Manav Pietro Kohli manav.kohli@columbia.edu, 401-536-3644

Education

Ph.D. in Electrical Engineering, Columbia University, New York NY, USA **Sept. 2018 – Present**
- GPA 3.91/4.00
- Advisor: Prof. Gil Zussman

M.S. in Electrical Engineering, Columbia University, New York NY, USA **Sept. 2018 – Dec. 2019**
- GPA 3.89/4.00

B.S. in Electrical Engineering, Brown University, Providence RI, USA **Sept. 2014 - May 2018**
- GPA 3.93/4.00

Honors and Awards

2018 Admitted to Sigma Xi honor society
2018 Brown University Academic Honors (Magna Cum Laude)
2019 NSF Graduate Research Fellowship
2019 NPSC Fellowship

Publications

Journals

2. **M. Kohli**, T. Chen, M. Baraani Dastjerdi, J. Welles, I. Seskar, H. Krishnaswamy, G. Zussman, "Open-Access Full-Duplex Wireless in the ORBIT and COSMOS Testbeds," *accepted*, *under review*, *Elsevier Computer Networks (invited)*, 2021.

1. J. Du, D. Chizhik, R. Valenzuela, R. Feick, G. Castro, M. Rodriguez, T. Chen, **M. Kohli**, and G. Zussman, "Directional Measurements in Urban Street Canyons from Macro Rooftop Sites at 28 GHz for 90% Outdoor Coverage," *IEEE Transactions on Antenna and Propagation*, Dec. 2020.

Workshops

3. **M. Kohli**, T. Chen, M. Baraani Dastjerdi, J. Welles, I. Seskar, H. Krishnaswamy, and G. Zussman, "Open-access full-duplex wireless in the ORBIT and COSMOS testbeds," in *Proc. ACM MobiCom'20 Workshop on Wireless Network Testbeds, Experimental evaluation & CHaracterization (WiNTECH) (invited)*, London, U.K., Sept. 2020.

2. T. Chen, **M. Kohli**, T. Dai, A. D. Estigarribia, D. Chizhik, J. Du, R. Feick, R. Valenzuela, and G. Zussman, "28 GHz Channel Measurements in the COSMOS Testbed Deployment Area," in *Proc. ACM MobiCom'19 Workshop on Millimeter-Wave Networks and Sensing Systems (mmNets)*, Los Cabos, Mexico, Oct. 2019.

1. T. Chen, J, Welles, **M. Kohli**, M. Baraani Dastjerdi, J. Kolodziejski, M. Sherman, I. Seskar, H. Krish- naswamy, and G. Zussman, "Experimentation with Full-Duplex Wireless in the COSMOS Testbed," in *Proc. IEEE ICNP'19 Workshop on Midscale Education and Research Infrastructure and Tools (MERIT),* Chicago, IL, Oct. 2019.

Demos and Posters

13. **M. Kohli**, T. Chen, J. Welles, M. Baraani Dastjerdi, J. Kolodziejski, M. Sherman, I. Seskar, H. Krishnaswamy, and G. Zussman, "Open-Access Full-Duplex Wireless in the COSMOS Testbed," *Data Science Day,* Data Science Institute at Columbia University, New York, NY, Apr. 2021

12. **M. Kohli**, A. D. Estigarribia, T. Dai, I. Kadota, T. Chen, D. Chizhik, J. Du, R. Feick, R. A. Valenzuela, and G. Zussman, "28 GHz Channel Measurements in the COSMOS Testbed Deployment Area", *Smart Cities Poster Session,* Data Science Institute at Columbia University, New York, NY, Nov. 2020

11. **M. Kohli**, T. Chen, J. Welles, M. Baraani Dastjerdi, J. Kolodziejski, M. Sherman, I. Seskar, H. Krishnaswamy, and G. Zussman, "Demo: Remote experimentation with open-access full-duplex wireless in the COSMOS testbed," in *Proc. ACM MobiCom'20*, London, United Kingdom, Sept. 2020

10. **M. Kohli** and T. Chen, "Experimentation with the city-scale programmable COSMOS testbed", *ACM MobiCom'20* Tutorial, London, United Kingdom, Sept. 2020.

9. **M. Kohli**, T. Chen, J. Welles, M. Baraani Dastjerdi, J. Kolodziejski, M. Sherman, I. Seskar, H. Krishnaswamy, and G. Zussman, “Open-Access Full-Duplex Wireless in the COSMOS Testbed,” *Data Science Day,* Data Science Institute at Columbia University, New York, NY, Mar. 2020

8. T. Dai, A. D. Estigarribia, **M. Kohli,** T. Chen, D. Chizhik, J. Du, R. Feick, R. A. Valenzuela, and G. Zussman, “28 GHz Channel Measurements in the COSMOS Testbed Deployment Area", *Data Science Day,* Data Science Institute at Columbia University, New York, NY, Mar. 2020

7. A. Nagulu, **M. Kohli**, T. Chen, G. Zussman, and H. Krishnaswamy, "A Real-Time Full-Duplex Wireless Link using Multi-Watt CMOS Circulators Based on Switched-Capacitor Clock Boosting," in *Proc. IEEE International Solid State Circuits Conference (ISSCC)*, Feb. 2020.

6. T. Chen and **M. Kohli**, “Experimentation with the city-scale programmable COSMOS testbed,” *ACM SenSys'19* Tutorial, New York, NY, Nov. 2019.

5. T. Chen, **M. Kohli**, P. Skrimponis, T. Dai, and A. D. Estigarribia, “The COSMOS Education Toolkit and open-access full-duplex wireless in the COSMOS testbed,” *6th Silicon Harlem Annual Tech Conference (invited)* New York, NY, Oct. 2019

4. T. Chen, J. Welles, **M. Kohli**, M. Baraani Dastjerdi, J. Kolodziejski, M. Sherman, I. Seskar, H. Krishnaswamy, and G. Zussman, "Experimentation with full-duplex wireless in the COSMOS testbed," *IEEE ICNP’19 Workshop Midscale Education and Research Infrastructure and Tools (MERIT)*, Chicago, IL, Oct. 2019

3. **M. Kohli**, “Open-Access Full-Duplex Wireless in the ORBIT/COSMOS Testbed,” *Midscale Experimental Research Infrastructure Forum (MERIF) Education Workshop*, Washington, DC, May 2019.

2. **M. Kohli**, “COSMOS Tutorial: Experimentation with Compact Full-Duplex Wireless.”, *Midscale Experimental Research Infrastructure Forum* (*MERIF)*, Washington DC, May 2019

1. **M. Kohli**, G. Farkash, J. Ostrometzky, T. Chen, and G. Zussman, "Demo: Noise-Aware Digital Self-Interference Cancellation for Full-Duplex Radios," in *Proc. IEEE ICASSP'19*, Brighton, U.K., May 2019.

Technical Reports

1. J. Du, D. Chizhik, R. Valenzuela, R. Feick, G. Castro, M. Rodriguez, T. Chen, **M. Kohli**, and G. Zussman, “Directional Measurements in Urban Street Canyons from Macro Rooftop Sites at 28 GHz for 90% Outdoor Coverage,” *arXiv preprint*: 1908.00512v2 [eess.SP], Aug. 2019.

Teaching Experience

Fall 2020	Computer Networks (Columbia University, CSEE 4119)
Fall 2017	Intro to Computer Systems (Brown University, CSCI 0330)
Spring 2017	Circuits & Signals (Brown University, ENGN 0520)
Spring 2016	Dynamics & Vibrations (Brown University, ENGN 0040)
Fall 2015	Intro to Engineering (Brown University, ENGN 0030)

Mentorship

Masters Students

- Shounak Roy (2019 – 2020)
- Zixiang Zheng (2020)
- Saravanan Govindarajan (2021 – Present)
- Tianyi Dai (2021 – Present)

Undergraduate Students

- Jean Lee (2016 – 2017)
- Tianyi Dai (2019 – 2021)
- Angel Daniel Estigarribia (2019 – Present)
- Kimberly Santiago (2019)
- Leoni Lu (2021 – Present)
- Watson Mushimbei (2021 – Present)
- Irfan Tamim (2021 – Present)
- Perry Flamer (2021 – Present)

Research Projects

Cloud Enhanced Open Software Defined Mobile Wireless Testbed for City-Scale Deployment (COSMOS)

— Involved in the development and deployment of the COSMOS wireless testbed in West Harlem, NYC.
— Pilot phase of deployment completed in early 2020 and made available to researchers in June 2020.

— Deployed datacenter infrastructure including 100 gigabit network switches and enterprise server and storage solutions. Installed metropolitan area optical network equipment, including optical switches and ROADMs.

Full-Duplex Wireless: From Integrated Circuits to Networks (FlexICoN) **Columbia University**

— Investigating methods of full-duplex (FD) wireless at the physical network layer as well as the impacts of FD at higher layers of the network e.g. medium access control. Use of custom hardware and software design.
— Built a first-of-its-kind FD experimentation testbed within the indoor COSMOS Sandbox 2 that is remotely accessible to researchers in the community. Developed experiments demonstrating performance of the integrated FD radios at the node-level, link-level and network-level.

Millimeter-Wave (mmWave) Channel Measurements and Algorithm Development **Columbia University**

— Conducted a 28 GHz wireless channel measurement campaign around the Columbia University campus in collaboration with Bell Labs. Measurements taken to characterize path loss and angular spread in various scenarios, including outdoor-outdoor and outdoor-indoor base station to user communications.
— Investigating network-level algorithms for beamforming and beamsteering using measurement results.

Avionics Hardware for "EQUiSat" 1U CubeSat, Brown Space Engineering (BSE) **Brown University**

— Designed, built and tested evaluation board for lithium-ion and lithium iron phosphate battery charging. Successful changes applied to second revision of battery charging board, including lithium-ion protection and current sensing.
— Built, tested, repaired and integrated the final battery charging board, as well as other boards, into the satellite.

Investigation into "artificial dielectric effect", Mittleman Laboratory **Brown University**

— Investigated the behavior of a terahertz wave as it propagates through a parallel plate waveguide with a widening opening at the end. Simulations with varying geometric parameters were run to investigate the "artificial dielectric effect" on the terahertz wave, which leads to the wave's direction of propagation changing. Report produced.

Hardware and software interface for High-Speed Infrared Microscope, Guduru Laboratory **Brown University**

— Revised FPGA hardware for microscope, with focus given on data transfer between the microscope and computer.

Work Experience

Research Intern, Nokia Bell Labs, Crawford Hill NJ, USA **June 2019 – Aug. 2019**

— Conducted a summer-long mmWave channel measurement campaign in New York City using a customized channel sounder capable of recording power over a 360-degree azimuthal scan. Measurement data used to compute channel properties including path loss and beamforming gain loss.

Applications Engineer Intern, ON Semiconductor, East Greenwich RI, USA **June 2017 – May 2018**

— Designed and developed two product demonstration boards for new automotive device driver chips. Boards are targeted at customers in the automotive industry to evaluate the new product. Boards were designed to be useable with just a power supply, with an LCD screen and Arduino to control and display user input and chip output.

Leadership Experience

Avionics Hardware Lead for Brown Space Engineering (BSE) **May 2017 – May 2018**

— Team Lead for the final stages of EQUiSat's hardware development. Effectively met project deadlines and produced working components. Also visited local schools as part of community outreach efforts.
— EQUiSat launched in May 2018, as part of NASA ELaNa Mission 23, and completed its mission upon re-entry in December 2020, far exceeding the expected mission lifespan of 3-12 months.

IMP Mentor, Brown University **Aug. 2016 – May 2017**

— Volunteered for Brown University's International Mentor Program during the 2016-2017 academic year.

Service to the Community

— COSMOS Educational Demo, Intrepid Museum Kid's Week **Intrepid Museum, New York NY, Feb. 2020**
— Teacher, Girls' Science Day **Columbia University, Nov. 2019**
— Committee on selecting engineering graduation speaker **Brown University, May 2018**
— Sophomore student advising **Brown University, 2016-2017**
— Remedial class TA **Hope High School, Providence Public School District, Providence RI, 2015-2017**
— After-school SAT tutor **Hope High School, Providence Public School District, Providence RI, 2014-2017**

Technical Skills

— **Programming Languages:** C, C++, Visual Basic, MATLAB, Python; Assembly (ARM and x86), Java, C#, Arduino (knowledgeable); JavaScript (beginner).
— **Hardware Design Proficiency:** FPGA and CPLD design with Verilog, and subsequent design verification. PCB design and layout. Integrated circuit design, layout and simulation. Electronics assembly, measurement and testing with vector network analyzer and other bench equipment.
— **Specialized Software Proficiency:** *Software Defined Radio Experimentation:* GNU Radio; *FPGA Hardware Design:* Altera Quartus II, Xilinx IDE; *PCB Design:* Mentor Graphics PADS, Autodesk EAGLE; *IC Design:*

Cadence; *Simulation:* Keysight ADS, Cadence, QuestaSim, LTSpice; *Schematic Design:* OrCAD, xDx Designer; *Programming:* Qt Creator, Visual Studio, Jupyter Python Notebooks.

— **General IT Proficiency:** Microsoft Windows, Mac OS, and Ubuntu Linux. Microsoft Excel and the rest of the Office suite, including VBA macros. LaTeX documents. Datacenter and optical network setup and deployment. Cloud resource deployment using Google Cloud Platform and AWS.

Other Details

— British and American Citizen.

Select Courses Completed

Analog Electronic Circuits, Analysis of Algorithms**,** Communications Circuits, Communications Systems, Computer Networks, Computer Communication Networks, Design of Computing Systems, Design of Robotic Systems, Digital Signal Processing, Digital Control Systems, Digital Communications, Electricity & Magnetism, Interactive Computer Graphics, Advanced Logic Design, Materials Science, Mathematics of Deep Learning, Mechanics of Solids and Structures, mmWave Integrated Circuit Design, Modelling & Performance Evaluation, Thermodynamics