graySuman Bhunia *Curriculum Vitae*
Suman Bhunia 1050 Nevada Street, Apt 121Reno, NV 89503 +1 (551) 587 0783
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1 Education

2013–present
GPA:4.0/4.0Ph.D. Candidate in Computer ScienceUniversity of Nevada, Reno, USA*Thesis:* Defense Against Intelligent Attacker in Cognitive Radio Networks Advisor: Dr. Shamik Sengupta

2008–2010
GPA:8.39/10Masters of Technology in Distributed and Mobile ComputingJadavpur University, Kolkata, India*Thesis:* Performance Evaluation of WiMAX Network in Aspect of Modulation and Coding Schemes and Hand-off using OPNETAdvisor: Dr. Iti Saha Misra

2004–2008
GPA:8.36/10Bachelor of Technology in Electronics and Communication EngineeringWest Bengal University of TechnologyKolkata, India

2 Professional Experience

2.1 Research Experience

2013–presentResearch AssistantComputer Networking LabUniversity of Nevada, Reno

2012–2013Research AssistantSecurity in Wireless & Ad hoc Networks (SWAN) LabJohn Jay College of Criminal JusticeCity University of New York

2009–2011Research FellowBroadband Wireless Communication LabJadavpur University

2.2 Teaching Experience

2016-presentInstructorDepartment of Computer Science and EngineeringUniversity of Nevada, Reno*Courses Taught:* Computer Operating Systems (CS 446/646), Enrollment $\sim$ 70 students

Summer 2016InstructorUniversity of Nevada, RenoProject: Research Experience for TeachersCyber Security Initiative for Nevada Teachers

2014-2016Teaching AssistantDepartment of Computer Science & Eng.University of Nevada, Reno*Courses Taught:* Digital Design Laboratory (CPE 201)

2011-2012Adjunct LecturerDepartment of Computer ScienceCity College of New York*Courses Taught:* Introduction to Computing (CS 102) and Operating System Laboratory (CS 332)

2011-2011Adjunct LecturerInstitute of Engineers, IndiaKolkata*Courses Taught:* Computing and Informatics

3 Research Interest

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

WirelessCognitive radio, dynamic spectrum access (DSA), cross-layer optimization, ad hoc, unmanned autonomous systems (UAS), 3D wireless mesh, LTE-WiFi coexistence

NetworkingQoS and resource management, end-to-end performance, testbed implementation

4 Research Projects

2013-presentJamming Avoidance in Dynamic Spectrum Access NetworksPhD 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-presentNeighbor Discovery in Directional CommunicationLead 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

5 Testbed Development and Demonstration

2015-presentDynamic 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.

2013-2014Mobile Frequency agile Testbed

- Built on top of Atheros chips and ath5k as the WiFi driver.
- Investigated pseudo random channel hopping to mitigate jamming.

6 Student Advisement

6.1 Graduate Students

2014-2017Paulo RegisPhD studentpregis@nevada.unr.eduTopic: Joint Routing and Position Control in 3D UAV Mesh Networks

2016-2017Manash SahaMS studentmsaha@nevada.unr.eduTopic: LTE-WiFi Coexistance

6.2 Undergrad Students

2016Dat Luudat$_luu@nevada.unr.eduTopic : TestbedDevelopmentforSpectrumAgilityinMeshNetworks$

2016Edward Mileselmiles93@live.comTopic: Testbed development of Jamming Resistant Networks using GNURadio and USRPs

6.3 Senior Capstone Project

2016-2017Jamming 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)

7 International Professional Activities

7.1 Session Chair at International Conferences

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

7.2 Technical Program Committee

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

7.3 Selected Journal/Conference Reviewer

JournalsComputer 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)

ConferencesIEEE Globecom, IEEE ICC, IEEE MILCOM, ISCIT, IEEE WoWMoM

8 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

9 Peer Reviewed Publications

Journals

[1] S. Mneimneh, **S. Bhunia**, S. Sengupta, and F. Vazquez-Abad. A game-theoretic and stochastic survivability mechanism against induced attacks in cognitive radio networks. *in press of Elsevier Pervasive and Mobile Computing*, 2017. (Impact Factor: 2.366).

[2] **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: 1.903).

[3] **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: 2.366).

[4] 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.

[5] **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. (28 citations).

[6] 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. (19 citations).

In Progress

[7] **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.*

[8] **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.*

[9] **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.*

Conference Proceedings

[10] **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%).

[11] 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%).

[12] **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.

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

[14] 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.

[15] **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.

[16] **S. Bhunia**, V. Behzadan, P.A. 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 Conferen on Embedded Software and Systems (ICESS), 2015 IEEE 17th International Conference on*, pages 1236–1241. IEEE, 2015. (acceptance rate=30%).

[17] **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*, pages 1173–1180. IEEE, 2014. (7 citations).

[18] **S. Bhunia**, X. Su, S. Sengupta, and F. Vázquez-Abad. Stochastic model for Cognitive Radio Networks under jamming attacks and honeypot-based prevention. In 15^{th} *International Conference on Distributed Computing and Networking (ICDCN)*. Springer, Jan 2014. (10 citations).

[19] 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.

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

[21] E. Troja, K. Ezirim, and **S. Bhunia**. Route aware dynamic channel scheduling and selection for multi-hop cognitive radio networks. In *IEEE* 78^{th} *Vehicular Technology Conference, VTC 2013-Fall*. IEEE, 2-5 September 2013.

[22] 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. (9 citations).

[23] 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.

[24] 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.

[25] 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.

[26] 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.

[27] **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.

10 Fellowships and Awards

2016Outstanding graduate student of Department of Computer Science, UNR 2016Outstanding Graduate Student by Graduate Student Association of UNR 2014-2016Student travel grants to attend MILCOM 2014, 2015 and 2016 2015-2016Student travel grants to attend IEEE CSS'15 and GRCon'16 2015Outstanding International

Graduate Student award, Graduate Student Association, UNR 2014-2016International Graduate Student Award, Office of International Students, UNR - two times 2011-2013Two year CUNY science fellowship 2010Paper 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 2008-2010Two year full scholarship for M.Tech programme for qualifying Graduate Aptitude Test in Engineering, GATE (All-India basis)

11 Leadership and Committee Experience

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

12 References

AdvisorDr. Shamik SenguptaAssistant ProfessorDepartment of Computer Science and Engineering, University of Nevada, RenoEmail: ssengupta@unr.edu http://www.cse.unr.edu/ shamik/

Committee MemberDr. Mehmet H. GunesAssociate ProfessorDepartment of Computer Science and Engineering, University of Nevada, Reno Email: mgunes@unr.eduhttp://www.cse.unr.edu/ mgunes

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CollaboratorDr. Felisa Vazquez-AbadProfessorDepartment of Computer Science, Hunter College, City University of New York (CUNY)Email: felisav@hunter.cuny.edu