

Raman Kumar

ramank.1137@gmail.com | [ramank1137.github.io](https://github.com/ramank1137)

ABOUT

I am a Research Associate at IIT Delhi, working with [Prof. Aaditeshwar Seth](#) on applying machine learning to geospatial datasets. Previously, I collaborated with [Prof. Prem Kalra](#) on computer vision applications for medical datasets.

EDUCATION

IIT Delhi, India

B.Tech, Computer Science and Engineering (2014)

PUBLICATIONS

1. **R. Kumar**, R. R. Dhanakshirur, R. Singh, C. Arora, P. Kalra, A. Suri, *A deep learning approach for objective evaluation of microscopic neuro-drilling craniotomy skills*, under review in journal Computers in Biology and Medicine
2. **R. Kumar**, ... A. Seth, *Multi-resolution satellite data processing for contextually relevant Land use Land Cover*, manuscript in preparation
3. C. Bansal, ... **R. Kumar** ... A. Seth, *Practical Methodologies for Regionally Accurate and Relevant Land Use and Land Cover Classification Using Landsat and Sentinel Data*, manuscript in preparation

RESEARCH PROJECTS

Multi-resolution satellite data analysis for contextually relevant LULC (Current)

- Developed a novel methodology using entropy measures and Hough transforms to improve computer vision based delineation of scrublands and field boundaries
- Built an efficient pipeline capable of processing up to 2,200 square kilometers at 1.19-meter resolution within three hours using a single NVIDIA RTX A5500 GPU
- This pipeline is being extensively used by [Core-Stack](#), [GramVaani](#) and [Well Labs](#)
- Currently authoring a **first-author** manuscript

Unsupervised classification of Cropping intensity in India (Current)

- Collaborated with an on-ground NGO to collect validation data from Raichur and Anantapur districts, designing a systematic sampling strategy for validation
- Worked on an unsupervised learning methodology to cluster annual harmonized time series data from Landsat and Sentinel satellites into distinct groups
- Based on the analysis re-mapped the clusters to better represent cropping intensity

Forecasting Forest Fire using Climate variables and Human variables (Current)

- Worked on classifying small and large forest fires using Landsat dataset
- Created dataset of forest fires clusters over the past 9 years on 6 eastern states of India using our fire predictions model

- Modeled forest fire forecasting using climate forecast variables using CFSV2: NCEP Climate Forecast System Version 2
- Currently in the process to adding human variables like human settlements and infrastructure development

Automatic assessment of microscopic neuro-drilling craniotomy skills (Finished in Apr '24)

- Curated a dataset of 435 annotated images in collaboration with neurosurgeons, ensuring label reliability
- Surpassed human accuracy on transformer- and CNN-based architectures by applying applying geometric constraints to align embeddings, along with homographic correction
- Integrated the best performing model with surgical microscopes in [NETS lab](#) at AIIMS
- **First-author** paper under review at the journal *Computer in Biology and Medicine*.
- This project was a part of **NeuroMentor** which received [Prix Galien India](#) award 2024

Surgical Tool tracking (Finished in Jan '24)

To address the lack of open-source library to synchronize video frames with 6D tool position using Polaris (an optical navigation system used for tool tracking in neuro-surgery)

- Developed a gstreamer pipeline to capture rgb frames and timestamps from RTP packets
- Build a codebase to capture 6D tool position and project it on rgb frames by computing 2D projection of 6D tool position, using camera parameters

INDUSTRY EXPERIENCE

Euler Systems Inc., Mumbai, IN
Tech Lead

July '18 – Apr '22

Complaint Classification System: (Gojek)

- Designed and implemented an end-to-end system to classify customer complaints into 100+ categories, aiding customer service representatives in resolving issues more efficiently
- Developed an ML pipeline inspired from a paper titled [COTA](#) which uses a pointwise ranking algorithm resulting in higher accuracy compared to a standard multi-class classifier.
- Designed and Implemented a [distributed architecture](#) consisting of a training cluster and inference cluster, and a ten stage data pipeline to preprocess incoming data, train, and deploy the model across API serving containers.
- Serialized distributed ML model using mLeap to deploy on lightweight API servers, achieving millisecond response time.

Data Plan Optimization: (Kore Wireless)

- Developed a product that predicts optimal data plans to decrease data overage and cost for an American SIM card provider
- Developed an heuristic based dynamic bin packing algorithm to find optimal plan
- Saved \$600K per year with optimal predictions

Doctor Recommendation System: (Dhani)

- Lead a team to build recommendation system which recommends doctors based on patient's history
- Developed a software to allocate doctors in real-time for video calling from a pool of doctors
- Reduced the waiting time for patients from 65 secs to 12 secs with efficient allocation

Backend Development: (Nykaa)

- Implemented e-commerce search, product recommendations and price and inventory management system for Nykaa
- Migrated Nykaa's monolith architecture to microservice architecture

Ikarus, Gurgaon, IN

Nov '16 – Jul '18

Software Engineer

Robotic Process Automation(RPA):

- Worked on Named-entity Recognition(NER) to extract entities like items, prices from unstructured text documents
- Developed an algorithm to detect tables in scanned documents by identifying lines using Hough Transforms
- Worked on auto orientation correction of scanned documents to increase OCR accuracy
- Implemented scalable and distributed data pipeline on pyspark to process millions of documents in batches

TECHNICAL SKILLS

Languages	Python, Java, C#, C/C++, scala
Libraries	PyTorch, Keras, mxnet, Scikit-Learn, Numpy, Pandas, NLTK, matplotlib, spacy, OpenCV
GIS	Google Earth Engine, GDAL, QGIS, Rasterio
Frameworks and Tools	Pyspark, Git, Docker, AWS Lambda, AWS EC2, Elastic Search, mLeap, redis, bash

HOBBIES

Drumming, hiking and reading fiction