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 Mean-shift clustering of HYSPLIT air-parcel trajectories with features extracted using wavelet transform for transportation pathways analysis.
- Performed Self-organising map based clustering of tropospheric ozone and their trend analysis using Bayesian Dynamic linear model and Multivariate linear regression.
- Conducted Causal network analysis of tropospheric ozone to identify geophysical drivers responsible for 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 and analysed 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

- J. Kuttippurath, A. R. Ravishankara, P. Newmann, **P. Kumar**, S. Raj, M. Chipperfiled W. Feng, F. Lefevre, L. Froidevaux, M. L. Santee, G. S Gopikrishnan, P. von Gathen, M. Weber, L. E. Flynn, J. Davies, and H. Fast, *A myth-busting ozone hole in the Arctic,* in preparation.

- J. Kuttippurath, S. Raj, **P. Kumar** and K. Abbhishek, *The ozone hole observed at the Indian station Maitri in Antarctica,* Polar Science, submitted.
- **P. Kumar**, J. Kuttippurath, P. von der Gathen, I. Petropavlovskikh, B. Johnson, Audra McClure-Begley, P. Cristofanelli, P. Bonasoni, M. E. Barlasina, and R. Sánchez, *Climate impact of tropospheric ozone trends in Antarctica,* Environmental Science and Technology, in revision.
- 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.