Daniel **Boateng (Dr. rer. nat.)**

Climate Risk Expert · Climate Data Scientist|Engineer · NatCat Modelling Analyst · Parametric Index-based Reinsurance

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Summary

Parametric Reinsurance & Climate Risk Specialist | Geospatial Solutions Expert Results-driven climate & weather data scientist and engineer with over 5 years of experience in geospatial data-driven analytics. I have contributed to developing and underwriting parametric and index-based reinsurance solutions and to satellite-based emissions monitoring. Proven expertise in NatCat modelling, climate risk assessment, and parametric product development, leveraging deep knowledge of the (re)insurance value chain to design scalable, client-focused solutions. Adept at using machine learning, spatial data engineering, satellite and meteorological data processing, and time series analysis to price and innovate climate-linked insurance products.

Skilled in Python, R, SQL/NoSQL, and cloud platforms (AWS, Azure, GCP) with a passion for building robust tools that drive automation and analytics at scale. Successfully led the deployment of a cloud-based parametric pricing platform and worked cross-functionally with technical and commercial teams to deliver impactful solutions. An exceptional communicator and collaborator, capable of translating complex datasets into actionable insights for clients and stakeholders.

Skills

Languages (Programming): Python (Keras/TensorFlow/PyTorch, Sklearn, Numpy, Pandas, Statsmodel, Scipy, Xarray, Seaborn/Mathplotlib, Flask/FlaskAPI, Cartopy, Plotly, etc), C, Fortran, JavaScript, R, MATLAB

Database: SQL, PostSQL, NoSQL, MangoDB, SparkSQL, BigQuery, AWS S3

Tools: Git, Terraform, PySpark, Docker, Airflow, Kafka, Tableau, Mage, GitHub Actions, Datalog, Kibana, etc

Cloud: AWS, GCP, Oracle, Azure

Frameworks and Methods: Machine learning (Deep Learning (ConvLSTM, Computer Vision (NLP)), Classification (SVG, Random Forest, Logistic, Naive Bayes), Regression (LassoCV, MLP, XGBoost, Stacking, AdaBoost), Data transformation (EOF, PCA), Data Wrangling and Visualization, Statistical Models (ARIMA, Causal Inference, A/B testing, Distribution fitting, Stochastic simulation)

NatCat Models: CLIMADA, Verisk, KatRisk, Touchstone Re

Languages: English (professional | C1), German (conversational | B1)

Work Experience

Hannover Re

Hannover, Germany

Data scientist (Parametric & Index-based pricing and structuring) *Feb. 2025 - present*

- Performs natural catastrophe modeling for main and side perils (Tropical Cyclone, Earthquakes, Flood, Winter Storms, Hail, etc) to price and validate reinsurance programs (proportional and non-proportional treaties of up to $20 million capacity)
- Performs spatial data analytics for pricing of parametric and index-based insurance solutions for many lines of business (e.g., agriculture, energy, climate finance, business interruption).
- Developing spatial data infrastructure on AWS to automate data modeling pipeline for climate related reinsurance products
- Probabilistic adjustment of stochastic event sets from NatCat models using historical losses and exposure information gathered in-house
- Database management of stochastic events catalogs and various global climate and weather datasets from public APIs (e.g., ECMWF and NOAA)
- Parametric products structuring and development for multi-perils for coverage in Agriculture, Nat Cat events (P&C), Business interruption, protection gaps programs
- Support under-writing decision making on weather and Nat Cat perils: contract wording reviews, pricing validation, market insights, climate change projection impacts

University of Tübingen

Tübingen, Germany

Research Data scientist

April. 2021 - present

- Performed numerical modeling with complex climate models on HPCs to generate petabytes of climate data using tools like cdo, ECHAM5-wiso, MPI-ESM, NCL, Bash scripting, etc.
- Developed pyESD, a Python package for ML-based downscaling of climate model output to high resolution using sklearn, TensorFlow, xarray, pandas, PyPi, SciPy, etc.
- Created pyClimat, a Python package for automating spatial big data analysis pipelines with dask-array, xarray, cartopy, sklearn, numpy, etc.
- Designed spatial data analysis pipelines used by over 500 scientists, ensuring reproducibility of research results.
- Post-processed climate datasets: CMIP6, PMIP4, DWD weather stations data, ERA5, CRU, CHIRPS
- Developed a full-stack application for flight temperature calibration on Raspberry Pi, deployed on drones for temperature sensors.

Equitech Futures, Chicago, USA

Remote

Data Scientist and Engineer

July. 2023 - March. 2024

- Contributed to a platform estimating atmospheric CO_2 emissions for countries and regions using NASA satellite XCO_2 measurements.
- Processed extensive spatial satellite datasets of global carbon emissions since 1979.
- Managed Google Cloud Platform and data engineering using Terraform, BigQuery, pySpark, MongoDB, Cloud Run, and Docker.
- Engineered platform using matplotlib, pandas, xarray, dask, plotly, Cloud Run, Streamlit, and more.

Education

University of Tübingen

Tübingen, Germany

Doctor of Science in Computational Geosciences (Climate Change Modelling, Climate Dynamics & Extremes and Machine Learning)

April. 2021 - May. 2024

- Spatial Data Analytics (Big Data), Software Development, (Paleo)Climate Modelling, Statistical Modelling, Climate Change Projection

University of Tübingen

Tübingen, Germany

M.Sc. in Applied and Environmental Geoscience (First Class)

Oct. 2018 - Feb. 2021

- Hydroclimatology, Environmental Modelling, Atmospheric Physics, Advanced Geophysics, Machine Learning

Kwame Nkrumah University of Science and Technology

Kumasi, Ghana

B.Sc. in Geological Engineering (First Class)

Oct. 2013 - June 2017

- Hydrogeology, Geophysics, Geotechnical Engineering, Rock Mechanics, Computer Programming

Projects

Machine learning-based framework for downscaling climate change information

Github

PyESD | **Documentation**]

- An open-source framework for statistical downscaling of climate change information (e.g., precipitation, temperature, wind speed) using re-analysis products like ERA5 as predictors. The package encompasses all downscaling cycles, including data preprocessing, predictor selection, construction (e.g., using transformers like PCA, EOF), model selection, training, validation, evaluation, and future prediction.

Python Package for Climate Data Analysis and Visualization

Github

PyClimat | **Code**]

- An open-source framework for climate data analysis and visualization. Statistical analyses include correlation, A/B testing, causality testing, Principal Component Analysis, Empirical Orthogonal Analysis, and Z-score. Spatial data visualization features include Cartopy, time series animation, and interactive maps.

Collection of Machine Learning Projects from Beginner to Advanced Level

Github

Data Science Projects | **Code**

- Absenteeism prediction, RNN (LSTM) for Google stock price prediction, AudioBooks target ads prediction, etc

Certifications

2024	**SQL for Data Science**, UC Davis (Cousera)	*Certificate*
2024	**Certificate of Excellence in Computational Tools for Climate Science**, Climatematch Academy	*Certificate*
2024	**Python for Everyone Specialisation (5 courses)**, University of Michigan (Coursera)	*Certificate*
2024	**Google Advanced Data Analytics Professional Certificate (7 courses)**, Google (Coursera)	*Certificate*
2023	**Machine Learning in Weather & Climate**, ECMWF	*Certificate*
2023	**Full Stack Software Engineering**, ALX Africa	*Certificate*
2023	**Complete Data Science Bootcamp**, Udemy	*Certificate*
2021	**From Machine Learning to Deep Learning: a concise introduction**, High-Performance Computing Center Stuttgart (HLRS)	*Certificate*
2021	**The Theory of Deep Learning-Deep Neural Networks**, Udemy	*Certificate*

Publications

2025	**Boateng, D. et al:**, Refining paleoelevation estimates of the European Alps by simulating Middle Miocene climate and δ18O responses to diachronous surface uplift scenarios. Global and Planetary Change, 2025	*Paper*
2024	**Boateng, D. et al:**, West African Monsoon Dynamics and Its Control on the Stable Oxygen Isotopic Composition of Precipitation in the Late Cenozoic. JGR Atmospheres, 2024	*Paper*
2023	**Boateng, D. and Mutz, S. G.:**, An open-source Python framework for empirical-statistical downscaling of climate information, Geoscientific Model Development (GMD), 2023	*Paper*
2023	**Boateng, D. et al:**, The effects of diachronous surface uplift of the European Alps on regional climate and the oxygen isotopic composition of precipitation, Earth System Dynamics (ESD), 2023	*Paper*
2022	**Botsyun, S., et al (incl Boateng, D.):**, Middle Miocene climate and stable oxygen isotopes in Europe based on numerical modeling, Paleoceanography and Paleoclimatology (JGR) 2022	*Paper*