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 airmass trajectories in python.
- Implemented clustering of air-parcel trajectories using 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**: 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.