

Gaurang Ramesh Naik

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Education

Ph.D., Virginia Tech Electrical Engineering; GPA: 4/4	Blacksburg/Arlington, VA <i>Aug. '15 - present</i>
M. Tech., Indian Institute of Technology Bombay Communications Engineering; CPI: 9.63/10	Mumbai, India <i>July'12 - July'15</i>
B. E., Vidyalankar Institute of Technology, University of Mumbai Electronics & Telecommunications Engineering; Aggr. 78.93% (GPA 3.9/4)	Mumbai, India <i>July'08 - June'12</i>

Experience

Graduate Research Assistant, Wireless@VT *Aug. '15 - present*

- Coexistence solutions for Vehicular to Vehicular (V2V) networks and Wi-Fi in 5.9 GHz band.
 - Performed Monte-Carlo simulations to evaluate impact of Wi-Fi users on V2V system.
 - Proposed a real-time channelization algorithm to maximize Wi-Fi throughput by up to 30%
 - Set up a V2V and Wi-Fi test-bed to validate the analysis and channelization algorithm.
- Performance analysis and optimization of IEEE 802.11ax Next Generation Wireless LAN
 - Implemented IEEE 802.11ax MU OFDMA capabilities in ns-3.
 - Analyzed random and scheduled access performance in uplink MU OFDMA.
 - Proposed a novel mechanism for UL OFDMA random access to increase throughput by up to 50%.

Summer Intern, Nokia Bell Labs *June'17 - Aug.'17*

- Comparative study of 5G, LTE and DSRC for V2V safety applications.
 - Studied latency and reliability requirements for different V2V safety applications.
 - Performed simulation studies for characterizing 5G, LTE and DSRC performance for EEBL.
 - Proposed an EMBMS/reservation scheme for LTE/5G to meet V2V latency requirements.

Graduate Teaching Assistant, Virginia Tech *Aug.'15 - May'16*

- ECE 5560: Fundamentals of Information Security
- ECE 4564: Network Application Design

Research Assistant, Information Networks Lab *July'12 - June'15*

- Feasibility studies for use of TV White Space in India
 - Developed a computation tool to estimate and generate heat map of available TVWS in India.
 - Modified *ath-x* drivers to meet custom requirements for a TVWS test-bed.
 - Deployed a test-bed with six village locations to demonstrate the use of TVWS for affordable broadband connectivity – the first in India.
 - Our pilot test-bed — Gram Marg — was the winner of Mozilla Equal Rating Innovation Challenge.

Skills

- Programming and Scripting Languages: C, C++, Python, Shell.
- Software Defined Radio (SDR) implementation using GNURadio and USRP.
- MATLAB, network simulator-3 (ns-3)
- Configuration, experimentation and testing of off-the-shelf WiFi devices using OpenWrt.
- TensorFlow.

Other Key Projects

- **Analysis of Cellular V2X/LTE-V performance for safety applications and coexistence with Wi-Fi**
Advisors: Prof. Jung-Min (Jerry) Park (Virginia Tech), Sushanta Das (Ford Motor Company) *Jan.'18 - present*
 - Implemented LTE-V/C-V2X Sidelink transmission mode 4 in *ns-3*.
 - Working towards understanding shortcomings of the 3GPP Rel. 14 resource selection algorithm.
 - Working towards developing coexistence mechanisms between C-V2x and Wi-Fi in the 5.9 GHz band.

- **Channel decoding using machine intelligence**
Course: Deep Learning, **Instructor:** Prof. Chandan Reddy *Aug.'17 - Dec.'17*
o Implemented a deep learning-based method for decoding of linear block codes.
o The neural network decoder can detect trapping set-like artefacts to provide gains over SPA-based decoding.
- **Implementation of an end-to-end Wi-Fi transceiver on MATLAB**
Course: Digital Communications II, **Instructor:** Dr. Vuk Marojevic *Jan. - May'16*
o Simulated OFDM PHY of Wi-Fi with equalization on a Rayleigh fading channel.
o Implemented belief propagation for hard decision decoding of LDPC codes.
- **A Game Theoretic Approach for Electric Vehicle Charging in Smart Grids**
Course: Game Theory for Networks, **Instructor:** Prof. Walid Saad *Aug. - Dec.'16*
o Developed an analytical model for EV charging in Smart Grids using a Game-Theoretic perspective.
o Proved existence of a generalized Stackelberg equilibrium and validated the same using simulation studies.
- **Comparative Study of Machine Learning Techniques for Human Activity Recognition**
Course: Advanced Machine Learning, **Instructor:** Dr. Stefan Lee *Aug. - Dec.'16*
o Implemented multiple multi-class classification techniques in MATLAB to compare performance over a UCI human activity recognition dataset.

Publications

Journal Papers

- J3 **Gaurang Naik**, Jung-Min (Jerry) Park, Sushanta Das, Ivan Vukovic, Jayanthi Rao, "LTE-V and DSRC: State-of-the-art, Coexistence and Future Evolution," submitted to IEEE Communication Magazine FT on Emerging Technologies for Connected and Smart Vehicles.
- J2 **Gaurang Naik**, Jinshan Liu, Jung-Min (Jerry) Park, "Coexistence of Wireless Technologies in the 5 GHz Bands: A Survey of Existing Solutions and a Roadmap for Future Research," to appear in IEEE Communications Surveys & Tutorials.
- J1 Animesh Kumar, Abhay Karandikar, **Gaurang Naik**, Meghna Khaturia, Shubham Saha, Mahak Arora, Jaspreet Singh, "Toward Enabling Broadband for a Billion Plus Population with TV White Spaces" in IEEE Communications Magazine, vol. 54, no. 7, pp. 28-34, July 2016.

Conference Papers

- C6 **Gaurang Naik**, Sudeep Bhattarai, Jung-Min (Jerry) Park, "Performance Analysis of Uplink Multi-User OFDMA in IEEE 802.11ax," in proceedings of IEEE ICC 2018, May 2018, Kansas City, MO, USA.
- C5 **Gaurang Naik**, Jinshan Liu, Jung-Min (Jerry) Park, "Coexistence of Dedicated Short Range Communications (DSRC) and Wi-Fi: Implications to Wi-Fi Performance," in proceedings of IEEE INFOCOM 2017, May 2017, Atlanta, USA.
- C4 Jinshan Liu, **Gaurang Naik**, Jung-Min (Jerry) Park, "Coexistence of DSRC and Wi-Fi: Impact on the Performance of Vehicular Safety Applications," in proceedings of IEEE ICC 2017, May 2017, Paris, France.
- C3 Sudeep Bhattarai, **Gaurang Naik**, Liang Hong, "A Computationally Efficient Node-Selection Scheme for Cooperative Beamforming in Cognitive Radio Networks", in proceedings of IEEE INFOCOM 2016 Workshop on 5G and Beyond - Enabling Technologies and Applications, April 2016, San Francisco, USA.
- C2 Soumik Ghosh, **Gaurang Naik**, Animesh Kumar and Abhay Karandikar, "OpenPAWS: An Open Source PAWS and UHF TV White Space Database Implementation for India", in proceedings of IEEE NCC 2015, Feb. 2015, Mumbai, India.
- C1 **Gaurang Naik**, Sudesh Singhal, Animesh Kumar, Abhay Karandikar, "Quantitative Assessment of TV White Space in India" in proceedings of IEEE NCC 2014, March 2014, Kanpur, India. (**Shortlisted for the Best Paper Award**).

Leadership Roles

- Student companion for a group of ten first year M. Tech. students under ISCP in the year 2013.
- **Head Organizer of FERVOR** - Annual Technical Festival of VIT in 2011.
- Part of the organizing team of several workshops conducted by Information Networks Lab at IITB.
- Held the position of Technical Secretary at VIT in the year 2010-11.

Awards

- Awarded the Best All round student in Electronics & Telecommunications branch for 2008-2012 batch at Vidyalkar Institute of Technology.

- Awarded the J.R.D. TATA Scholarship for Academic Excellence in the years 2009 and 2010.

Talks

- Coexistence of Dedicated Short Range Communications (DSRC) and Wi-Fi: Implications to Wi-Fi Performance
 - Wireless@VT Seminar Series
 - Broadband Wireless Access and Applications Center (BWAC), Fall 2016 IAB Meeting
- Can 5G make our roads safer?
 - Nokia Bell Labs, Summer Intern presentation

Professional Service

- Technical Reviewer
 - IEEE Transactions on Wireless Communications
 - IEEE Transactions on Mobile Computing
 - IEEE Communications Magazine
 - IEEE Wireless Communications and Networking Conference (WCNC)

References

- **Jung-Min (Jerry) Park**, Professor, Bradley Department of Electrical and Computer Engineering, Virginia Tech, USA
- **Abhay Karandikar**, Director, IIT Kanpur, India
- **Animesh Kumar**, Assistant Professor, Department of Electrical Engineering, IIT Bombay, India
- **Ashok Chandra**, Former Wireless Advisor to the Government of India, Wireless Planning and Coordination Wing, Department of Telecommunications, India