Abhishek Anand

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Current Position

Lamont-Doherty Earth Observatory, Columbia University New York City, NY

Postdoctoral Research Scientist, Advisor: Prof. Daniel Westervelt *November 2024-Present*

- Leveraging remote sensing air pollution datasets (from NASA and European satellite fleets) and low-cost ground-based sensors to build machine learning algorithms for estimating highly accurate particulate pollutant concentrations and health exposures in sub-Saharan Africa.

Education

Carnegie Mellon University Pittsburgh, PA

Doctor of Philosophy in Mechanical Engineering *May 2024*

Advisor: Prof. Albert Presto

Hong Kong University of Science and Technology Hong Kong

Master of Philosophy, Environmental Science, Policy and Management *August 2020*

Hong Kong University of Science and Technology Hong Kong

Master of Science, Environmental Engineering and Management *May 2017*

Indian Institute of Technology Delhi New Delhi, India

Bachelor of Technology in Civil Engineering *May 2015*

Past Research Experience

Carnegie Mellon University Pittsburgh, PA

Postdoctoral Research Associate, Advisor: Prof. Albert Presto *May 2024-August 2024*

- Analyzed large datasets from instruments at the Pittsburgh site of Atmospheric Science and Chemistry mEasurement NeTwork (ASCENT), a network for high-time-resolution and long-term measurement in the U.S. for characterization of aerosol chemical composition.

Carnegie Mellon University Pittsburgh, PA

Ph.D. Student, Advisor: Prof. Albert Presto *August 2020-May 2024*

- Leveraged existing beta attenuation monitors (BAMs) to measure hourly black carbon using image processing to help identify emission sources and evidence-based policymaking in Africa.
- Developed a deep learning-based $PM_{2.5}$ forecast model for Pittsburgh using air pollution and meteorological covariates from NASA's GEOS-CF model and aerosol optical depth from MODIS satellite instrument. We used a low-cost sensor network $PM_{2.5}$ data as ground truth.

Hong Kong University of Science and Technology Hong Kong

M.Phil. Student, Advisor: Prof. Zhi Ning *August 2018- July 2020*

- Technology development and validation of a remote and compact drone-based sniffer sensor system to identify high emitting ships by measuring their fuel sulfur content (FSC). FSC values were calculated using ship plume SO_2 and CO_2measurements from the sensor systems.

Hong Kong University of Science and Technology Hong Kong

Research Assistantship, Advisor: Prof. Zhi Ning *June 2018-August 2018*

- Impact of cross-sensitivity and environmental factors on performance of low-cost gaseous pollutant sensors. The sensors included Alphasense electrochemical gas sensors (CO, NO, NO_2, O_3 and SO_2) and NDIR (Non-Dispersive Infrared) CO_2 sensors.

Hong Kong University of Science and Technology Hong Kong

M.Sc. Student, Advisor: Prof. Irene Man Chi Lo *August 2016-May 2017*

- Synthesis of visible-light-driven magnetic titanium oxide (TiO_2) - based nanophotocatalysts for degradation of persistent organic pollutants in wastewater.

Publications

- **Anand, A.**, Farimani, A. B., Presto, A., et al. A novel deep learning approach for forecasting daily $PM_{2.5}$ using GEOS-CF parameters and low-cost sensor network. (*Under Preparation*)
- Westervelt, D., Amooli, J. J., **Anand, A.** Twenty Years of High Spatiotemporal Resolution Estimates of Daily PM2.5 in West Africa Using Satellite Data, Surface Monitors, and Machine Learning. *Environmental Science & Technology Air. 2025.*
- **Anand, A.**, Touré, N. D. E., Bahino, J., Gnamien, S., Hughes, A. F., Arku, R. E., ... & Presto, A. A. Low-cost hourly black carbon measurements at multiple cities in Africa. *Environmental Science & Technology*. 2024.
- Wei, P., Hao, S., Shi, Y., **Anand, A.**, et al. Combining Google traffic map with deep learning model to predict street-level traffic-related air pollutants in a complex urban environment. *Environment International*. 2024.
- **Anand, A.**, Kompalli, S., Ajiboye, E., & Presto, A. A. Estimation of hourly black carbon aerosol concentrations from glass fiber filter tapes using image reflectance-based method. *Environmental Science: Atmosphere*. 2023.
- Wei, P., Brimblecombe, P., Yang, F., **Anand, A.**, et al. Determination of local traffic emission and non-local background source contribution to on-road air pollution using fixed-route mobile air sensor network. *Environmental Pollution*. 2021.
- Wei, P., Sun, L., **Anand, A.**, Zhang, Q., et al. Development and evaluation of a robust temperature sensitive algorithm for long term NO_2 gas sensor network data correction. *Atmospheric Environment*. 2020.
- **Anand, A.**, Wei, P., et al. Protocol development for real-time ship fuel sulfur content determination using drone-based plume sniffing microsensor system. *Science of The Total Environment*. 2020.

Accepted Proposals

Climate School Summer Internship Funding Program, Columbia University.

$6,000. 6/1/2025–8/31/2025. Funding for hiring interns in Summer 2025 to work on projects related to climate, sustainable development and the environment.

Dowd Fellowship, Carnegie Mellon University.

$100,000. 9/1/2022–8/31/2023. Covered my tuition and monthly stipend for one academic year.

Fellowships and Awards

- Winner, Hackathon on Applying Machine Learning for Subseasonal-to-Seasonal Climate Predictions, LEAP, Columbia University. 2025
- Travel Grant recipient for American Association for Aerosol Research 2023 conference 2023
- Philip and Marsha Dowd Fellowship, CMU (around $100,000 in tuition and stipend) 2022-2023
- Milton Shaw Ph.D. Research Award, Department of Mechanical Engineering, CMU 2022
- Postgraduate Studentship for the M.Phil. study at HKUST 2018-2020
- HKUST awardee for the 8th Global Young Scientists Summit, National Research Foundation, Prime Minister's Office, Singapore 2020
- University Grants Committee Research Travel Grant, HKUST 2019
- Division of Environment and Sustainability Research Travel Grant by HKUST 2019
- Hong Kong Government Innovation and Technology Fund Internship Award 2018
- M.Sc. Excellent Student Scholarship, School of Engineering, HKUST 2017
- Champion Award, BESTo camp, HKUST Entrepreneurship Center 2017
- Entrance Scholarship, School of Engineering, HKUST 2016
- Ministry of Human Resources Development Scholarship at IIT Delhi, covering tuition fees for 4 years of undergraduate studies. 2011-2015

Invited Talks

- **GRAPHS Manuscript Series, Columbia University, NY** *December 2025*
  Mapping Two Decades of Daily High-Resolution $PM_{2.5}$ Data in Ghana Using Machine Learning.
- **Geochemistry Division, Columbia University, NY** *October 2025*
  Atmospheric Black Carbon Measurements by Applying Image Processing Method on Filter Tapes.
- **Department of Civil Engineering, University of Illinois Urbana-Champaign, IL** *October 2025*
  Leveraging Satellite Measurements, Surface Monitors, and Machine Learning for Generating 20 Years of High-Resolution Daily $PM_{2.5}$ in Ghana.
- **SPARTAN & CAMS-Net Joint Meeting, Washington University in St. Louis, MO** *June 2025*
  Two Decades of High-Resolution Daily $PM_{2.5}$ in Ghana: A Machine Learning Approach
- **Lamont 75th Mini-Symposium: The Data Drive Discovery, Columbia University, NY** *May 2025*
  Leveraging Satellite Measurements to Build Machine Learning Models for Estimating 20 years of High-Resolution Gridded Daily $PM_{2.5}$ for Ghana
- **Air Sensors International Conference, Riverside, CA** *October 2024*
  Low-cost methods for measurement of $PM_{2.5}$ composition at African cities by exploiting existing Beta Attenuation Monitors.

Conference Presentations

- **Anand, A.**, Amooli, J. A., Westervelt, D. M. Leveraging Satellite Measurements, Surface Monitors, and Machine Learning for Estimating 20 Years of High-Resolution Gridded $PM_{2.5}$ in Ghana. *American Association for Aerosol Research*, Buffalo, NY. 2025.
- **Anand, A.**, Opinde, G., Mwendwa, T. M., Habineza, T., Presto, A., DeCarlo, P. F., Nault, B. A., Westervelt, D. M. Aerosol Chemical Composition at an Urban Core Location in Nairobi, Kenya. *American Association for Aerosol Research*, Buffalo, NY. 2025.
- **Anand, A.**, Presto, A., et al. Estimation of Total and Biomass-Based BC at African Cities by Applying Image-Reflectance Method on BAM Tapes. *American Association for Aerosol Research*, Albuquerque, NM. 2024.
- **Anand, A.**, Presto, A., Farimani, A. B. Development of an improved deep learning-based $PM_{2.5}$ model for predicting high pollution episodes in Pittsburgh by leveraging GEOS-CF atmospheric composition data. *American Geophysical Union*, San Francisco, CA. 2023.
- **Anand, A.**, Presto, A., Farimani, A. B. Developing a machine learning-based daily $PM_{2.5}$ forecast model with GEOS-CF and land use parameters. *American Association for Aerosol Research*, Portland, OR. 2023.
- **Anand, A.**, Kompalli, S. P., et al. Black carbon measurements in multiple cities of sub-Saharan Africa with low-cost image reflectance method. *American Association for Aerosol Research*, Portland, OR. 2023.
- **Anand, A.**, Presto, A., Kompalli, S. P., et al. Hourly black carbon measurements in Africa using cell phone camera images. *American Geophysical Union*, Chicago, IL. 2022.
- **Anand, A.**, Presto, A., Kompalli, S. P., et al. Low-Cost black carbon detection from Beta Attenuation Monitors using image reflectance-based method. *American Association for Aerosol Research*, Raleigh, NC. 2022.
- Kim, S., **Anand, A.**, Rajan, P. E., Presto, A. Comparison of organic aerosol composition and source distributions across different urban environments. *American Association for Aerosol Research*, Raleigh, NC. 2022.
- **Anand, A.**, Presto, A., Kompalli, S. P., et al. Estimation of hourly BC from BAM tapes using image reflectance-based method. Air Sensors International Conference, Pasadena, CA. 2022.
- **Anand, A.**, Gali, N. K., Yang, F., et al. Laboratory calibration, validation and protocol development to use UAV borne sensor system for fuel sulfur content-based field screening of OGVs. *Global Young Scientists Summit*, Singapore. 2020.

- **Anand, A.**, Gali, N. K., Westerdahl, et al. Technology development and evaluation of an ultra-compact ship fuel Sulfur sniffing sensor system. *Freight and Environment: Ports of Entry*, Newark, NJ. 2019.
- Ning, Z., **Anand, A.**, Gali, N. K., et al. Protocol Development of using Sniffing Method to Identify High Sulfur Fueled Ships. *Freight and Environment: Ports of Entry*, Newark, NJ. 2019.

Teaching Experience

Guest Lecture, Air Pollution & Measuring the Environment, Columbia University *November 2025*
Course Lecture: Introduced principles of remote sensing and tools for monitoring air quality, including accessing, visualizing, and interpreting satellite-derived pollution datasets from NASA and ESA.

Future Faculty Career Program, Carnegie Mellon University 2020-2024
Designed to help early career researchers develop their teaching skills for a faculty career.

Teaching Assistant

Renewable Energy Engineering – 24792, CMU	Spring 2023
Fluid Mechanics – 24231, CMU	Spring 2022
GIS for Environmental Professionals – EVSM5240, HKUST	Fall 2019
Carbon Emission Trading – ENVR6090A, HKUST	Spring 2019

Peer Tutor for Undergraduate Students, CMU 2022-2023
Physics I for Science Students (33121), Physics II for Biological Sciences and Chemistry Students (33122), Physics I for Engineering Students (33141), Physics II for Engineering and Physics Students (33142), Calculus (21111-122), Differential Equations (21260)

Advising Experience

Undergraduate Research Mentor

Polina Goldberg - Undergraduate student, Data Science, Columbia University	Summer 2025–Present
Elsevar Zeynalov - Undergraduate student, Data Science, Columbia University	Summer 2025
Ria Sharma - Undergraduate student, Mechanical Engineering, CMU	Summer 2023
Jordan Petzold - Undergraduate student, Mechanical Engineering, CMU	Summer 2023
Jocelyn Kiefel - Undergraduate student, Mechanical Engineering, CMU	Summer 2023
Shaborn Leggette - Undergraduate student, Mechanical Engineering, CMU	Summer 2023
Max Labovitz - Undergraduate student, Mechanical Engineering, CMU	Summer 2022

Graduate Research Mentor, Carnegie Mellon University

Sizhou Su - Master's student, Columbia University	Summer 2025–Present
Aziz Bhetasiwala - Master's student, Mechanical Engineering, CMU	Fall 2023 - Summer 2024
Ria Sharma - Master's student, Mechanical Engineering, CMU	Fall 2023

Committees and Professional Development

Session Chair
AAAR: Advancing Aerosol Science Through Data Analysis. October 2025

Panel Discussion
Spartan and CAMS-Net meeting: Low-Cost Monitoring of Atmospheric Particulate Matter. June 2025

Coordinator, Ocean and Climate Physics Department Seminar, Columbia University 2025-2026
Core Representative, Postdoc/ARS Hardship Support Fund, Columbia University 2025-Present
President, AAAR Student Chapter, Carnegie Mellon University 2023-2024
Coordinator, Center for Atmospheric Particle Studies Seminar, Carnegie Mellon University 2022-2023
Core Committee Member, CAPS Laboratory, Carnegie Mellon University 2021-2022

Reviewer Activities

Geoscientific Model Development, Environmental Science & Technology Air, Environmental International, Scientific Reports, Environmental Science and Pollution Research 2023-Present

Coursework Experience

Probability, Machine Learning and Statistics, Carnegie Mellon University 2020-2024

Introduction to Deep Learning for Engineers, Intermediate Deep Learning, Machine Learning and Artificial Intelligence for Engineers, Probability and Estimation Methods for Engineering Systems, Statistical Learning and Modeling.

Air Quality and Atmospheric Sciences

Air Quality Engineering at CMU; Atmospheric Dynamics at HKUST, Numerical Simulation of Atmospheric Phenomena at IIT Delhi