

# Kaushik Ravi

COMPUTATIONAL URBAN ECOLOGIST · CIVIC TECHNOLOGIST · RESEARCHER

Hosur, India

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## Research Interests

I develop and analyze systems at the intersection of urban ecology, computational analysis, and civic technology. My work involves developing scalable, data-driven systems to quantify the socio-ecological value of urban green infrastructure. My specific interests include: citizen-centric climate intelligence, participatory sensing for environmental monitoring, applying machine learning and photogrammetry for urban forestry, and designing sustainable mobility systems that integrate objective environmental metrics.

## Education

### National Institute of Technology, Tiruchirappalli (NIT Trichy)

Tiruchirappalli, India

BACHELOR OF TECHNOLOGY (B.TECH) IN CIVIL ENGINEERING, MINOR IN ENERGY & ENVIRONMENTAL ENGINEERING

Dec 2021 – May 2025

- **Cumulative GPA:** 9.5/10.0
- **Relevant Coursework:** Geodesy, Energy and Environmental Engineering, Environmental Management and Impact Assessment, Solid Waste Management Techniques, Conservation Geography, Forests and their Management, Hydrology and Irrigation Engineering, Transportation Planning, Bio-Energy Conversion, Solar Thermal Technology.

## Publications / Pre-Prints

### Citizen Centered Climate Intelligence: Operationalizing Open Tree Data for Urban Cooling and Eco-Routing in Indian Cities

RAVI, K., & BRÜCK, A. (2025), IN HACKYOURDISTRICT (FORTHCOMING BOOK CHAPTER, UNDER REVIEW)

### Urban Tree Density and Its Impact on Temperature and Oxygen Production: A Case Study of Berlin

RAVI, K., & BRÜCK, A. (2024), TECHNISCHE UNIVERSITÄT BERLIN. (VIEW PUBLICATION)

## Work Experience

### Inside Out (Independent Research Initiative)

Hosur, India

FOUNDER & PRINCIPAL INVESTIGATOR

Mar. 2025 - Present

#### Product 1: Pune Urban Tree Intelligence Dashboard

- Engineered a full-stack urban analytics platform to visualize and analyze a census of 1.79 million trees. The system quantifies city-wide carbon sequestration (288,772 tons) and localized cooling effects.
- Developed a novel ETL pipeline in Python (GeoPandas, Rasterio) to process 390 satellite-derived Land Surface Temperature (LST) images, creating new percentile-based metrics for cooling efficacy that are robust to data outliers.
- Pioneered a data-driven "Tree Archetype" classification system, identifying high-performance growth profiles with up to 13.9°C of cooling potential.
- Designed and implemented a prescriptive "Planting Advisor" in React (TypeScript, Turf.js) that simulates greening interventions, forecasting the thermal impact for a user-defined area.
- Solved a critical performance bottleneck by architecting a Vector Tile (MVT) pipeline, reducing initial map data load from 57MB to kilobytes to enable seamless, city-scale visualization of 1.79 million data points.

#### Product 2: TreeFolio - AI-Powered Dendrometry Tool

- Developed a full-stack web application (FastAPI, React) that employs Meta's Segment Anything Model (SAM) and photogrammetry to extract dendrometrics from a single smartphone photo.
- Engineered an end-to-end scientific pipeline integrating PlantNet API for species identification.
- Integrated with a Global Wood Density Database to estimate sequestered CO<sub>2</sub> using pantropical allometric equations, calculating 3,210.99 kg of CO<sub>2</sub>e for a sample tree.

#### Product 3: Pune Eco-Path Navigator

- Designed a dual-mode navigation system featuring an eco-friendly driving mode and an AI-powered wellness mode for pedestrians.
- Engineered the driving mode which integrates real-time traffic (TomTom API) with a custom Environmental Quality Score (EQS) to recommend routes that balance travel time, predicted emissions, and exposure to green infrastructure.
- Engineered the wellness mode which generates personalized, guided walking meditations by using Google's Gemini API to create a unique script based on the ecological themes of trees along an intelligently generated path.
- Developed a novel "Serenity Score" for road segments by synthesizing tree data, prioritizing experiential qualities like canopy cover and biodiversity for pedestrians, normalized using robust quantile transformation.

**LABOR K / K LAB, Technische Universität Berlin**  
SUMMER RESEARCH INTERN

*Berlin, Germany*  
Jun. 2024 - Aug. 2024

- Conducted a quantitative analysis of Berlin's urban forest (885,825 trees), calculating a mean temperature reduction of 1.48°C in high-density areas and estimating total oxygen production using species-specific allometric equations.
- Developed interactive data visualizations to communicate the ecological benefits of urban trees for heat mitigation and air quality improvement.
- Funded by the prestigious DAAD WISE Scholarship.

**MIT Senseable City Lab**  
SELECTED FOR EXCHANGE STUDENT POSITION

*Dubai, UAE*  
Selection for Jan 2025

- Selected for a competitive research position to work on deploying resilient tree species by integrating urban forestry with smart city solutions.

Research Translation & Civic Impact

**Reap Benefit**  
YOUTH BOARD MEMBER

*Bengaluru, India*  
Jan. 2025 – Present

- Serve as a voting member on the organization's strategic youth board, contributing to long-term planning and governance for a leading national civic-tech NGO.
- Provide a critical youth-centric perspective on organizational strategy, influencing the roadmap for product development, analytics, and fundraising initiatives.
- Collaborate directly with internal teams to ensure strategic goals are translated into actionable, on-the-ground projects for youth changemakers.

**The World Bank (Solutions for Youth Employment)**  
YOUTH ADVISOR, CLIMATE THEMATIC GROUP

*Remote*  
Nov. 2023 - Present

- Serve as one of 140 members of the Youth Advisory Group, providing feedback on global climate policies and assessing their stance on sustainability from a youth perspective.
- Collaborate with an international cohort to co-create strategies for impactful, youth-led climate engagement and local solutions to global challenges.

**Reap Benefit**  
TEAM LEADER & MENTOR, URBAN DATA ANALYSIS

*Remote*  
Apr. 2022 - Present

- In my concurrent operational role, I began my engagement via the selective Solve Ninja Leadership Accelerator, developing a POC that won the national Avery Dennison InvEnt Scholarship.
- Promoted to a leadership position to mentor cohorts of "Solve Ninjas" in applying rigorous, data-driven methods to solve hyperlocal civic and environmental problems.
- Guide student teams through the full project lifecycle, from survey design and spatial analysis to crafting evidence-based narratives for government advocacy.

Technical Skills

Programming Languages	Python, C++, TypeScript, JavaScript (React, Node.js), SQL
Data Science Libraries	NumPy, Pandas, Scikit-learn, Rasterio, Shapely, GeoPandas, Turf.js
Geospatial & Databases	Google Earth Engine (GEE), PostgreSQL / PostGIS, QGIS
AI & Machine Learning	PyTorch, Gemini API, Meta Segment Anything Model, Neural TTS (Piper), Supervised Learning (Regression)
Web Development	React, Vite, MapLibre GL JS, Chart.js, Tailwind CSS, Flask, FastAPI
DevOps & Tools	Docker, Vector Tiles (Tippecanoe), Git
Engineering Software	MATLAB, AutoCAD, SAP2000, ETABS

Honors & Awards

2024	<b>DAAD WISE (Working Internships in Science and Engineering) Scholarship</b> , German Academic Exchange Service, One of 150 scholars selected from a national pool of several thousand applicants to fund a research internship in Germany	<i>Germany</i>
2025	<b>Millennium Fellowship &amp; Campus Director</b> , UN Academic Impact & MCN, Selected as one of 4,000 fellows from a global pool of 52,000+ applicants for a leadership program advancing UN SDGs; appointed to lead the campus cohort	<i>Global &amp; Trichy, India</i>
2022	<b>Avery Dennison InvEnt Scholarship</b> , Avery Dennison Foundation, National-level award for innovation in combating climate change; one of 10 scholars selected from 500+ applicants across five premier national institutes	<i>India</i>
2025	<b>Ranga Class of 1974 Award</b> , National Institute of Technology, Tiruchirappalli, Awarded for academic excellence	<i>Trichy, India</i>
2023 & 2024	<b>Seetharaman Narayanan 1984 Trust Scholarship</b> , National Institute of Technology, Tiruchirappalli, Awarded consecutively for academic excellence	<i>Trichy, India</i>