Nikhil Dadheech

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Education

PhD, Climate and Data Science, University of Washington Seattle, WA (Sept 2021 – May 2026)
Advisor: Dr Alex Turner (Courses: Deep Learning, Weather Prediction)

MS, Atmospheric Sciences, University of Washington Seattle, WA (Sept 2021 – Mar 2024)
Advisor: Dr Alex Turner (Courses: Parallel Programming, Remote Sensing)

BTech, Civil Engineering, Indian Institute of Technology Delhi, India (July 2015 – May 2019)
Advisor: Dr Mukesh Khare (Courses: Probability, Data Structures, Algorithms)

Experience

University of Washington Sept 2021 – Present
*Graduate Research Assistant (**NASA FINESST fellow**)* *Seattle, WA*

- Accelerated GHG emission monitoring by 650 times for satellite and surface observations using machine learning.
- Emulated atmospheric transport using computer vision to address computational issues in physics-based models.
- Identifying methane super emitters from high-resolution satellite data using deep learning and computer vision.

Innoplexus July 2019 – Sept 2021
Data Scientist, Innovation team *Pune, India*

- Developed deep learning models for biomedical entity recognition, relationship extraction, and entity normalization
- Created a biomedical knowledge graph of 350M nodes and 1.5B relationships for named entity disambiguation.

Innoplexus May 2018 – July 2018
Data Science Intern, Entity Normalization team *Pune, India*

- Developed a Named Entity Recognition model using deep learning for entity normalization and disambiguation.
- Received a **full-time offer** as a data scientist for exemplary performance and accomplishment of deliverables.

Relevant Projects

Machine Learning Emulator for Atmospheric Transport (FootNet) July 2022 – Present
PhD Thesis Chapter (Funded by NASA FINESST; manuscript under review)

- Developed a deep learning model using U-Net which computes surface sensitivities for atmospheric observations.
- Accelerated computation of atmospheric transport by **1000x** using machine learning emulator.
- Currently training a generalized model with 500,000 data points (15TB space) using Distributed Data Parallel.

Near-Real-Time Greenhouse Gas Emission Monitoring from Space Sept 2023 – July 2024
PhD Thesis Chapter (Funded by NASA FINESST; manuscript under review)

- Using satellites (TROPOMI, MethaneSAT, OCO-2/3) and surface observations to monitor real-time emissions.
- Parallelized the framework to efficiently analyze high-resolution data with matrices of dimensions 15M $\times$ 15M.
- Successfully integrated machine learning emulator outputs into the GHG emission monitoring pipeline.

Methane Plumes Detection from Space May 2024 – Present
PhD Thesis Chapter

- Creating a **40+ years** of record of methane plumes observed from space using Landsat and Sentinel satellites.
- Developing a U-Net model that identify methane plumes from satellite bands using image semgentation techniques.

Satellite Bands Inpainting for Landsat7 Missing Data May 2024 – Present
PhD Thesis Chapter

- Developing an inpainting model using generative AI to fill missing stripe data in Landsat 7 due to failed sensors.
- Actively using state-of-the-art models such as diffusion models and generative adversarial networks for inpainting.

Characteristics of Photochemical Pollutants over Indo-Gangetic Plain July 2018 – May 2019
Undergraduate Research Thesis (Advisor: Dr. Mukesh Khare)

- Selected for the **Best BTech Project** Award bestowed to only one student in the entire graduating class.
- Developed regression models using Random Forest to predict the ozone concentrations over Indo-Gangetic Plain.

Awards

- Future Investigators in NASA Earth and Space Science and Technology (**funding PhD**; Sept 2022 – Present)
  - Proposed a 3-year research plan to efficiently utilize greenhouse gas satellite data for emissions estimations.
- Integral Environment Big Data Research Fund (2021 – 2022)
  - Proposed a one-year research plan to the Integral Charitable Foundation on leveraging big data and machine learning for efficient GHG emissions estimation.
- Department of Atmospheric Sciences Scholar Award (2021)
  - Merit-based award for excellent academic performance.
- IIT Delhi Department of Civil Engineering Best B.Tech. Project (Mr. & Mrs. Prem Sheel Bhatnagar Award 2019)
  - Bestowed to only one student in the entire graduating class for excellent research including a journal publication.
- Centre of Excellence for Research on Clean Air Grant (2019)
  - Merit-based award for undergraduate research on air pollution in Indo-Gangetic Plain.
- Freedom of Kumaon House Award, IIT Delhi (2019)
  - Awarded for outstanding representation of Kumaon house by leading a team of 50+ people in IIT's cultural events.
- Kishor Vaigyanik Protsahan Yojana Scholarship (2015)
  - Selected in a 2-tier scholarship test by the Government of India, among 1,500 applicants out of 500,000.
- Dakshana Foundation Scholarship (2013 – 2019)
  - Awarded the merit-based high-school and undergraduate scholarship after qualifying a national-level written test.

Publications

Dadheech, N.*, He, T. L.*, and Turner, A. J. (2024). High-resolution greenhouse gas flux inversions using a machine learning surrogate model for atmospheric transport. EGUsphere, 2024, 1-21. (*in review*; * Equally contributed authors)

He, T. L*., **Dadheech, N.***, Thompson, T. M., and Turner, A. J. (2024). FootNet: Development of a machine learning emulator of atmospheric transport. (*in review*; * Equally contributed authors)

Hamilton, S.D., Wu D., Johnson M.S., Turner A.J., Fischer M.L., **Dadheech N.**, and Jeong S. (2024). Estimating carbon dioxide emissions in two California cities using Bayesian inversion and satellite measurements, (*in review*).

Shukla, K., **Dadheech, N.**, Kumar, P., and Khare, M. (2021). Regression-based flexible models for photochemical air pollutants in the national capital territory of megacity Delhi. Chemosphere, 272, 129611.

Extracurricular Activities

Department Colloquium Committee Member May 2024 – Present

Graduate Student member

- Coordinating with professors and students in the department to invite external speakers for weekly colloquium.
- Leading collaboration efforts with students to host external speakers and ensure diversity among speakers.

Student Advisory Council Sept 2021 – Dec 2022

Graduate Student Advisor

- Elected student member of the council of the dean of the College of Environment at the University of Washington.
- Championed student perspectives on key issues and promoted an inclusive, interdisciplinary college community.

Hindi Theatre Aug 2015 - Present

Actor and Director

- Directed and performed in over 10 Hindi plays at both professional and competitive college levels.
- Mentored junior team members by organizing and leading theatre workshops, and directed stage productions.

Mentorship Sept 2021 - Aug 2022

Undergraduate student

- Simon Zhang, Conducting GHG flux inversion with iterative methods.

Skills

Computing: Python, C++, Data Structures and Algorithms, Computer Vision, Deep Learning, Machine Learning, Artificial Intelligence, PyTorch, Distributed Data Parallel, Jupyter Notebook, Parallel Computation, Remote Sensing