Dwaipayan Chatterjee

Solving challenges in dynamics and predictability at the interface of meteorology, mathematics, and computer science

Time lapse

2010-12
U.P Sainik School, Lucknow, India
76.4%

2014-18
B.Tech. in Energy engineering
Central university of Jharkhand
8.8 CGPA

2018-20
M.Tech in Atmospheric – Oceanic Science and technology
IIT, Delhi 8.91 CGPA

Nov 2020- Sep 2024
Ph.D. in Meteorology
University of Cologne
Magna Cum Laude

Work experience

Institute for Meteorology and Climate Research, KIT December 2024 to present ● Karlsruhe

- **Atmospheric – Machine Learning Scientist**
  - ✓ Building deep learning architectures suitable to exploit multi-scale Earth system observations
- **Scientific Coordinator for Machine Learning Course at ECMWF** September 2025 to December 2026
  - ✓ Detailed ML course design and concept development, expert selection
  - ✓ Content preparation and scientific quality control
  - ✓ Panel and podcast concept development and moderation

European Centre for Medium Range Weather Forecast January to April 2023 ● Online

- **Technical moderator in Machine Learning for Weather and Climate (MOOC)**
  - ✓ Involved in responding to technical questions from participants directly on topics related to machine learning, weather and climate
  - ✓ Debugging their coding problems & fostering a community by simulating discussions

Tensor Dynamics July 2020 to Oct 2020 ● New Delhi

- **Energy forecaster (solar)**
  - ✓ Involved in developing models for solar energy forecasting by using Satellite INSAT 3D and 3DR cloud images
  - ✓ Developing machine learning regression models for power forecasting
  - ✓ Developing automated guided user interface python codes for product development

Education

Institute of Geophysics and Meteorology, UoCologne November 2020 to Sep 2024 ● Cologne

- **Doctoral work on characterizing cloud systems using self-supervised deep learning**
  - ✓ Involved in developing self-supervised deep learning architectures for spatiotemporal investigation of cloud systems
  - ✓ Developing contents related to AI applications in Earth system science for e-learning platform
  - ✓ Associated with Helmholtz Data Science School for Life, Earth and Energy

Indian Institute of Technology Delhi June 2018 to June 2020 ● New Delhi

- **Masters of Technology**
  - ✓ M.Tech in Atmospheric-Oceanic Science and Technology (CGPA – 8.91/10)
  - ✓ M.Tech thesis - Estimation of the oceanic wave energy potential along the Indian coastal waters
  - ✓ Outcome –thesis selected from the centre for ocean society of India, PG dissertation award

Central University of Jharkhand June 2014 to May 2018 ● Ranchi

- **Bachelors of Technology**
  - ✓ B.Tech in Energy engineering (CGPA – 8.88/10)
  - ✓ All India rank 184 in graduate aptitude test in engineering, 2018

Journal publications:

- **Chatterjee, D.**, Acquistapace, C., Deneke, H., & Crewell, S. (2023). Understanding Cloud Systems' Structure and Organization Using a Machine's Self-Learning Approach. Artificial Intelligence for the Earth Systems, 2(4), e220096. https://doi.org/10.1175/AIES-D-22-0096.1
- **Chatterjee, D.**, Schnitt, S., Bigalke, P., Acquistapace, C., & Crewell, S. (2024). Capturing the diversity of mesoscale trade wind cumuli using complementary approaches from self-supervised deep learning. Geophysical Research Letters , https://doi.org/10.1029/2024GL108889
- Crewell, S., Driemel, A., Phillips, J. M., & **Chatterjee, D.** (2024). Computational Geometry of Earth System Analysis (Dagstuhl Seminar 23342). *Dagstuhl Reports*, *13*(8), 91-105. Schloss Dagstuhl – Leibniz-Zentrum für Informatik. https://doi.org/10.4230/DagRep.13.8.91
- Minghze, L.,**Chatterjee, D.**, Glassmeier, F., Senf, F., & Wang, B., (2025). Tracking Low-Level Cloud Systems with Topology. IEEE Workshop on Topological Data Analysis and Visualization (TopoInVis), Vienna, Austria, 2025, pp. 89-99, doi: 10.1109/TopoInVis68599.2025.00013.
- Acquistapace, C., Schnitt, S., Krause, S., Risse, N., Lange, D., **Chatterjee, D.**, (2025). Characterization of precipitation life cycle in the trades across different regimes of shallow convection. Quarterly Journal of the Royal Meteorological Society. https://doi.org/10.1002/qj.70038

Under review:

- **Chatterjee, D.**, Raabe N., & Crewell, S. (2025). Four Low-Level Cloud Regimes Revealed by Latent Space Analysis and Their Impact on Solar Energy Variability, Journal of Machine Learning: Earth (Revised submitted)
- Netz, L., **Chatterjee, D.**, Remy, R., Fiolleau, T., Acquistapache, C., A Conditional GAN for Generating GEO-like Radar-Informed Convective Fields from Geostationary Multispectral Infrared Data. (to be submitted to AIES, in preparation)
- **Chatterjee, D.**, Raabe, N., Knippertz, P., Crewell, S., Dueben, P., Vanniere B., A New Concept for Comparing Satellite Observations and km-Scale Atmospheric Simulations using Self-Supervised Machine Learning. (to be submitted to JAMES, in preparation)
- **Chatterjee, D.**, Raabe, N., Knippertz, P., Crewell, S., Dueben, P., Vanniere B., Diagnosing Cloud Evolution Biases in km-Scale Models Using Latent-Space Dynamics. (to be submitted to AIES, in preparation)

Selected funding:

- Scientific coordination and curriculum design for the training program on the use of machine learning in the Destination Earth initiative. Destination Earth initiative on training material and activities in scope of the use of machine learning (ITT Ref: DE_392), approx €128,000

Community service:

- Associate Editor: Journal of Meteorological Applications, Royal Meteorological Society
- Reviewer: Artificial Intelligence for Earth System, Machine Learning: Earth, Environmental Research: Climate
- Organizing workshop on From Equations to Emulators: Learning Chaos with AI; Student Meteorology Conference 2026
- Organizing Hackathon on machine learning for the earth-system as part of workshop on Workshop on Machine Learning for Earth System Modeling 2026 (Link for 2025)

Conferences:

- **Chatterjee D**., Raabe N., Knippertz P., Crewell S., Dueben P., Vanniere B.,: A New Concept for Comparing Satellite Observations and km-Scale Atmospheric Simulations using Self-Supervised Machine Learning (Invited talk by the WeatherGenerator modeling team)
- **Chatterjee D**., Raabe N., Knippertz P., Crewell S., Dueben P., Vanniere B.,: A New Concept for Comparing Satellite Observations and km-Scale Atmospheric Simulations using Self-Supervised Machine Learning (Invited talk at ECMWF)

- **Chatterjee D.**, Raabe N., Knippertz P., Crewell S., Dueben P.: Evaluating Km Scale ICON and IFS Simulations in the High Dimensional Observational Latent Space, AlgoEarth Kick-off, 2025
- **Chatterjee D.**: Small Data, Big Stakes: Unlocking the Full Potential of Deep Learning with Self-Supervision, (Invited talk and tutorial)
- Netz L., **Chatterjee D.**, Fiolleau T., Acquistapace C., Roca R.: Deep Convective Core Detection Using Conditional Generative Adversarial Networks Trained on Collocated Geostationary Multi-Spectral Observations and Precipitation Radar Data from GPM Satellite, Eumetsat 2025
- Acquistapace C., Corradini D., Bigalke P., Cattani E., **Chatterjee D.**, Denby L.: Self-supervised deep-learning of cloud spatio-temporal features to improve understanding of processes and evolutions of cloud organizations, Eumetsat 2025
- Ebell K., Risse N., **Chatterjee D.**, Walbröl A., Maturilli M., Bauer S., Crewell S., Mech M.: Long-term Analysis of Vertically Resolved Cloud Observations at Ny-Ålesund (Svalbard) from Self-supervised Deep Learning, AMS Conference on Polar Meteorology and Oceanography.
- **Chatterjee D.**, Deneke H., Crewell S.: Capturing boundary layer cloud variability using regularized self-supervision for short-term solar energy applications, EUMETSAT Conference
- **Chatterjee D.**, Schnitt S., Bigalke P., Acquistapace C., Crewell S.: Investigating cloud organizations using complementary approaches in self-supervision and geostationary satellite observations, EUMETSAT Conference
- **Chatterjee D.**, Schnitt S., Bigalke P., Acquistapace C., Crewell S.: Capturing the diversity of trade wind cumuli using complementary approaches from self-supervision, 3rd Workshop on Cloud Organization and Precipitation
- **Chatterjee D.**, Schnitt S., Bigalke P., Acquistapace C., Crewell S.: Investigating mesoscale cloud organizations from geostationary satellite observations and Eurec4A measurements using complementary approaches from self-supervision, EGU 2023
- **Chatterjee D.**, Schnitt, S., P. Bigalke, Acquistapace C., Crewell S.: Representation learning of mesoscale cloud systems using energy-based deep neural networks, ECMWF Machine Learning Workshop 2022

Supervised Master thesis:

- Lucas Imbsweiler (2025). Towards Reconstructing Atmospheric 3D State Through Innovative ML-Approaches. Master thesis in Karlsruhe Institute of Technology
- Jan Kremer (2025). Evaluating African convective systems from Km Scale ICON and IFS Simulations in the High Dimensional Observational Latent Space. Master thesis in Karlsruhe Institute of Technology
- Amit Sextus (2025). Data-driven mid-latitude precipitation forecasting. Master thesis in Karlsruhe Institute of Technology
- Louis Netz (2025). Deep Convective Core (DCC) Detection Using Conditional Generative Adversarial Networks (CGAN) Trained on Collocated Geostationary multi-spectral Observations and Spaceborne Radar Data, PhD work at CNRS, France.
- Becker, Björn (2022). Spectral clustering for self-supervised learning of cloud patterns, Master thesis in Universität zu Köln
- Zaun, Sebastian (2022). Graph-Based Clustering of Cloud Images, Master thesis in Universität zu Köln

Science communications:

- Delivered thirteen AI-Earth science lectures focused on remote sensing of clouds: https://kiste.webflow.io/courses/ai-for-cloud-classification
- In YouTube:
  AI and convection: over land: link: 1 , 2 , 3 , 4 , 5 , 6 , 7 over ocean: link: 1 , 2 , 3 , 4 , 5 , 6

Coding repository:

- https://github.com/DC95
- https://doi.org/10.5281/zenodo.8352614
- https://doi.org/10.5281/zenodo.7437949