Suman Bhunia

☏ +1 (551) 587 0783
✉ bhunias@miamioh.edu
www.sbhunia.me

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

2016–2017 **Instructor**, *Department of Computer Science and Engineering*.
University of Nevada, Reno, USA

2013–2016 **Research Assistant**, *Computer Networking Lab*.
University of Nevada, Reno, USA

2012–2013 **Research Assistant**, *Department of Computer Science*.
City University of New York, New York, USA

2011-2012 **Adjunct Lecturer**, *Department of Computer Science*.
City College of New York, New York, USA

2010–2011 **Senior Research Fellow**, *Department of Electronics and Telecommunication Engineering*.
Jadavpur University, Kolkata, India

Education

2013–2017 **Ph.D. in Computer Science**, *University of Nevada, Reno, USA*, *Thesis:* Survivability Against Intelligent Adversary in Next-Generation Wireless Networks, GPA: 4.0/4.0.
Committee: Shamik Sengupta, Murat Yuksel, Mehmet Gunes, Sergiu Dascalu, Sankar Mukhopadhyay

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.
Committee: Dr. Iti Saha Misra and Dr. Salil K. Sanyal

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 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) |

Research Interest

Security	Network security, malicious node sensing/detection, cyber-physical security, wireless honeypot, jamming attack, spectrum fingerprinting, IoT Security
Wireless	5G LTE, 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

Graduate Courses

| 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)

Peer Reviewed Publications

Journals

[1] **S. Bhunia**, M. Khan, M. Yuksel, and S. Sengupta. In-band los discovery using highly directional transceivers. *Ad Hoc Networks*, 91:101875, 2019. (Impact Factor: 3.5).

[2] 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: 3.82).

[3] **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*, 4(3):567–581, 2018.

[4] **S. Bhunia**, P. A. Regis, and S. Sengupta. Distributed Adaptive Beam Nulling to Survive Against Jamming in 3D UAV Mesh Networks. *Elsevier Computer Networks*, 137:83–97, 2018. (Impact Factor: 3.0).

[5] 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*, 40:577–592, 2017. (Impact Factor: 2.8).

[6] **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*, 109:50 − 66, 2016. Special issue on Recent Advances in Physical-Layer Security (Impact Factor: 3.0).

[7] **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*, 21:133–149, 2015. (Impact Factor: 2.8).

[8] T. Chakraborty, A. Mukhopadhyay, **S. Bhunia**, I.S. Misra, and S.K. Sanyal. An Optimization Technique for Improved VoIP Performance over Wireless LAN. *Journal of Networks*, 7(3):480–493, 2012. (Impact Factor: 1.2).

[9] **S. Bhunia**, I.S. Misra, S.K. Sanyal, and A. Kundu. Performance study of mobile WiMAX network with changing scenarios under different modulation and coding. *Wiley International Journal of Communication Systems*, 24(8):1087–1104, 2011. (Impact Factor: 1.3).

[10] A. Kundu, I.S. Misra, S.K. Sanyal, and **S. Bhunia**. VoIP performance over broadband wireless networks under static and mobile environments. *International Journal of Wireless & Mobile Networks (IJWMN) Vol*, 2(4), 2010. (20 citations).

Conference Proceedings

[11] A. Murthy, C. Green, R. Stoleru, **S. Bhunia**, A. Swanson, and T. Chaspari. Machine Learning-based Irrigation Control Optimization. In *BuildSys*. IEEE, 2019.

[12] **S. Bhunia** and S. Sengupta. Implementation of Interface Agility for Duplex Dynamic Spectrum Access Radio Using USRP. In *Military Communications Conference (MILCOM)*. IEEE, 2017.

[13] **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%).

[14] 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%).

[15] **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.

[16] M. Khan, **S. Bhunia**, M. Yuksel, and S. Sengupta. LOS Discovery in 3D for Highly Directional Transceivers. In *Military Communications Conference (MILCOM)*, 2016.

[17] 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*, WNS3 '16, pages 124–131, 2016.

[18] **S. Bhunia**, V. Behzadan, and S. Sengupta. Enhancement of spectrum utilization in non-contiguous DSA with online defragmentation. In *Military Communications Conference, MILCOM*, pages 432–437. IEEE, 2015.

[19] **S. Bhunia**, V. Behzadan, P.A. Regis, and S. Sengupta. Performance of Adaptive Beam Nulling in Multihop Ad-Hoc Networks under Jamming. In *IEEE 7th International Symposium on Cyberspace Safety and Security (CSS)*, 2015. 7 citations.

[20] **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)*, pages 1173–1180. IEEE, 2014. (10 citations).

[21] **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. (13 citations).

[22] 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*, page 8. ACM, 2014.

[23] **S. Bhunia** and S. Sengupta. Feasibility of channel hopping in jamming attack. *IEEE TCSIM Newsletter*, (19):2–5, 2013.

[24] 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.

[25] A. Mukhopadhyay, T. Chakraborty, **S. Bhunia**, I.S. Misra, and S.K. Sanyal. Study of enhanced voip performance under congested wireless network scenarios. In *International Conference on Communication Systems and Networks (COMSNETS)*. IEEE, 2011. (10 citations).

[26] T. Chakraborty, A. Mukhopadhyay, **S. Bhunia**, I.S. Misra, and S.K. 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.

[27] A. Mukhopadhyay, T. Chakraborty, **S. Bhunia**, I.S. Misra, and S.K. Sanyal. An adaptive jitter buffer playout algorithm for enhanced voip performance. In *International Conference on Advances in Computing and Information Technology (ACITY)*. Springer, 2011.

[28] T. Chakraborty, A. Mukhopadhyay, **S. Bhunia**, I.S. Misra, and S.K. Sanyal. Optimizing voip call in diverse network scenarios using state-space search technique. In *International Conference on Advances in Computing and Information Technology (ACITY)*, pages 231–242. Springer, 2011.

[29] A. Kundu, **S. Bhunia**, I.S. Misra, and S.K. 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.

[30] **S. Bhunia**, A. Kundu, I.S. Misra, and S.K. Sanyal. Reducing hand-off latency in wimax network using cross layer information. In *International Conference on Advances in Computer Engineering (ACE)*, pages 346–348. IEEE, 2010.

Patent Invention Disclosure

[1] M. R. Khan, **S. Bhunia**, M. Yuksel, and S. Sengupta, Directional Link Discovery and Maintenance Between Mobiles, USPTO patent application PCT/US17/32731, May 15, 2017.

Proposal Preparation

TAMU Prepared a part of the proposal, "Deploying Defenses for Cellular Networks Using the AWARE Testbed", submitted to DHS in 2019

TAMU Prepared a part of the proposal, "DAAR: Drone-Augmented Augmented Reality for Cyber-Human Physical Systems", submitted to NSF CPS in 2019

| UC Davis | Prepared a part of the proposal, "Building Low-Power Wide Area Networking Systems for Smart City IoT Applications", submitted to NSF ICE-T in 2018 |
| UNR | Helped my advisor writing in a proposal, "Efficient Spectrum Access Utilizing Unmanned Autonomous Systems", submitted to NSF EARS in 2014 |

Research Projects

2018-present Secured Edge Computing for Disaster Response Network, *Postdoctoral research*.
– Design EdgeKeeper- A distributed coordination scheme for Edge Network to facilitate Security, Naming and Service discovery in Opportunistic network.
– Implementing EdgeKeeper using Java and Android that utilizes Zookeeper, GNS, etc.

2017-2018 Security in cyber-physical system, *Postdoctoral research*.
– Designed BF-IoT - a Wireless fingerprint-based authentication mechanism in IoT.
– Securing privacy leakage in Bluetooth based IoT network.
– Design authentication mechanisms in Voice based personal assistant such as Alexa.

2013-2017 Survivability Against Intelligent Adversary in Next-Generation Wireless 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.

2015-2017 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 networks by 50% through integrating Mobile IP and MAC.

Testbed Development and Demonstration

2018-2020   **EdgeKeeper-A Resilient Coordination Service for Edge Computing**.
– Designed and Implemented EdgeKeeper a distributed coodrination service for edge networks.
– EdgeKeeper provides naming, service discovery and authentication services.
– Built the system using Java. It utilizes ZooKeeper for distributed fault tollerance.
– Integrated with Global Naming Scheme (GNS) based GUID as resource identities.
– PKCS12 based authentication and authorization are used when disconnected from Internet.
– Successfully demonstrated EdgeKeeper and its integration with other Distressnet-NG applications at NIST PSCR meeting in Chicago and at NIST outdoor deployment at Gypsum, Colorado.
– Deployed EdgeKeeper for a team of first responders in a real life search and rescue operation at the Winter Institute at Disaster City

2015-2017   **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

2019-2020   **Mohammad Sagor**, *MS student*, TAMU, `msagor@tamu.edu`.
Topic: Resilient Mobile Distributed File System for Delay Tollerant Edge Networks

2018-2019   **Akshay Murthy**, *MS student student*, TAMU, `akshay.ramuhally@tamu.edu`.
Topic: Machine Learning-based Irrigation Control Optimization

2014-2017   **Paulo Regis**, *PhD student*, UNR, `pregis@nevada.unr.edu`.
Topic: Joint Routing and Position Control in 3D UAV Mesh Networks

2016-2017   **Manash Saha**, *MS student*, UNR, `msaha@nevada.unr.edu`.
Topic: LTE-WiFi Coexistance

Undergrad Students

2016   **Dat Luu**, *UNR*, `dat_luu@nevada.unr.edu`.
Topic: Testbed Development for Spectrum Agility in Mesh Networks

2016   **Edward Miles**, *UNR*, `elmiles93@live.com`.
Topic: Testbed development of Jamming Resistant Networks using GNURadio and USRPs

Professional Activities

Session Chair at International Conferences

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

Technical Program Committee

Military Communications Conference (MILCOM) – 2017, 2018, 2019

Conference on Decision and Game Theory for Security (GameSec) – 2017

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

Journals	IEEE Communications Magazine, IEEE Networking Letters, IEEE Transaction on Mobile Computing, IEEE Transactions on Cognitive Communications and Networking, IEEE Transactions on Sustainable Computing, Elsevier Computer Networks, Elsevier Computer Communications, Elsevier Physical Communication, Elsevier Pervasive and Mobile Computing, Elsevier Future Generation Computer Systems
Conferences	IEEE Globecom, IEEE ICC, IEEE MILCOM, GameSec, ISCIT, IEEE WoWMoM

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

Postdoc Advisor	**Dr. Radu Stoleru**, *Professor*, Department of Computer Science and Engineering, Texas A&M University, `http://faculty.cs.tamu.edu/stoleru/`. Email: stoleru@cse.tamu.edu, Tel: (979) 862-8349
PhD Advisor	**Dr. Shamik Sengupta**, *Ralph E.& Rose A. Hoeper Professor and Executive Director of UNR Cybersecurity Center*, Department of Computer Science and Engineering, University of Nevada, Reno, `http://www.cse.unr.edu/~shamik/`. Email: ssengupta@unr.edu, Tel: (775) 784-6953
Thesis committee	**Dr. Murat Yuksel**, *Associate Professor*, Department of Electrical and Computer Engineering, University of Central Florida (UCF), `http://www.ece.ucf.edu/~yuksem/`. Email: murat.yuksel@ucf.edu, Tel: (407) 823-4181
Department Chair	**Dr. George Bebis**, *Professor and Chair*, Dept of Computer Science & Engineering, University of Nevada, Reno, `http://www.cse.unr.edu/~bebis/`. Email: bebis@cse.unr.edu, Tel: (775) 784-6463
Collaborator	**Dr. Felisa Vazquez-Abad**, *Professor*, Department of Computer Science, Hunter College, City University of New York (CUNY). Email: felisav@hunter.cuny.edu, Tel: (212) 772-5634