



# PANKAJ KUMAR

📍 Kharagpur, India 721302    📞 7061255826  
✉️ pankaj.kmr1990@gmail.com

## PROFESSIONAL SUMMARY

A passionate researcher with strong analytical skills and 5+ years of experience using a suite of statistical, machine learning and physical modeling techniques to solve challenging problems. Involved in Python open source software development and enthusiastic about explainable artificial intelligence. Adaptive team player with proven written and oral communication skills, time management and planning traits.

## EDUCATION

- Ph.D. | Atmospheric Science** 02/2022  
**IIT Kharagpur, Kharagpur, West Bengal, India**
- Master of Technology | Earth System Science And Technology** 2017  
**IIT Kharagpur, Kharagpur, West Bengal, India**
- Bachelor of Engineering | Mechanical Engineering** 2012  
**Birla Institute of Technology Mesra, Ranchi, Jharkhand, India**

## RESEARCH EXPERIENCE

### RESEARCH SCHOLAR 07/2017 to CURRENT

#### ATMOS LAB, IIT KHARAGPUR | KHARAGPUR, INDIA

- Developed an open source bias correction library in python for time series data of rainfall, ozone and related trace gases which includes correction techniques like **quantile mapping** and scaled distribution mapping.
- Developed an open source python library (named **pyvortex**) and analyzed Polar vortex based stratospheric ozone for detection of **ozone hole** saturation using ground-based and satellite based measurements in Antarctica. This work featured on a number of **national media portals**.
- Developed an open source python library called **HyTraj** for **air pollution source detection** based on **airmass trajectories** and clustered them using **wavelet transform based K-Means clustering** for transportation pathways analysis. This work was covered by a number of **national and international media portals**.
- Investigated Land Use Land Cover (LULC) change over North-East India using **Google Earth Engine** and **Random forest** based classification.
- Performed **Self-organizing map (SOM)** based clustering of more than 25 years of tropospheric ozone time series for Antarctic region. Their long-term trend and potential causes were analyzed using **DLM** and **MLR**.
- Developed a **seq2seq variational AutoEncoder** based on **LSTM** for learning the representation of airmass trajectories.
- Conducted **Causal Effect Network (CEN)** analysis of tropospheric ozone in

Antarctica using **Pearl causality framework** for determining the geophysical drivers responsible for observed variability.

➤ Developing a **causal discovery and inference framework** based on **Granger causality** for time series data using **attention based temporal CNN**.

## RESEARCH ASSISTANT

07/2015 to 05/2017

### ATMOS LAB, IIT KHARAGPUR | KHARAGPUR, INDIA

➤ Compared **long term time series** of total column ozone from various ground based instruments with satellite based observations in Antarctic region.

➤ Estimated rainfall using preliminary data from **Doppler Weather radar** in Kolkata region using **wradlib** radar data analysis package in python.

➤ Investigated freezing of water droplet and subsequent transformation of its shape numerically using **MATLAB**.

## SKILLS

- **Programming:** Python, MATLAB, JavaScript, Fortran, HTML/CSS, Git, Markdown, LaTeX, Linux
- **Statistical Learning:** Bayesian Data Analysis and Parameter Estimation, Regression, Classification and Clustering, Time series and Trajectory modeling, Machine learning, and Causal Inference.
- **Physical Modeling Skills:** HySPLIT, WRF, GEOS-Chem
- **Analytics Tools:** Statistical Learning: statsmodels, scikit-learn, Keras, PyTorch, Mathematical optimization: scipy, RADAR Data Analysis: wradlib, Geospatial Data Analysis: gdal, rasterio, xarray, geopandas, Google Earth Engine, QGIS, Parallel Programming: dask, joblib
- **Data visualization:** Matplotlib, seaborn, Folium, D3.js, Three.js

## ACCOMPLISHMENTS

- Received full funding for attending European Geosciences Union (EGU) General Assembly held in Vienna, Austria during April 2017.
- Our research works featured in a number of national and international media including **The Hindu**.

## CERTIFICATIONS

- Python for Statistical Analysis
- Introduction to Databases and SQL Querying
- PyTorch for Deep Learning and Computer Vision
- Amazing AI: Reverse Image Search
- Causal Data Science with Directed Acyclic Graphs

## LANGUAGES

**Hindi:** Native language

**English:**

C1

**German:**

A1

Advanced

Beginner

## LINKS

- <https://pankajkarman.github.io/>
- <http://www.github.com/pankajkarman>