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 Coexistance

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

In Progress

[1] **S. Bhunia**, M. Khan, M. Yuksel, and S. Sengupta. LOS Directional Neighbor Discovery Using In-Band Full-Duplex Transceivers. *submitted to IEEE Transactions on Mobile Computing*.

[2] **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. *submitted to IEEE Transactions on Cognitive Communications and Networking*.

[3] **S. Bhunia**, P. A. Regis, and S. Sengupta. Distributed Adaptive Beam Nulling to Mitigate Jamming in 3D UAV Mesh Networks. *submitted to IEEE Transactions on Wireless Communication*.

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/~yuksem/`

Collaborator **Dr. Felisa Vazquez-Abad**, *Professor*, Department of Computer Science, Hunter College, City University of New York (CUNY), Email: felisav@hunter.cuny.edu.