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*

Awards & Honors

- **Honor Roll Award** for Outstanding Performance as an Individual Research Contributor at **Conduent Labs** -2021
- **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

Social & Policy Entrepreneurship

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

Conduent Labs (formerly Xerox Research Centre) **2019 - Present**
Senior Research Engineer *Bangalore, IN*

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

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, (Under Review)

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, 2021 (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, 2021 (Under Review)

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 (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, 2019, (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.

Invited Tallks

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

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.