

Abhi Adhikari

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Education

- **Columbia University** New York, NY
M.S./Ph.D. in Electrical Engineering (advised by Prof. Gil Zussman) *Sept. 2021 - Present*
– Evergreen Fellow
- **Drexel University** Philadelphia, PA
B.S. in Computer Engineering – Magna Cum Laude *Graduated June 2021*

Activities, Awards and Honors

- 2023: NSF CS3-ERC Columbia Student Leadership Council Co-Chair
- 2022: NSF GRFP Honorable Mention
- 2021: Columbia Evergreen Fellowship (awarded to the top incoming EE graduate students)
- 2019-2021: IEEE-HKN and Tau Beta Pi (executive board at Drexel)
- 2018-2021: Dean's List (Drexel)
- 2018: A.J. Drexel Scholarship (partial tuition scholarship for all years of undergraduate education)
- 2017: Pennsylvania NASA Space Grant Scholarship (enables a select number of first-year undergraduate students to perform research at Penn State University)

Research Experience

- **Nokia Bell Labs** Murray Hill, NJ
Internship *June 2023 - August 2023*
6G Radio Systems Summer Intern
Supervised by Dr. Dmitry Chizhik, Dr. Jinfeng Du, and Dr. Reinaldo Valenzuela.
– Upcoming.
- **Nokia Bell Labs** Murray Hill, NJ
Internship *June 2022 - August 2022*
Propagation Modeling Summer Intern
Supervised by Dr. Dmitry Chizhik, Dr. Jinfeng Du, and Dr. Reinaldo Valenzuela.
 - Collected over 15 million power measurements to determine coverage of 28 GHz wireless around the corner of a typical urban block.
 - Created a path loss model for around-corner scenarios with 6 dB RMSE.
 - Collected measurements and performed analysis for over-the-top NLOS scenarios of 28 GHz wireless.
 - Developed software for a rotating 140 GHz channel sounder which generates angle-power spectrum at a high resolution.
- **Columbia University** New York, NY
Graduate Assistant *July 2021 - Present*
Evaluating Outdoor-to-Indoor mmWave for 5G
In collaboration with Dr. Dmitry Chizhik, Dr. Jinfeng Du, and Dr. Reinaldo Valenzuela (Nokia Bell Labs).

- Characterizing the outdoor propagation of millimeter-wave (mmWave) signals at a middle school located in NYC, a modern coffee shop with UV-protection glass, and a 100-year-old building with metal window gratings using a Nokia Bell Labs 28 GHz channel sounder.
- Determined that outdoor-to-indoor mmWave FWA is capable of achieving data rates of 1.3 Gbps indoors, particularly in an area where 30 percent of the population lacks internet access.
- Designing and evaluating various MAC/PHY level beam steering/beamforming and downlink resource allocation algorithms that would use encrypted uplink data and their packet header information to more effectively manage the 1.3 Gbps bandwidth between several users.

Sensing Weather Phenomena with mmWave Radar

In collaboration with Prof. Tingjun Chen (Duke) and Dr. Jonathan Ostrometzky (Tel Aviv University).

- Collecting extensive radar measurements using a mmWave radar sensor to train a machine learning model using high-quality weather phenomena data.

Lockheed Martin Advanced Technology Laboratories

Philadelphia, PA

• *Senior Capstone Project – Team Lead*

Sept. 2020 - June 2021

- Designed a software-defined mmWave radar testbed to enable rapid prototyping of multi-target tracking (MTT) algorithms for autonomous vehicles through RF ray tracing and channel emulation.
- Built and tested a Joint Probabilistic Data Association tracking filter with real-world software-defined radio (SDR) radar MTT data collected by testbed.

Lockheed Martin Advanced Technology Laboratories

Cherry Hill, NJ

Applied Research Co-Op

May 2020 - Sept. 2020

- Created a GNU Radio Out-Of-Tree Module to wrap a C++ radar algorithm (CA-CFAR) into a Python interface for use with SDR.
- Wrote a C++ benchmarking tool to characterize radar algorithm performance.
- Enabled real-time I/Q collection from SDR through SoapySDR, SDRAngel, and UHD.

NASA Big Idea Challenge

Philadelphia, PA

Wireless Communication Lead

Sept. 2019 - June 2020

- Developed wireless communication architecture for a lunar rover to send soil data to a lander located outside a permanently-shadowed-region (PSR) while lacking direct line of sight.
- Organized meetings with computer engineering students to develop wireless architecture and communicate with team leads from a diversity of disciplines to ensure that our work aligns and integrates with the rover, power, and sampling system teams.

NASA Space Grant Scholarship Recipient

University Park, PA

Research Assistant

Jan. 2017 - Dec. 2018

- Analyzed the microscopic wear of Micro Electrical-Mechanical Systems by testing the friction coefficient between silicon substrates exposed to various gases.
- Selected to present research in a conference sponsored by Penn State University.

Publications

Patents

A. Adhikari, “System and method for controlling, sharing, release and management of digital data between smart mobile device(s) and external device(s) using a connector pad”. *U.S. Utility Patent 10,348,691* filed May 14, 2018, and issued July 9, 2019.

A. Adhikari, “System and method for making a quick connection between a smart mobile device and external audio speakers and video monitors using a connector pad”. *U.S. Utility Patent 9,998,848* filed Nov. 13, 2015, and issued June 12, 2018.

Conferences/Journals

M. Kohli, **A. Adhikari**, G. Avci, S. Brent, J. Moser, S. Hossain, A. Dash, I. Kadota, R. Feick, D. Chizhik, J. Du, R. Valenzuela, G. Zussman, “Outdoor-to-Indoor Measurements of 28 GHz Wireless in a Dense Urban Environment,” submitted to *IEEE/ACM Transactions on Networking*.

D. Chizhik, J. Du, M. Kohli, **A. Adhikari**, R. Feick, R. Valenzuela, G. Zussman, “Accurate Urban Path Loss Models Including Diffuse Scatter,” to appear in *European Conference on Antennas and Propagation (EuCAP) 2023*. Mar. 2023.

M. Kohli, **A. Adhikari**, G. Avci, S. Brent, J. Moser, S. Hossain, A. Dash, I. Kadota, R. Feick, D. Chizhik, J. Du, R. Valenzuela, G. Zussman, “Outdoor-to-Indoor Measurements of 28 GHz Wireless in a Dense Urban Environment,” in *Proc. of ACM MobiHoc’22*, Seoul, South Korea. Oct. 2022.

A. Adhikari, S. Parihar, S. Das, M. Jacovic, A. Trezza, V. Pano, and K. R. Dandekar, “Software-Defined Radar Testbed for Multi-Target Tracking,” in *Proc. of IEEE RadarConf’22*, NYC, NY. Mar. 2022.

Tutorials

A. Adhikari, J. Shane, J. Kolodziejski, P. Skrimponis, I. Seskar, T. Chen, S. Rangan, G. Zussman, “COSMOS Testbed for Advanced Wireless and Edge Cloud Research,” presented at *2022 ACM SIGCOMM*, Amsterdam, NL. Tutorial, Aug. 2022.

Posters and Demos

A. Adhikari, S. Mukherjee, A. Mehta, M. Kohli, R. Feick, D. Chizhik, J. Du, R. Valenzuela, G. Zussman, “Turning the Block in NYC and Still Getting 5G Coverage? mmWave Around-the-Corner Measurements for Dense Urban Deployment,” presented at *Columbia Smart Cities Poster Session*, NYC, NY. Poster Presentation, Apr. 2023.

A. Adhikari, S. Mukherjee, A. Mehta, M. Kohli, R. Feick, D. Chizhik, J. Du, R. Valenzuela, G. Zussman, “Turning the Block in NYC and Still Getting 5G Coverage? mmWave Around-the-Corner Measurements for Dense Urban Deployment,” presented at *2023 Columbia Data Science Day*, NYC, NY. Poster Presentation, Apr. 2023.

The Clinton School, Traceroute Lab w/ COSMOS Edu. Toolkit, NYC, Jan. 2023.

A. Adhikari, M. Kohli, G. Avci, S. Brent, J. Moser, S. Hossain, A. Dash, S. Mukherjee, C. Garland, I. Kadota, R. Feick, D. Chizhik, J. Du, R. Valenzuela, G. Zussman, “mmWave Measurements for Fixed and Mobile Wireless Access Algorithm Development,” presented at *2022 Columbia Data Science Day*, NYC, NY. Poster Presentation, Apr. 2022.

Silicon Harlem, Demo of COSMOS Edu. Toolkit to various communities and stakeholders, West Harlem, NYC, Feb.-Apr. 2022.

G. Avci, S. Brent, S. Hossain, J. Moser, A.D. Estigarribia, M. Kohli, I. Kadota, **A. Adhikari**, D. Chizhik, J. Du, R. Feick, R. Valenzuela, G. Zussman, “Outdoor-to-Indoor 28 GHz mmWave Measurements in the COSMOS Testbed Deployment Area,” *2021 IEEE MIT Undergraduate Research Technology Conference (URTC)*, Cambridge, MA. Poster Presentation, Oct. 2021.

Silicon Harlem, Demo of COSMOS Edu. Toolkit to Silicon Harlem, West Harlem, NYC, Sept. 2021.

Datasets

NIST, 28 GHz Outdoor-to-Indoor Measurements Taken at a Middle School, NextG CMA Dataset on NIST Public Dataset Repository (nextg.nist.gov/submissions/131).

Paper Review Experience

MobiSys 2023 (2 Papers)

IPSN 2023 (1 Paper)

Teaching and Mentorship Experience

Teaching Assistant

Columbia, Electrical Engineering CSEEW4119 Computer Networks, CVN TA, *Spring 2023*

Columbia, Electrical Engineering ELEN9701 Info and Communication Theories, Head TA, *Fall 2022*

Columbia, Electrical Engineering CSEEW4119 Computer Networks, Head TA, *Spring, Summer 2022*

Columbia, Electrical Engineering ELENE1201 Introduction to Electrical Engineering, *Fall 2021*

Participated in the COSMOS/EFRI RET/REM program, *Sept. 2021*

Undergraduate Students

Shivan Mukherjee, Columbia University, *January 2022 - September 2022*

Carson Garland, Columbia University, *January 2022 - May 2022*

Kaya Celebi, REU from Duke University, *June 2021 - January 2023*

Sabbir Hossain, Columbia-Amazon SURE, City College of New York, *June 2021 - August 2021*

High School Students

Aahan Mehta, Stuyvesant High School, *June 2022 - September 2022*

Jared Moser, Stuyvesant High School (now at Johns Hopkins University), *June 2021 - August 2022*

Skills

Software: Python, scikit-learn, MATLAB, C/C++, Linux, GNU Radio, Wireless InSite Ray Tracing

Hardware: Software-Defined Radio, mmWave Channel Sounder, RF Emulation, Optical Fiber, Radar