and A. Kundu, "Performance study of mobile WiMAX network with changing scenarios under different modulation and coding," *Wiley International Journal of Communication Systems*, vol. 24, no. 8, pp. 1087–1104, 2011, (Impact Factor: 1.9).
 - [12] A. Kundu, I. Misra, S. Sanyal, and **S. Bhunia**, "VoIP performance over broadband wireless networks under static and mobile environments," *International Journal of Wireless & Mobile Networks (IJWMN) Vol*, vol. 2, no. 4, 2010, (20 citations).
- [Conference Proceedings](#)
- [13] S. Bhunia, R. Stoleru, A. Haroon, M. Sagor, A. Altaweel, M. Chao, M. K. Maurice, and R. Blalock, "EdgeKeeper: resilient and lightweight coordination for mobile edge clouds," in *2022 IEEE 19th International Conference on Mobile Ad Hoc and Smart Systems (MASS) (IEEE MASS 2022)*, Denver, USA, Oct. 2022.
 - [14] M. Sagor, R. Stoleru, A. Haroon, S. Bhunia, M. Chao, A. Altaweel, M. K. Maurice, and R. Blalock, "R-Drive: resilient data storage and sharing for mobile edge clouds," in *2022 IEEE 19th International Conference on Mobile Ad Hoc and Smart Systems (MASS) (IEEE MASS 2022)*, Denver, USA, Oct. 2022.

- [15] L. Rizkallah, N. Potter, K. Reed, D. Reynolds, M. Salman, and S. Bhunia, "Red toad, blue toad, hacked toad?" in *2022 IEEE World AI IoT Congress (AllIoT)*. IEEE, 2022, pp. 379–386, (acceptance rate=41.3%).
- [16] C. Faircloth, G. Hartzell, N. Callahan, and S. Bhunia, "A study on brute force attack on t-mobile leading to sim-hijacking and identity-theft," in *2022 IEEE World AI IoT Congress (AllIoT)*. IEEE, 2022, pp. 501–507, (acceptance rate=41.3%).
- [17] E. Caroscio, J. Paul, J. Murray, and **S. Bhunia**, "Analyzing the ransomware attack on dc metropolitan police department by babuk," in *IEEE International Systems Conference (SysCon)*, 2022.
- [18] J. Vazquez-Estrada, **S. Bhunia**, M. Khan, Y. Qian, and N. T. Huu, "Neighbor discovery in a lora assisted multi-transceiver free-space-optical network," in *IEEE Wireless Communications and Networking Conference (WCNC)*, 2022.
- [19] P. A. Regis, **S. Bhunia**, A. N. Patra, and S. Sengupta, "Deep-learning assisted cross-layer routing in multi-hop wireless network," in *2021 IEEE 7th World Forum on Internet of Things (WF-IoT)*. IEEE, 2021, pp. 35–39.
- [20] L. Sterle and **S. Bhunia**, "On solarwinds orion platform security breach," in *2021 IEEE Smart-World, Ubiquitous Intelligence & Computing, Advanced & Trusted Computing, Scalable Computing & Communications, Internet of People and Smart City Innovation (Smart-World/SCALCOM/UIC/ATC/IOP/SCI)*. IEEE, 2021, pp. 636–641.
- [21] A. Murthy, C. Green, R. Stoleru, **S. Bhunia**, C. Swanson, and T. Chaspari, "Machine learning-based irrigation control optimization," in *Proceedings of the 6th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation*, 2019, pp. 213–222.
- [22] **S. Bhunia** and S. Sengupta, "Implementation of interface agility for duplex dynamic spectrum access radio using usrp," in *Military Communications Conference (MILCOM)*. doi: 10.1109/MILCOM.2017.8170844, 2017, pp. 762–767.
- [23] S. Bhunia and S. Sengupta, "Distributed Adaptive Beam Nulling to Mitigate Jamming in 3D UAV Mesh Networks," in *2017 International Conference on Computing, Networking and Communications (ICNC)*. IEEE, 2017, (acceptance rate 29%).
- [24] P. A. Regis, **S. Bhunia**, and S. Sengupta, "Enhancing Performance and Longevity of Multi-radio Multi-channel HetNets through Dynamic Path-assignment," in *2017 International Conference on Computing, Networking and Communications (ICNC)*. IEEE, 2017, (acceptance rate 29%).
- [25] **S. Bhunia**, M. Khan, S. Sengupta, and M. Yuksel, "LOS Discovery for Highly Directional Full Duplex RF/FSO Transceivers," in *Military Communications Conference (MILCOM)*, 2016.
- [26] M. Khan, **S. Bhunia**, M. Yuksel, and S. Sengupta, "LOS Discovery in 3D for Highly Directional Transceivers," in *Military Communications Conference (MILCOM)*, 2016.
- [27] P. A. Regis, **S. Bhunia**, and S. Sengupta, "Implementation of 3D Obstacle Compliant Mobility Models for UAV Networks in Ns-3," in *Proceedings of the Workshop on Ns-3*, ser. WNS3 '16, 2016, pp. 124–131.

- [28] **S. Bhunia**, V. Behzadan, and S. Sengupta, "Enhancement of spectrum utilization in non-contiguous DSA with online defragmentation," in *Military Communications Conference, MILCOM*. IEEE, 2015, pp. 432–437.
- [29] **S. Bhunia**, V. Behzadan, P. Regis, and S. Sengupta, "Performance of Adaptive Beam Nulling in Multihop Ad-Hoc Networks under Jamming," in *High Performance Computing and Communications (HPCC), 2015 IEEE 7th International Symposium on Cyberspace Safety and Security (CSS), 2015 IEEE 12th International Conference on Embedded Software and Systems (ICESSE), 2015 IEEE 17th International Conference on*. IEEE, 2015, pp. 1236–1241, (acceptance rate=30%).
- [30] **S. Bhunia**, S. Sengupta, and F. Vazquez-Abad, "CR-Honeynet: A Learning & Decoy Based Sustenance Mechanism against Jamming Attack in CRN," in *Military Communications Conference (MILCOM), 2014 IEEE*. IEEE, 2014, pp. 1173–1180, (7 citations).
- [31] **S. Bhunia**, X. Su, S. Sengupta, and F. Vázquez-Abad, "Stochastic model for Cognitive Radio Networks under jamming attacks and honeypot-based prevention," in *15th International Conference on Distributed Computing and Networking (ICDCN)*. Springer, Jan 2014, (10 citations).
- [32] S. Das, S. Barman, and **S. Bhunia**, "Performance Analysis of IEEE 802.11 Rate Adaptation Algorithms Categorized Under Rate Controlling Parameters," in *Proceedings of the 2014 International Conference on Information and Communication Technology for Competitive Strategies*. ACM, 2014, p. 8.
- [33] **S. Bhunia** and S. Sengupta, "Feasibility of channel hopping in jamming attack," *IEEE TCSIM Newsletter*, no. 19, pp. 2–5, 2013.
- [34] E. Troja, K. Ezirim, and **S. Bhunia**, "Route aware dynamic channel scheduling and selection for multi-hop cognitive radio networks," in *IEEE 78th Vehicular Technology Conference, VTC 2013-Fall*. IEEE, 2-5 September 2013.
- [35] A. Mukhopadhyay, T. Chakraborty, **S. Bhunia**, I. Misra, and S. Sanyal, "Study of enhanced voip performance under congested wireless network scenarios," in *International Conference on Communication Systems and Networks (COMSNETS)*. IEEE, 2011, (9 citations).
- [36] T. Chakraborty, A. Mukhopadhyay, **S. Bhunia**, I. Misra, and S. Sanyal, "Analysis and enhancement of qos in cognitive radio network for efficient voip performance," in *World Congress on Information and Communication Technologies (WICT)*. IEEE, 2011.
- [37] A. Mukhopadhyay, T. Chakraborty, **S. Bhunia**, I. Misra, and S. Sanyal, "An adaptive jitter buffer playout algorithm for enhanced voip performance," in *International Conference on Advances in Computing and Information Technology (ACITY)*. Springer, 2011.
- [38] T. Chakraborty, A. Mukhopadhyay, **S. Bhunia**, I. Misra, and S. Sanyal, "Optimizing voip call in diverse network scenarios using state-space search technique," in *International Conference on Advances in Computing and Information Technology (ACITY)*. Springer, 2011, pp. 231–242.
- [39] A. Kundu, **S. Bhunia**, I. Misra, and S. Sanyal, "Comparison of voip performance over wimax, wlan and wimax-wlan integrated network using opnet," in *International Conference on Wireless and Mobile Networks*. Springer, 2010.
- [40] **S. Bhunia**, A. Kundu, I. Misra, and S. Sanyal, "Reducing hand-off latency in wimax network using cross layer information," in *International Conference on Advances in Computer Engineering (ACE)*. IEEE, 2010, pp. 346–348.

Short Papers and Posters

- [41] **S. Bhunia**, R. Stoleru, A. Haroon, M. Sagor, A. Altaweel, M. Chao, M. Maurice, and R. Blalock, "Poster: Edgekeeper—resilient and lightweight coordination for mobile edge computing systems," in *20th ACM International Conference on Mobile Systems, Applications, and Services (ACM MobiSys)*, 2022.
- [42] J. Vazquez-Estrada, **S. Bhunia**, M. Khan, Y. Qian, and N. T. Huu, "Neighbor discovery in a multi-transceiver free-space-optical ad hoc network," in *2022 IEEE 19th Annual Consumer Communications & Networking Conference (CCNC)*. IEEE, 2022, pp. 509–510.

Fellowships and Awards

- 2016 Outstanding graduate student of Department of Computer Science, UNR
- 2016 Outstanding Graduate Student by Graduate Student Association of UNR
- 2014-2016 Student travel grants to attend MILCOM 2014, 2015 and 2016
- 2015-2016 Student travel grants to attend IEEE CSS'15 and GRCon'16
- 2015 Outstanding International Graduate Student award, Graduate Student Association, UNR
- 2014-2016 International Graduate Student Award, Office of International Students, UNR - two times
- 2011-2013 Two year CUNY science fellowship
- 2010 Paper entitled "Study of OPNET and performance evaluation of WiMAX network under various terrain conditions in OPNET" won the *best student paper award* at the National Conference on Microwave and Communication NCMicroCom-2010
- 2008-2010 Two year full scholarship for M.Tech programme for qualifying Graduate Aptitude Test in Engineering, GATE (All-India basis)

Leadership and Committee Experience

- 2014-2017 Elected thrice as a college of engineering representative at UNR Graduate Student Association
- 2015-2017 Elected twice as the chair of the clubs and organizations committee of UNR GSA
- 2014-2017 Serving budget committee of UNR GSA
- 2014-2017 Serving judicial committee of UNR GSA
- 2014-2015 Elected vice president of Computer Science Graduate Student Club, UNR
- 2013-2015 Elected twice as the vice president of Indian Student Organization, UNR

References

- Advisor **Dr. Shamik Sengupta**, *Assistant Professor*, Department of Computer Science and Engineering, University of Nevada, Reno, Email: ssengupta@unr.edu.
<http://www.cse.unr.edu/~shamik/>
- Committee Member **Dr. Mehmet H. Gunes**, *Associate Professor*, Department of Computer Science and Engineering, University of Nevada, Reno, Email: mgunes@unr.edu.
<http://www.cse.unr.edu/~mgunes>
- Committee Member **Dr. Sergiu Dascalu**, *Professor*, Department of Computer Science and Engineering, University of Nevada, Reno, Email: dascalus@cse.unr.edu.
<https://www.cse.unr.edu/~dascalus/>
- Department Chair **Dr. George Bebis**, *Professor and Chair*, Dept of Computer Science & Engineering, University of Nevada, Email: bebis@cse.unr.edu.
<http://www.cse.unr.edu/~bebis/>

- Dean **Dr. David Zeh**, *Dean of the Graduate School*, University of Nevada, Reno,
Email: zehd@unr.edu.
<http://www.unr.edu/biology/people/david-zeh>
- Collaborator **Dr. Murat Yuksel**, *Associate Professor*, Department of ECE, University of Central Florida (UCF), Email: murat.yuksel@ucf.edu.
<http://www.ece.ucf.edu/~yukse/>
- Collaborator **Dr. Felisa Vazquez-Abad**, *Professor*, Department of Computer Science, Hunter College, City University of New York (CUNY), Email: felisav@hunter.cuny.edu.