Neeraj Gudipati

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Education

Indian Institute of Information Technology **2013 – 2017**
Bachelor of Technology in Electronics & Communication Engineering GPA:8.39/10 *Guwahati, IN*

Harvard-MIT Health Science & Technology **2017 – 2019**
Pre-Doctoral Fellowship, Shafiee Lab & Fluid Interfaces, MIT Media Lab *Boston, USA*

Awards & Honors

- Selected as a Delegate for the **Harvard College Project for Asian and International Relations (HPAIR) 2025 Asia Conference at the University of Tokyo.** **-2025**
- **Network for Advanced Study of Technology Geopolitics (NAST) Fellowship, Takshashila Institution**, joining a cross-disciplinary cohort advancing research at the intersection of technology and policy. **-2025**
- Awarded scholarship to attend the **AIMI (Artificial Intelligence in Medical Imaging) Symposium, Stanford**, supporting global participation and inclusion of professionals from resource-limited settings. **-2025**
- **Clinical Researchers Meet, TATA IISc Medical School** Selected for international series on clinical medicine and biomedical research with leading US institutions. **-2025**
- 6 x Consecutive **Honor Roll Awardee** for Individual Research Excellence**Conduent Labs (2020 - 2025)**
- Recognized as Expert Contributor for the Stakeholder Consultation on AI RAM Engagement by **UNESCO - 2025**
- **Winner** of the Environmental Justice Challenge - **MIT Policy Hackathon** **-2021**
- **Conduent-Labs (formerly Xerox Research Centre)** selected for the Budding Scientist position **-2019**
- Awarded the **Best Hardware Hack** at **Hack Harvard** **-2018**
- **MIT Media Lab & LVPEI Innovation center**,selected for the Research Fellow position. **-2016**
- **Winner** of the **National Robotics Championship** - Indian Institute of Technology, Kharagpur **-2015**
- Selected for the **INSPIRE Fellowship**, Department of Science & Technology, Govt. of India **-2013**

Invited Tallks

UNESCO Stakeholder Consultation on AI Readiness Assessment Methodology (RAM), Recognized Expert Contributor for Global Stakeholder Consultation for the breakout Group - AI adoption for specific use cases, 2025

Agentic AI: Building Systems That Reason, Adapt, and Act, Gen AI ML Global Conclave, Bangalore, 21 June 2024

Adapting to Change: Is Gen-AI the New Paradigm in Computer Vision?, Generative AI Day, Bangalore, 2024

Automated "Human in Loop" Data Annotations & Harmonization of Heterogeneous Geo-AI Data, Geo-AI Roundtable, Open Geospatial Consortium, 2024

A Citizen-Owned Map of the World, Community-led Mapping and Data Cooperatives, eGov Foundation 2023

NASSCOM:Augmenting Remote Workplace Through AR & VR, Invited as a Panelist for the Tech-Talk Session, 2021

Socratus Foundation Urban Mobility Sensome, Invited to Talk on the Topic "The Crucible of the Future: Street", 2020

Social & Policy Entrepreneurship

Qen Labs © Inc. - *Spinout of MIT & QRCI* **Present**
Founding Member - CTO

- Spearheading academic, government, and startup collaborations to commercialize Geo-AI technologies licensed from MIT and QCRI, focusing on urban planning, agriculture, Mobility Planning, sustainability, and climate change resilience.
- Written 9 federal grant proposals for AI use cases related to sustainable development goals.
- Convened the industry-academia consortiums for the development of large academic grant proposals for the use of satellite imagery and GeoAI in agriculture that were submitted to NASA ($15 M), US Department of Agriculture ($52 M & $5 M), and Google's Impact Challenge ($5 M).
- Advisory Team– Geospatial Systems, NITI Aayog: Developing the vision, strategy, and implementation plan for the geospatial sector in India for the government's central planning body.

e-devi – *Studio & Think Tank for Heritage Conservation, Technology, and Policy* **Present**
Founding Member – CTO

- Spearheading immersive storytelling projects, including (1) revitalizing India's ancient **Mutts** and (2) reimagining the **Vijayanagar civilization** with AR/AI. Successfully delivered a flagship project for the **Raja Ravi Varma Heritage Foundation**.

- Driving the integration of ethical and accountable AI systems within immersive digital environments, ensuring cultural authenticity and safeguarding heritage in the face of technological disruption.
- Shaping **e-devi** as a dynamic hub operating at the intersection of technology, policy, and climate change, aligning immersive digital storytelling with environmental sustainability and governance priorities.
- Developed in-house computer vision and multimodal AI models, including semantic segmentation (Segment Anything Model) and portrait animation models, to create personalized and adaptive AR experiences that amplify the relevance of traditional wisdom for contemporary audiences.
- Built strategic collaborations with community organizations, cultural institutions, and policymakers to extend the role of immersive technologies in preserving local identities and contributing to climate resilience.
- Advocated for the integration of emerging technologies with a deep awareness of their distributional consequences, ensuring that the benefits of immersive and data-driven decision systems are accessible and equitable.

MITTI - *MIT Tata Center Initiative* **Present**

Founding Member

- Leading the Tech & Design Team to build machine learning-powered open and actionable soil- nutrient management platform that introduces a new, two-way paradigm for agricultural extension to support smallholder farmers.

FILOS - *Healthcare entity started at All India Institute of Medical Sciences* **Present**

Founding Member - CTO

- Building AI enabled tool-kits and Knowledge Systems to facilitate, Digital Health records for under-served communities and exchange of information in healthcare-systems (Funded by AIIMS Intramural Grant & UCL-AIIMS Partner Fund.)

Research Experience

Qen Labs **2021 - Present**

Founding Member and Chief Technology Officer (CTO) *Minnesota, USA (Remote)*

Collaborators: University of Minnesota, Great Plains Institute, World Bank, MIT, IIT Bombay, Planet Labs, UN AI for Good, ITU, NASA, DOE, DOT-US, QCRI, WGIC

- Designed and led HoodLab, a hyperlocal citizen-owned environmental data platform combining sparse sensor networks with spatio-temporal AI for urban air quality and heat island analysis; established a data cooperative model for collaborative urban sensing.
- Developed multimodal machine-assisted mapping systems for safer streets using computer vision, micro-mobility behavior mining, and road safety perception modeling, enabling infrastructure improvement prioritization.
- Pioneered Offline Reinforcement Learning models for citywide traffic management, achieving up to 30% traffic flow improvements and real-time energy-efficient signal optimization.
- Co-created a modular framework for Red-Teaming and Evaluation of GeoAI Foundation Models to assess explainability, geographic bias, and robustness, generating new metrics and benchmarks.
- Led MITTI-Land Vulnerability Index (LVI) research, using multi-year Landsat imagery and GeoAI to inform sustainable cropping options and soil health strategies for farmers.
- Built GeoAI-based PV-SMaRT modeling systems for stormwater runoff risk assessment in solar developments, promoting informed siting and resilience planning for expanding U.S. solar capacity.
- Developed Knowledge-Guided Machine Learning (KGML) pipelines for modeling carbon stock dynamics in oil crops supporting Sustainable Aviation Fuel (SAF) production, bridging data and agroecosystem models.
- Automated Ground Control Point (GCP) generation for Arctic airborne imagery using advanced photogrammetry techniques, improving terrain modeling in GNSS-constrained environments.
- Designed a community-driven science communication platform for GeoAI and geosciences to enhance transparency, reproducibility, and diversity in scientific publishing.
- Built machine-assisted infrastructure detection models using high-resolution satellite imagery in partnership with the World Bank, enhancing rural road network mapping for underserved regions.

Conduent Labs (formerly Xerox Research Centre) **2019 - Present**

Senior Research Engineer *Bangalore, IN*

Traffic Pattern Recognition & Analysis System for Urban Innovation - *RoadSide Innovation Team*

- Led the design and deployment of the **TPRA System**, an AI-driven visual sensing and analytics platform for optimizing traffic management, enhancing pedestrian safety, and informing equitable public space planning in large cities.
- Developed advanced computer vision modules for real-time detection of pedestrian and vehicle flows, near-miss incidents, and curbside activity, enabling dynamic traffic signal optimization and risk forecasting.
- Integrated multi-source sensor data (video, IoT, environmental) and reinforcement learning to deliver actionable insights for city planners and transportation agencies.
- Collaborated with stakeholders to deliver measurable improvements in traffic flow, emissions reduction, curbside management, accessibility, and urban cleanliness.
- Filed patent applications for novel methods in urban sensing, immersive analytics, and adaptive mobility management.

Curb-Space Innovation, *Dr.Cazhaow's & Eduardo Cardenas Parking Innovation Group*

- Formulated & developed a traveling officer problem for Parking Enforcement to increase productivity, social justice & reduce predatory enforcement. Used Genetic Algorithms, Ant Colony Optimization & Spatio-temporal clustering.
- Developed a Patent-pending System to Enable Immersive Navigation for Enforcement Routing using Geo-spatial Augmented reality & Cartographic Systems to capture violations & intuitively visualize Curb Regulations in AR.
- Developed a Patent-pending System to Enable Geo-spatial Surveys using Augmented Reality and multi-source sensor integration to support accurate map-matching for constructing digital twins.
- Offline Reinforcement Learning Models to reward adherence to rule based curb utilization. Counterfactual Causal analysis on parking violations & Traffic congestion data.

Urban Information Systems - Trip Planner Platform, *Dr.Audrey Pouzin, Mobility Analytics Group*

- Designed an automated framework for Multi-source heterogeneous spatio-temporal mobility data based on a referencing layer to include categorical matching using a recursive map matching algorithm. Used K-D trees & Markov Models.
- Engineered a Platform for urban intelligence to harness historical data-sets and add to that the dynamics of real-time streams, seamlessly integrated with data mining algorithms using Kafka & Spark frameworks.
- Employed analytical tools to understand the Mobility patterns in conjunction with other spatial data in a city using K-means, Dynamic Time warping, spatio-temporal variograms, Probabilistic tools like Bayes & Markov Models.
- Solution for the Re-balancing Problem in bike sharing systems using Linear & Mixed integer programming & Multi Criteria Decision Making tools like Multi-MOORA.
- Time Series Predictive modelling for trip planning system using multi-variate prophet, Periodic LSTM with weather & event -aware Gating Mechanism, spatio-temporal graph convolution networks.

Cross City Learning & Knowledge Systems, *Dr.Saikat Saha's ML and Statistics Group*

- Representational Learning: Generating embeddings for spatial regions using mobility, crime & Other demographic data.
- Developed & experimented with Methods & Frameworks to Transfer the knowledge from the data-rich cities to data-scarce ones using Instance, feature & model based transfer-learning techniques, and dynamic spatial similarity and periodic temporal shifts using network analysis techniques.

Computer Vision Group - Urban Sensing, *Dr.Cazhaow & Dr.Armon Rahgozar's group*

- Designed a Patent Pending ensemble system to boost the performance of large-scale small-object licence plate re-identification in urban settings using representational learning and decision tree.
- Human in loop machine learning for knowledge transfer of Licence Plate manual reviews using light-weight, few-shot metric learning techniques using Image embeddings from pre-trained LPR signature recognition models.
- Developed Federated- edge frameworks for Urban sensing and interactions.
- Image Quality assessment probability Distribution using NIMA , Earth Mover's Distance & Optimal Transport.

Fluid Interfaces Group, MIT Media Lab, *Mentor: Mina Khan, PhD Student* **2018 - 2019**
Collaborator *Cambridge, MA*

- Developed accelerated food recognition & detection models(with Mobile-net, tiny-yolo & active-learning) for PAL- a context-aware wearable system to help users with real-time and personalized nutrition nudge for behavioral change.
- Built custom electronics using magnetic dust and MEMS for tracking facial muscle activity like chewing, smiling, etc.
- Fabricated Epidermal electrodes immobilized with Glucose oxidase for the detection of Glucose using micro-fabrication techniques and transfer printing.

Shafiee Lab, Harvard Medical School, *Mentors: Dr.Hadi Shafiee & Dr.Mohamed Draz* **2017 - 2019**
Research Assistant *Cambridge, MA*

- Developed Smartphone-based point-of-care systems for ovulation testing, measuring sperm viability,DNA fragmentation, Neutrophil counting using mobile Microscopy attachments & Light-weight machine learning for pathology like U-Net, W-Net, Segmentation & spectral transformers.
- Trained CNN's to identify and qualitatively analyze the structural morphology of cells. Optimized the models to deal with class imbalance using class-sensitive training and sampling.

ABB Corporate Research Center, *Mentors: Dr.Anitha Varghese, IoT & Automation Group* **2016**
Research Intern *Bangalore, IN*

- Prototyped a novel, bi-directional Augmented reality user interface for connected things in Electrical Power plants built on a decentralized networking infrastructure & Bluetooth protocols.

Publications

Ankit Sharma, Madhur Gupta, Mohd Junaid, Anuj Nandwana, **Gudipati Neeraj**, Lokendra Chauhan, MapYog: Intelligent Spatiotemporal Data Explorer, **UrbanAI '24: Proceedings of the 2nd ACM SIGSPATIAL International Workshop on Advances in Urban-AI**, 2024

Vaishnavi P,Preethi K,Hemanth k, Prudhvi T, Manoj K, K Sai Pavan, **Gudipati Neeraj**, et.al An inexpensive smartphone-based device for point-of-care ovulation testing, **Lab on a Chip**, Cover Highlighted, 2018

Irene D, Charles L., Manoj Kumar, Prudhvi T, Vinish Y, **Neeraj Gudipati** et.al. Automated smartphone-based system for measuring sperm viability, DNA fragmentation, and hyaluronic binding assay score. **PlOS One**, 2019

Patents

Neeraj Gudipati, Vinuta G, Cazhaow Q, Multi-Layer ensemble booster system for automatic license plate recognition, U.S. Patent, 2021

Snigdha P, Suchismita N, Nupur L **Neeraj Gudipati** et.al, System and interaction method to enable immersive navigation for enforcement routing, U.S. Patent, 2020

Neeraj Gudipati, Nikhilesh C, Arun K, Saikat S, Cazhaow Q,Geo-Spatial Digital twin system using Interactive Survey tool for multi-source data integration & validation, U.S. Patent, 2023 (Under Review)

Harshit Agarwal, **Neeraj Gudipati**, Rishabh S et.al, Framework for real-time decision making accounting for inter-dependence between functionally correlated edge nodes, U.S. Patent, 2022, (Under Review)

Neeraj Gudipati, Arun K, Saikat S, Cazhaow Q, Systems and Methods for Integrating multi-source heterogeneous mobility data for Improved decisions in Trip Planning Systems, U.S. Patent, 2022 (Under Review)

Other Projects

Equitable Smart Grid Financing & Outreach | *MIT Policy Hackathon Winners for Environmental Justice Track* **2021**

- Applied Clustering Techniques like DBSCAN and HDBSCAN to help Identify the Underserved, Low Income, Climate vulnerable Communities using multi-source data to roll out the policies.
- Agent-based model to Simulate resiliency for installing renewable energy storage in under-served communities.
- Recommended a comprehensive behavioural nudge strategy to build trust and secure a buy-in of households by Aligning GB and Utility Partners and Orienting outreach as an educational intervention rather than an advertising effort.

Soil Nutrient Management Platform | *Dr.Chintan Vaishnav, MIT Tata Center* **Ongoing**

- Studying the factors using causal analysis methods for quantifying the effects of agricultural practices in reducing nutrient loss from agricultural fields and developing an RL framework by using counter-factual reasoning.

Organized Health Records for underserved communities | *Dr.Vikas, AIIMS, New Delhi* **Ongoing**

- AI based tool-kits to extract structured data from printed matter in patient Health Records
- Knowldge Graph Database and Similarity Indexing for Translating paper based records to EHR, and On-boarding under-served communities to digital health systems.

TUVIS Social-Impact Storytelling | *India Foundation of Arts Grant* **2020**

- Tuvi's Core Creative AI Experimentation is a Mobile Centric journey which revolves around Scripto-Visual Storytelling with Visual semantic reasoning, Open AI's GPT Computer vision to depict the Digital Divide in Developing nations.
- Co-creative story-telling, with collaborators from Design, Art, Technology, Policy, local artisan's & educators.

COVID - Medical Resource Control Rooms | *collaborators from MIT, Stanford University & IITB* **2020**

- Toolkits to understand, anticipate, and act to support and ramp up health systems capacity to effectively care for a rapidly growing number of active COVID-19 patients in need of hospitalization & ICU care.
- Data collection, spatial analysis, visualizations, and scenario-planning tools aimed at informing resource planning & deployment, decision making to support healthcare providers in rural and Urban contexts.

COVID & Mental Health | *Dr.Anita Rao, MIT Open Documentary Lab* **2020**

- Data backed Citizen Science Narrative for mental health literacy and the chain reaction of COVID & Mental Health.
- Comparing the search relevance of mental health before and after COVID-19, Analyzing other demographic factors such as race, income, and political affiliation which might affect the search relevance of mental health.
- Regression analysis to understand social-determinant variable's which affect the Mental Health of the community.

MagneTalk | *Best Hardware Hack, Hack Harvard* **2018**

- Developed proof of concept wearable device for silent speech in Healthcare units.
- Speech articulators by facial movements are captured by the Magnetalk system using small mini magnets/ magnetic dust hooked through feature selection on muscular areas of interest, LSTM Model to classify/map the signals to vowels.

Low Cost Mobile-Corneal Topographer | *Bachelour's Thesis, IIIT Guwahati-LVPEI, Dr.Rusha Patra* **2017**

- Designed a Head Mounted cardboard-headset with eye tracking system to reflect & capture cornea reflected patterns.
- Algorithms for surface reconstruction to generate the Corneal topography Maps of the patients from the low quality images captured, helping in early keratoconus detection & astigmatism.

Relevant Coursework

- Data Structures
- Signals & Systems
- Algorithms Analysis
- Digital Signal Processing
- Control Systems
- Digital Control Systems
- Machine Learning
- Computer Architecture

Technical Skills

Languages:C, C++, Python, ARM Assembly, Verilog, C , JAVA, PostgreSQL, shell, lua, MATLAB
Frameworks: : PyTorch, TensorFlow, sklearn, Numpy, Docker, Git, Android, Latex, open-cv, sci-kit, OpenVino
Interfacing libraries/softwares: Labview, Unity-3D, Xilinx Vivado,D3.js, HSPICE, HFSS ANSYS, Solidworks
Hardware: Circuit design, PCB Design, Micro soldering, AutoCAD, 3D Printing, Rapid Prototyping, Laser Cutter
Microfabrication : Processes: Photomask Layout & write, spin coating, Photolithography, sputtering, Wet etching
Wet-lab: Electron Microscopy (Fix, Embed, Stain, Section), Pipette weight, Sterilize

Activities & Volunteer Experience

Billion Social Masks: A Platform for Translating N-95-Like Masks for the People by the People committed to making safe, certified, high-quality N95+ face masks for the public at an affordable price, while enhancing their livelihoods of many Self Help Groups (SHGs). Coordinated & Networked to manage collaborations & activities..

Socratus Foundation: Participated in the collective wisdom discussions for a flourishing society in the areas of food systems, urban systems livelihoods & envisioning Green-New Deal for India. Newsletter Editor for the Socratus Greenup Edition.

Impact Vision: Connect volunteers with social impact organizations across the globe according to areas of interest.

MIT India Conference 2018: Volunteered to curate the content, invite speakers, and coordinate with the Chairs.

AI For Good - ITU Challenge: Volunteering to Network, Collaborate & Curate AI For Good Challenges across ecosystems.