A Barbara Metzler, PhD

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Research interests

Applied ML Scientist with 7+ years of experience in ML and bridging cutting-edge deep learning research and production, including unsupervised, self-supervised, and foundation models. Guided by a passion for building explainable AI, I specialize in integrating diverse unstructured data — from satellite imagery to text — into robust workflows. With a PhD in Applied AI from Imperial College London, I thrive on creative problem-solving, rapid prototyping, and continuous learning to deliver equitable, sustainable solutions from concept to deployment.

Education and Qualifications

2019 – 2023 **PhD** Applied AI — Imperial College London, UK

- Thesis: Characterizing large-scale urban environments in Sub-Saharan Africa with high-resolution Earth Observation (EO) imagery and unsupervised deep learning.
- Built scalable ML pipelines (Python, PyTorch) for geospatial data ingestion, model development, and inference.
- Published novel methods in STOTEN journal demonstrating end-to-end deployment of unsupervised models on large EO dataset.
- Collaborated with global stakeholders (Pathways to Equitable Healthy Cities) to deliver actionable policy recommendations derived from EO insights.

2018 – 2019 **MSc** Health Data Analytics and Machine Learning (first class honours) — Imperial College London, UK

- Thesis: Applied deep learning-based object detection to StreetView imagery, integrating multi-source datasets into predictive ML workflows.
- Gained advanced proficiency in ML theory, large-scale data analytics, and model evaluation for real-world health applications.

2014 – 2017 **BASc** Physics (First class honours) — University College London, UK

- Focused on environmental physics research and minor in English Literature, honing both quantitative and communication skills.

Work Experience and Academic Appointments

2023 – March 2025 **Research Associate** Science of Cities and Regions — Alan Turing Institute, London, UK

- Led end-to-end development of large-scale geospatial foundation models, scaling PB-level Sentinel-2 data with HPC and distributed systems.
- Deployed transformer-based approaches for air pollution and housing price prediction, optimizing both inference time and model performance.
- Built a geo-aware LLM-based interface to enable natural-language policy queries within an interactive tool, allowing users to explore and analyse policy impacts in real time.
- Designed ML workflows for Demoland and EuroFab, integrating advanced data engineering, feature extraction, and model training pipelines.
- Partnered with interdisciplinary teams and external stakeholders (OECD, Geospatial Commission), translating technical outputs into actionable insights, culminating in a gov.uk report.

2020 – 2023 **General Teaching Assistant** — Imperial College London, UK

- Instructed MSc courses on Machine Learning and Population Health Analytics, focusing on scalable model training, MLOps strategies, and deployment best practices.
- Created teaching material on ML methods and computer vision techniques.

2019 **Data Science Study Group** Alan Turing Institute & WWF London, UK

- Developed NLP pipelines for large-scale environmental threat detection from unstructured text.
- Documented an end-to-end ML architecture in a project report, integrating data ingestion, feature engineering, and model deployment.

2018 – 2019 **Imperial College Data Science Society Elite Team** Imperial College London, UK

- Used transformer-based models (BERT) for sentiment analysis in FinTech and personalization use cases, balancing model accuracy with computational efficiency.

2017 – 2018 **Research Data Analyst** indoo.rs (Esri), Vienna, Austria

- Contributed to a fast-paced start-up environment, iterating rapidly on indoor positioning products and collaborating with cross-functional teams.
- Implemented SLAM and trajectory analytics on large-scale indoor data, combining clustering with network-based recommendations.
- Published paper on geometric constraint modelling, showcasing robust and scalable solutions for location-based services.

Key skills

Programming Languages:

- **Python (9+ years):** Advanced, leveraging ML/AI libraries (NumPy, SciPy, PyTorch, TensorFlow, JAX), geospatial (GeoPandas, rasterio, GDAL, xarray etc.), and parallel computing and high-performance computing (Dask/HPC).
- **R, C++:** Intermediate; **SQL:** Intermediate; **HTML/CSS:** Intermediate; **JavaScript:** Basic

Additional Proficiencies:

- **Cloud Platforms:** Experienced with AWS and GCP for end-to-end ML workflows, including scalable compute, storage, and deployment.
- **Communication:** Skilled at translating complex ML research into clear insights, presenting to diverse audiences (policy: i.e. at OECD, UN (World Urban Forum), academic conferences: i.e. CVPR23, AAG23).
- **Data Analysis:** Proficient in advanced analytics (pandas, NumPy, SciPy) and feature engineering, ensuring robust, data-driven outcomes.
- **Production & Scalability:** Adept at HPC clusters, distributed computing, container-based deployments (Docker), and CI/CD pipelines.
- **Best Practices:** Familiar with code quality tooling and version control (Git, GitHub).
- **Operating Systems:** Comfortable working in Linux, Windows, and macOS environments.
- **Languages:** German (Native), English (Fluent, C2), French (Advanced, B1), Mandarin (Conversational)

Selected Publications & Honours

- A.B. Metzler et al. (2024) *Is a (satellite) image worth a thousand data points?* (In Review)
- A.B. Metzler, R. Nathvani, W. Bai et al. (2024) *High-resolution satellite imagery reveals urban phenotypes in Sub-Saharan Africa* (In Review)
- A.B. Metzler et al. (2023) *Phenotyping urban built/natural environments with unsupervised deep learning*, Science of the Total Environment
- R. Nathvani, A.B. Metzler et al. (2022) *Characterising urban environments via street images and deep learning*, Nature Scientific Reports

Awards: President's PhD Scholarship (Imperial College London), Best MSc Dissertation (Imperial College London), FEMtech Scholarship (Austrian Research Council), Participation scholarships (Computer Vision for EO, GISRUK, Forum Alpbach)