

# Pankaj Kumar

Python ★ Git ★ Machine Learning ★ Physical Modeling

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## EDUCATION

- Present **Doctor of Philosophy, Atmospheric Chemistry and Physics, Indian Institute of Technology Kharagpur (IN).**
- 2017 **Master of Technology, Earth System Science and Technology, Indian Institute of Technology Kharagpur (IN),** GPA: 9.19/10.
- 2012 **Bachelor of Engineering, Mechanical Engineering, Birla Institute of Technology, Mesra (IN),** GPA: 7.59/10.

## RESEARCH EXPERIENCE

- 2017 - Present **Research Scholar, PhD, ATMOS Lab, IIT Kharagpur.**
- Implemented bias-correction of long-term records of rainfall, ozone and related trace gases using various techniques like quantile mapping and scaled distribution mapping in python.
  - Developed Receptor models for pollutant source detection based on air-mass trajectories in python.
  - Implemented clustering of air-parcel trajectories wavelet features for transportation pathways analysis.
  - Performed Self-organising map based clustering of tropospheric ozone profiles and their trend analysis using Bayesian dynamic linear model and multivariate linear regression.
  - Conducted causal analysis of tropospheric ozone to identify the geophysical drivers of observed variability.
  - Investigated Land Use Land Cover change over North-East India using Google Earth Engine and Random forest based classification.
  - Developed a sequence-to-sequence autoencoder to extract features from variable length trajectories.
  - Simulated global atmospheric chemistry using GEOS-Chem at Pratyush, India's fastest supercomputer.
- 2016 - 2017 **Research Assistant, MTech, ATMOS Lab, IIT Kharagpur.**
- Estimated rainfall using preliminary Doppler Weather radar data for Kolkata region using python.
  - Investigated freezing and shape transformation of water droplet numerically using MATLAB.
- 2011 - 2012 **Undergraduate project, BE, BIT Mesra.**
- Performed optimization of Wind Turbine Blades using Fluent in Ansys.
  - Investigated natural convection in Bingham fluids with differentially heated sidewalls using Fluent.

## TECHNICAL SKILLS

- Data Analytics:** Bayesian inference, Machine Learning, Causal analysis
- Physical Modeling:** HYSPLIT, RRTMG, WRF, GEOS-Chem, climlab
- Programming:** Python, JavaScript, MATLAB, Fortran, Bash, Git
- Markup Languages:**  $\text{\LaTeX}$ , Markdown, HTML/CSS

## PUBLICATIONS

- Pankaj Kumar, Jayanarayanan Kuttippurath, Peter von der Gathen, Irina Petropavlovskikh, Bryan Johnson, Audra McClure-Begley, Paolo Cristofanelli, Paolo Bonasoni, Maria Elena Barlasina, and Ricardo Sánchez, *The increasing surface and tropospheric ozone in Antarctica and their possible drivers*, Environmental Science & Technology, 2021, accepted.
- J. Kuttippurath, P. Kumar, P. J. Nair, P C Pandey, *Emergence of ozone recovery evidenced by reduction in the occurrence of Antarctic ozone loss saturation*, npj Climate and Atmospheric Science, 2018.
- J. Kuttippurath, P. Kumar, P. J. Nair, A. Chakraborty, *Accuracy of satellite total column ozone measurements in polar vortex conditions: Comparison with ground-based observations in 1979–2013*, Remote Sensing of Environment, 2018.

## AWARDS

- Received full funding for attending European Geosciences Union (EGU) General Assembly held in Vienna, Austria during April 2017.