Chirag Manchanda

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Education

University of California, Berkeley — Berkeley, CA
Ph.D. in Environmental Engineering, GPA: 4.0/4.0 — 2021–2026
Advisors: Prof. Joshua S. Apte and Prof. Robert A. Harley

University of California, Berkeley — Berkeley, CA
M.S. in Civil and Environmental Engineering, GPA: 4.0/4.0 — 2021–2022

Manipal Institute of Technology, Manipal University — Karnataka, India
B.Tech. in Mechanical Engineering, GPA: 9.82/10.0 — 2014–2018

Research Interests

Applying physics-informed machine learning, inverse modeling, and data assimilation to challenges in air quality, climate, and environmental equity.

Professional Experience

Graduate Student Researcher — University of California, Berkeley
Environmental Engineering — Fall 2021 – Present
Developing advanced data assimilation and inverse modeling frameworks to optimize urban air quality, climate, and equity outcomes.

Research Associate — Indian Institute of Technology Delhi
Air Quality Research Group — Summer 2018 – Summer 2021
Led field measurement campaigns and source apportionment analyses to characterize chemical variability in $PM_{2.5}$ composition during festival fireworks and the COVID-19 lockdown.

NTU-India Connect Research Scholar — Nanyang Technological University Singapore
School of Mechanical and Aerospace Engineering — Spring 2018 – Summer 2018
Designed computational and experimental models for non-invasive detection of carotid artery stenosis using thermal imaging and flow diagnostics.

Summer Research Fellow — Indian Institute of Technology Delhi
Mechanical Engineering — Summer 2017
Developed reduced-order models for reactive turbulent swirling and particle-laden flows.

Scholarships and Awards

- **Jane Warren Award**, Health Effects Institute — 2025
- **JN Tata Gift Award**, Tata Education and Development Trust — 2025
- **Outstanding Graduate Student Instructor Award**, UC Berkeley — 2024
- **STEM*FYI Graduate Diversity Fellow**, UC Berkeley — 2023
- **Founder's Gold Medal for the Best Outgoing Student**, Manipal University — 2018
- **Summer Undergraduate Research Grant for Excellence**, Indian Institute of Technology Delhi — 2017
- **Avery Dennison InvEnt Scholar**, Avery Dennison Foundation — 2015
- **GE Foundation Scholar Leader**, General Electric Foundation — 2015
- **4x Annual Academic Excellence Award**, Manipal University — 2014 - 2018

Publications

** denotes co-first authorship | † denotes paper in submission*

1. L. Koolik*, **C. Manchanda***, A. Ünal, I. Fung, J. Marshall, R. Morello-Frosch, A. Turner, R. Harley, and J. Apte, "Modeling Optimal Pathways to a Triple Win in Air Quality, Climate, and Equity." †
   Preprint: 10.26434/chemrxiv-2025-c6sn4

2. **C. Manchanda**, R. Cohen, R. Alvarez, T. Thompson, M. Harris, A. Turner, J. Marshall, R. Harley, and J. Apte, "Hyperlocal Sensing and Inversion Reveal Community Impacts of Urban Air Pollutant Emissions." *Under review.* †
   Preprint: 10.26434/chemrxiv-2025-zt4zh

3. J. Apte and **C. Manchanda**, "High-resolution urban air pollution mapping," *Science*, **385**, 380–385, 2024. DOI:10.1126/science.adq3678

4. **C. Manchanda**, R. Harley, J. Marshall, A. Turner, and J. Apte, "Integrating mobile and fixed-site black carbon measurements to bridge spatiotemporal gaps in urban air quality," *Environmental Science & Technology*, **58**, 12563–12574, 2024. DOI:10.1021/acs.est.3c10829

5. **C. Manchanda**, M. Kumar, V. Singh, N. Hazarika, M. Faisal, V. Lalchandani, A. Shukla, J. Dave, N. Rastogi, and S. N. Tripathi, "Chemical speciation and source apportionment of ambient $PM_{2.5}$ in New Delhi before, during, and after the Diwali fireworks," *Atmospheric Pollution Research*, **13**, 101428, 2022. DOI:10.1016/j.apr.2022.101428
   Press coverage: [1] [2] [3]

6. **C. Manchanda**, M. Kumar, and V. Singh, "Meteorology governs the variation of Delhi's high particulate-bound chloride levels," *Chemosphere*, **291**, 132879, 2021. DOI:10.1016/j.chemosphere.2021.132879

7. **C. Manchanda**, M. Kumar, V. Singh, M. Faisal, N. Hazarika, A. Shukla, V. Lalchandani, V. Goel, N. Thamban, D. Ganguly, and S. Tripathi, "Variation in chemical composition and sources of $PM_{2.5}$ during the COVID-19 lockdown in Delhi," *Environment International*, **153**, 106541, 2021. DOI:10.1016/j.envint.2021.106541

8. A. Saxena, E. Ng, **C. Manchanda**, and T. Canchi, "Cardiac thermal pulse at the neck-skin surface as a measure of stenosis in the carotid artery," *Thermal Science and Engineering Progress*, **19**, 100603, 2020. DOI:10.1016/j.tsep.2020.100603

9. A. Saxena, E. Ng, M. Mathur, **C. Manchanda**, and N. Jajal, "Effect of carotid artery stenosis on neck skin tissue heat transfer," *International Journal of Thermal Sciences*, **145**, 106010, 2019. DOI:10.1016/j.ijthermalsci.2019.106010

10. **C. Manchanda**, L. Koolik, R. Harley, J. Marshall, and J. Apte, "Mapping the Structural Anatomy of Environmental Disparity through Marginal Decomposition." *In preparation.*

Patents

1. J. Apte, R. Harley, **C. Manchanda**, L. Koolik, and J. Marshall, "Systems, methods, and program products for reducing air pollution for one or more pollutants in a locality." U.S. Provisional Patent Application No. 63/877,812, filed: September 08, 2025.

2. J. Apte, R. Harley, **C. Manchanda**, J. Marshall, and A. Turner, "Systems, methods, and program products for detecting emissions of an airborne pollutant on a hyperlocal scale." U.S. Provisional Patent Application No. 63/864,040, filed: August 14, 2025.

Invited Talks and Conference Presentations

- **Gordon Research Seminar & Conference in Atmospheric Chemistry**
  "High-Resolution Inverse Modeling of Urban Air Pollution Emissions Using Multi-Platform Observations"
  Newry, ME, USA | *Talk + Poster* August 2025

- **Massachusetts Institute of Technology, Department of Urban Studies and Planning**
  "INFE²R What Drives Urban Pollution: Hyperlocal Sensing and Inverse Modeling"
  Cambridge, MA, USA | *Invited Seminar* August 2025
- **Health Effects Institute Annual Meeting**
  "High-Resolution Urban Emission Mapping: Bridging Gaps Between Inventories and Hyperlocal Observations"
  Austin, TX, USA | *Talk + Poster* May 2025
- **European Geosciences Union (EGU) Annual Meeting**
  "Connecting Urban Black Carbon Emissions and Measured Concentrations: A Fusion of Hyperlocal Monitoring and Bayesian Techniques"
  Vienna, Austria | *Invited Talk* April 2025
- **Stanford University, Department of Earth System Science**
  "INFE²R What Drives Urban Pollution: Hyperlocal Sensing and Inverse Modeling"
  Stanford, CA, USA | *Invited Seminar* March 2025
- **International Society for Environmental Epidemiology (ISEE) Conference**
  "Enhancing Exposure Estimates in Urban Environments: Integrating Mobile and Fixed-Site Black Carbon Measurements to Bridge Spatiotemporal Gaps"
  Santiago, Chile | *Talk* August 2024
- **Health Effects Institute Annual Meeting**
  "Refining Urban Exposure Estimates: A Modeling Approach Melding Mobile and Fixed-Site Observations"
  Philadelphia, PA, USA | *Poster* April 2024
- **American Geophysical Union (AGU) Annual Meeting**
  "Spatiotemporal Modeling of Black Carbon Concentrations: Combining Mobile and Fixed Site Measurements with Tailored Compressive Sensing"
  San Francisco, CA, USA | *Poster* December 2023

Teaching

- **Engineering Cluster Leader**, UC Berkeley Fall 2024 – Fall 2025
  First-time Graduate Student Instructor Teaching Conference
- **Graduate Student Instructor**, UC Berkeley Fall 2023
  Air Quality Engineering (CE 218A)
- **Teaching Assistant**, Manipal University Fall 2017
  Applied Thermodynamics (MME 2201)
- **Teaching Assistant**, Manipal University Spring 2017
  Computer-Aided Mechanical Drawing (MME 2216)

Academic and Non-Academic Service

- **Peer Reviewer**, *Environmental Science & Technology*, *ES&T Air* 2024–2025
- **Student Representative**, Environmental Engineering Graduate Admissions Committee, UC Berkeley 2023
- **Student Coordinator**, Environmental Engineering Seminar Series, UC Berkeley 2023
- **Community Outreach Volunteer**, Public engagement on wildfire smoke impacts and air filtration 2022–2025

Mentoring

- **Undergraduate Research Mentor**, Indian Institute of Technology Delhi 2019–2020
  Supervised Himanshu Patanwala on a research project in CFD modeling of coal gasification; went on to pursue graduate studies at RWTH Aachen.
- **Undergraduate Thesis Mentor**, Indian Institute of Technology Delhi 2019–2020
  Supervised Priyam Sodhiya on a B.Tech. thesis on on-road $PM_{2.5}$ exposures in New Delhi; now Head of Marketing at Zenskar.