# Gaurang Naik

Bradley Department of Electrical & Computer Engineering
Virginia Tech

Email: gaurang@vt.edu
Web: http://gaurang.xyz
Cell: (540) 449-7603

## Education

**Ph.D., Virginia Tech**  Blacksburg/Arlington, VA
Electrical Engineering; GPA: 4/4  *Aug.'15 - Oct.'20*

**M. Tech., Indian Institute of Technology Bombay**  Mumbai, India
Communications Engineering; CPI: 9.63/10  *July'12 - July'15*

**B. E., Vidyalankar Institute of Technology, University of Mumbai**  Mumbai, India
Electronics & Telecommunications Engineering; Aggr. 78.93% (GPA 3.9/4)  *July'08 - June'12*

## Experience

**Qualcomm**, Senior Systems Engineer  *Jan.'21 - present*

- Standardization of MAC features for IEEE 802.11be

**WiNSeR Lab, Virginia Tech**, Graduate Research Assistant  *Aug.'15 - Dec.'20*

- Coexistence solutions for Vehicle to Everything (V2X) networks and Wi-Fi in 5.9 GHz band.
  o Performed simulation and hardware experiments to study coexistence of IEEE 802.11p and Wi-Fi.
  o Proposed and implemented a Real-time Channelization Algorithm for off-the-shelf Wi-Fi hardware for harmonious coexistence with IEEE 802.11p.
  o Implemented C-V2X sidelink transmission mode 4 capabilities in ns-3.
  o Studied co-channel coexistence and adjacent channel interference issues between C-V2X and Wi-Fi.

- Performance analysis and optimization of IEEE 802.11ax Next Generation Wireless LAN
  o Analyzed random and scheduled access performance in uplink MU OFDMA.
  o Studied coexistence of IEEE 802.11ax and New Radio Unlicensed (NR-U) with a focus on 6 GHz bands.

**Qualcomm**, Summer Intern  *May'19 - Aug.'19*

- Performance study of Multi Link Aggregation in IEEE 802.11be
  o Developed a Wi-Fi MAC simulator for latency and throughut evaluation.
  o Studied the latency gains resulting from Multi Link Aggregation in comparison to single link Wi-Fi.
  o Investigated the fairness impact of introducing MLA 802.11be devices on legacy Wi-Fi performance.

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

- Comparative study of 5G, LTE and DSRC for V2V safety applications.
  o Studied latency and reliability requirements for different V2V safety applications.
  o Performed simulation studies for characterizing 5G, LTE and DSRC performance for EEBL.

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

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

**InfoNet Lab, IIT Bombay**, Research Assistant  *July'12 - June'15*

- Feasibility studies for use of TV White Space in India
  o Developed a computation tool to estimate and generate heat map of available TVWS in India.
  o Modified *ath-x* drivers to meet custom requirements for a TVWS test-bed.
  o Deployed a test-bed with six village locations to demonstrate the use of TVWS for affordable broadband connectivity – the first in India.
  o 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.

# Publications

**Journals/Magazines**

J4 **Gaurang Naik**, Jung-Min (Jerry) Park, Jonathan Ashdown, William Lehr, "Next Generation Wi-Fi and 5G NR-U in the 6 GHz Bands: Opportunities & Challenges," to appear in IEEE Access.

J3 **Gaurang Naik**, Biplav Choudhury, Jung-Min (Jerry) Park, "IEEE 802.11bd & 5G NR V2X: Evolution of Radio Access Technologies for V2X Communications," in IEEE Access, vol. 7, no. 1, pp. 70169-70184, 2019.

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," in IEEE Communications Surveys & Tutorials, vol. 20, no. 3, pp. 1777-1798, Third Quarter 2018.

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 Proceedings**

C12 **Gaurang Naik**, Dennis Ogbe, Jung-Min (Jerry) Park, "Can Wi-Fi 7 Support Real-Time Applications? On the Impact of Multi Link Aggregation on Latency," to appear in proceedings of IEEE ICC 2021.

C11 **Gaurang Naik**, Jung-Min (Jerry) Park, "Coexistence of Wi-Fi 6E and 5G NR-U: Can We Do Better in the 6 GHz Bands?," to appear in proceedings of IEEE INFOCOM 2021.

C10 **Gaurang Naik**, Jung-Min (Jerry) Park, Jonathan Ashdown, "$C^2RC$: Channel Congestion-based Retransmission Control for 3GPP-based V2X Technologies," in proceedings of IEEE WCNC 2020.

C9 **Gaurang Naik**, Jung-Min (Jerry) Park, "Impact of Wi-Fi Transmissions on C-V2X Performance," in proceedings of IEEE DySPAN 2019.

C8 Sudeep Bhattarai, **Gaurang Naik**, Jung-Min (Jerry) Park, "Uplink Resource Allocation in IEEE 802.11ax," in proceedings of IEEE ICC 2019.

C7 Rajeev Kumar, Athanasios Koutsaftis, Fraida Fund, **Gaurang Naik**, Pei Liu, Yong Liu, Shivendra Panwar, "TCP BBR for Ultra-Low Latency Networking: Challenges, Analysis, and Solutions," in proceedings of IFIP Networking 2019.

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.

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.

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.

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.

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.

C1 **Gaurang Naik**, Sudesh Singhal, Animesh Kumar, Abhay Karandikar, "Quantitative Assessment of TV White Space in India" in proceedings of IEEE NCC 2014. **(Shortlisted for the Best Paper Award)**.

## Awards & Leadership Roles

- Awarded the Prasad Fellowship for Academic Excellence for the year 2019-2020 by the Bradley Department of Electrical & Computer Engineering at Virginia Tech.

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

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

- Student companion for a group of ten first year M. Tech. students under ISCP in the year 2013.

- Part of the organizing team of several workshops conducted by Information Networks Lab at IITB.

- Head Organizer of FERVOR - the Annual Technical Festival of VIT in 2011.

- Held the position of Technical Secretary at VIT in the year 2010-11.

## 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

- Performance Analysis of Multi Link Aggregation in IEEE 802.11be
  - Qualcomm, Summer Intern presentation

## Professional Service

- Technical Reviewer
  - IEEE Communications Letters
  - IEEE Transactions on Communications
  - IEEE Transactions on Wireless Communications
  - IEEE Transactions on Mobile Computing
  - IEEE Transactions on Vehicular Technology
  - IEEE Communications Magazine
  - IEEE Vehicular Technology Magazine
  - IEEE Access
  - IEEE Wireless Communications and Networking Conference (WCNC)
  - IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC)

## References

Available upon request.