Ananya Saha

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ACADEMIC DETAILS

Indian Institute of Technology (BHU) Varanasi
B.Tech and M.Tech in Civil Engineering (2022-2027)

- Major CGPA 8.22 out of 10.00
- Relevant courses: Traffic Engineering, Advanced Transportation Engineering, Urban Transport Systems Planning, Analysis of Transportation Systems, Modelling Analysis Simulation, Probability and Statistics

PROFESSIONAL SUMMARY

Aspiring researcher seeking to leverage my background in transportation engineering, spatial analysis, and data-driven research to address challenges in transit accessibility, urban mobility efficiency, and sustainable transportation systems. Passionate about translating complex data into insights for planning and policy.

SKILLS

Transportation & Geospatial Analysis: Transportation Planning, Accessibility Analysis, Freight Transportation, Urban Mobility, Network Analysis, GIS, Spatial Analysis, OpenStreetMap
Programming & Data: Python, R, MATLAB, SQL, NumPy, Pandas, GeoPandas, scikit-learn, Matplotlib
Quantitative Methods: Regression Analysis, Statistical Inference, Spatial Statistics & Econometrics, Clustering, Time-Series Analysis, Traffic State Estimation, Sensitivity and Robustness Analysis, Model Validation
Simulation & Software: PTV Vissim, SUMO, QGIS, JavaOpenStreetMap
Research Methods: Research Design, Literature Review, Methodology Development, Experimental Design, Reproducible Analysis, Scientific Writing, Data Visualization

PROJECTS & RESEARCH EXPERIENCE

- **Multimodal Freight Accessibility and the Limits of Spatial Targeting for Locational Disadvantage**
  Department of Civil Engineering, IIT (BHU) Varanasi (Mar 2026 – Jul 2026)
  Guide: Dr. Agnivesh Pani
  - Constructed a cross-city multimodal freight accessibility index for 123,591 manufacturing MSMEs in five Indian cities using externally anchored impedance functions.
  - Computed enterprise-to-terminal network distances via Dijkstra routing and tested robustness across a 625-combination sensitivity sweep.
  - Identified freight-deprivation zones via HDBSCAN clustering and tested their spatial targetability against null models.
  - Assessed whether freight disadvantage supports place-based or network-scale infrastructure investment; manuscript submitted to TRB Annual Meeting 2027.
- **Trajectory-Calibrated Microsimulation of Highway Work-Zone VMS Compliance under Mixed Traffic**
  IIT Hyderabad – Summer Research Internship (May 2026 – Jul 2026)
  Guide: Dr. Digvijay Pawar
  - Built a calibrated Vissim model of a National Highway work-zone lane closure under mixed-traffic conditions, capturing merging, speed adaptation, and lane-changing behaviour upstream of the taper.
  - Modelled Variable Message Sign (VMS) messaging across a range of driver-compliance rates and distances to quantify how advance information influences merge timing and work-zone throughput.
  - Evaluated operational performance through delay, queue length, and throughput metrics to assess VMS effectiveness as a low-cost traffic-management measure.
  - Developed a simulation framework for testing VMS and work-zone management strategies under heterogeneous traffic.

- **Work Patterns, Fatigue, and Safety Events among E-Hailing Drivers: A Cross-Sectional Study**
  University of Technology Malaysia (UTM) – Research Project (Jan 2026 – May 2026)
  Guide: Dr. Nordiana Mashros
  - Analysed survey data from 363 e-hailing drivers to examine how work patterns and demographics shape driver fatigue and safety-critical outcomes such as dozing at the wheel.
  - Applied hierarchical OLS, staged logistic and Poisson regression, and confirmatory factor analysis (CFA) to model fatigue severity and its behavioural determinants.
  - Identified part-time driving as a significant fatigue-severity factor (Cohen's d = 0.755) and elevated dozing risk among drivers aged 35–44 (OR = 3.531).
- **Traffic Signal Time Optimization of Heterogeneous Roundabout Intersection via VISSIM COM**
  Department of Civil Engineering, IIT (BHU) Varanasi (Aug 2025 – Jan 2026)
  Guide: Dr. Abhisek Mudgal
  - Analysed traffic flow characteristics at a highly congested heterogeneous roundabout intersection.
  - Implemented queue length based adaptive signal control optimisation strategies using VISSIM COM.
  - Evaluated improvements in average delay, queue length, and throughput under varying signal times based on max-pressure queue-length priority assignment vs. fixed signal timing
  - Assessed robustness under encroachment, off-peak hours, lane closure, and rainfall scenarios.
- **Development of a 1:14 Scaled Connected Autonomous Vehicle Testbed for Mixed Traffic Conditions**
  IIT Bombay – Summer Research Internship (May 2025 – Jul 2025)
  Guide: Dr. Archak Mittal
  - Designed a miniaturised 1:14 scale cyber-physical testbed (associated with RWTH Aachen Germany) to support heterogeneous non-lane following traffic observed on Indian roads.
  - Integrated open-source and licensed simulation tools (CARLA, Unreal Engine 5, TrueVision Designer, MATLAB RoadRunner, CommonRoad) to support autonomous vehicle prototyping.
  - Developed a cross-format pipeline for real-world map integration into CARLA; also calculated map geometries, turning radii, clearance, allowable speed, lane widths, and scaling parameters.
  - Validated map geometry and topology built in Lanelet2 via JOSM using ROS2 tools such as Rviz.
  - Developed a multi-agent simulation script in CARLA to spawn, control, and monitor vehicles with live top-down visual feedback for real-time scenario testing.
- **Pedestrian Crossing Behaviour Study at Mid-Block Sections**
  Department of Civil Engineering, IIT (BHU) Varanasi (Feb 2025 – May 2025)
  Guide: Dr. Abhisek Mudgal
  - Conducted an observational, data-driven study of pedestrian crossing behaviour at mid-block locations in mixed traffic environments with absent or minimal signal control.
  - Captured pedestrian movement data through manual observation and video recordings to study gap acceptance, delay, crossing speed, and conflict points with vehicles.
  - Categorised pedestrian behaviour by demographic and situational parameters (age group, vehicle density, group vs. solo crossing, visibility, etc.).
  - Applied statistical tools and behaviour modelling to evaluate how environmental and traffic factors influence decision-making and safety.
  - Identified unsafe crossing behaviours and infrastructure-related delays, and quantified pedestrian Level of Risk.
  - Findings intended to inform infrastructure design, traffic calming measures, and policy-level interventions for walkability and safety in urban environments.

RESEARCH INTERESTS

Multimodal accessibility, urban freight, last-mile logistics, spatial and network analysis, transport equity and safety, travel behaviour, demand modelling, network resilience and disruption recovery, large-scale mobility data analytics, transport policy and infrastructure planning.

ACHIEVEMENTS & LEADERSHIP

- Ranked in the top 5 percentile (among a million candidates) in JEE Advanced.
- Graduate researcher at SCULPT Lab (PI: Dr. Agnivesh Pani), IIT (BHU) Varanasi.
- Member of Students Parliament and Entrepreneurship Cell, IIT (BHU) Varanasi.
- Runner-up in Civil Conclave Case Study, IIT Roorkee '24