

Adebanji Oluwatimileyin Adelowo

Scientific Machine Learning · Mathematical Engineering · Probabilistic Modelling

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RESEARCH PROFILE

Machine Learning practitioner with an M.Sc. in Mathematical Engineering and a B.Sc. in Mathematics (Honours). Research background in mathematical modelling, numerical methods, optimization, PDEs, and scientific computing, complemented by professional experience developing machine-learning and signal-processing systems for engineering applications.

EDUCATION

- 2018 – 2021 **M.Sc. Mathematical Engineering** (Final grade: 106/110)
University of L'Aquila, Italy
Thesis: Bounds on Mixing of Passive Scalars Advected by Incompressible Energy- and Enstrophy-Constrained Flows and Anomalous Dissipation
Relevant coursework: Advanced Optimization; Machine Learning; Dynamical Systems and Bifurcation Theory; Scientific Computing; Functional Analysis; Partial Differential Equations; Fluid Dynamics; Numerical Methods for PDEs; Galerkin / Finite-Element Methods
- 2014 – 2018 **B.Sc. Mathematics** (Honours, CGPA 4.57/5.0)
Obafemi Awolowo University, Ile-Ife, Nigeria
Thesis: Application of Galerkin Finite Element Method to the One-Dimensional Stefan Problem
Relevant coursework: Real Analysis; Complex Analysis; Topology; Measure Theory; Numerical Analysis; Ordinary Differential Equations; Probability and Statistics

RESEARCH EXPERIENCE

- 2020 – 2021 **M.Sc. Thesis Research** | University of L'Aquila, Italy
Research on mathematical bounds and numerical computation for passive-scalar mixing in constrained incompressible flows.
- Studied the Iyer–Kiselev–Xu lower bounds on the mix norm for passive scalars in incompressible, energy- and enstrophy-constrained flows
 - Studied the Lin–Thiffeault–Doering optimal-stirring framework under energy and enstrophy constraints
 - Simulated optimal stirring with a [pseudo-spectral Python solver](#) and compared fitted mixing rates with the Iyer–Kiselev–Xu scaling
 - Combined mathematical analysis, numerical algorithms, and computational experiments
- 2017 – 2018 **B.Sc. Thesis Research** | Obafemi Awolowo University, Nigeria
Research on numerical methods for a two-phase free-boundary problem.
- Applied Galerkin finite-element methods to the one-dimensional Stefan problem
 - Formulated the weak problem and developed computational algorithms for phase-boundary tracking
 - Studied numerical approaches to a physically motivated PDE problem

PROFESSIONAL EXPERIENCE

Dec 2024 – Dec 2026	Data Scientist <i>Intuos Srl</i> , L'Aquila, Italy - Developed aircraft flight-phase classifiers from operational telemetry; F1 score of 0.98 on an evaluation set. - Developed FFT-based audio signal-processing pipelines to analyze aircraft-engine recordings in the frequency domain, identify dominant frequency components, estimate engine RPM, and infer engine operating state across 1,500 telemetry/audio samples; validated RPM estimates against ground-truth measurements, achieving $R^2 = 0.80$. - Built automated flight-telemetry workflows with a reported 30% processing-speed improvement and 80% less manual data preparation. - Delivered REST APIs and a full-stack dashboard exposing model predictions and engineering metrics; over 200 users.
Apr 2023 – Nov 2024	Machine Learning Engineer <i>N-and Italia Srl</i> , Italy - Developed delivery-failure prediction models using over 5 million transaction records from approximately 150 vending machines, with reported F1 of 0.85. - Analyzed transactional and telemetry patterns to investigate vending-machine reliability and operational failure drivers. - Built ETL and KPI-monitoring workflows with reported 85% faster reporting and monitoring coverage of over 1 million transaction records.
Jan 2023 – Mar 2023	Operational Data Analyst <i>eResult Srl</i> , Cesena, Italy - Optimized SQL queries, reporting 45% faster execution, and automated recurring business-intelligence workflows. - Transformed operational data into reproducible KPI reports, with a reported 75% reduction in reporting effort. - Built automated, customized customer relationship management (CRM) platforms using SQL and Omniaplace, its integrated software development platform, tailoring workflows and features for operational performance, efficiency, and versatility.
Apr 2022 – Oct 2022	Digital Engineering Intern <i>Bridgestone EMIA</i> , Rome, Italy - Developed computational-geometry algorithms and improved data structures for tire cross-section simulation and finite-element meshing, with a reported 20% computational speed improvement. - Implemented a closest-point utility for cubic Bézier curves to support geometry projection and meshing operations.
May 2022 – Aug 2022	Machine Learning Intern <i>Fellowship.AI</i> , Remote Integrated an InsetGAN-based whole-body image-generation pipeline (StyleGAN-Human with InsetGAN joint optimization) and built FastAPI inference serving for a Swift iOS application; reported evaluation on 500 generated samples and 2.3-second inference latency.

SELECTED RESEARCH & COMPUTATIONAL PROJECTS

Finite-Element Solver for 2D Incompressible Flow: Schäfer–Turek Cylinder Benchmarks

- Implemented Taylor–Hood finite-element methods for two-dimensional incompressible Navier–Stokes flow past a cylinder, with manufactured-solution convergence checks.
- Compared the steady 2D-1 and periodic 2D-2 regimes with published benchmark quantities; including drag, lift and flow dynamics.

Optimal Mixing of Passive Scalars: M.Sc. Thesis and Numerical Convergence Study

- Studied energy- and enstrophy-constrained optimal stirring and implemented the Lin–Thiffeault–Doering greedy strategy with a pseudo-spectral solver.
- Extended the numerical resolution study to $N = 512$; identified changes in fitting windows as a major explanation of apparent resolution dependence.

Photoacoustic Reconstruction: Model-Based vs. Learned Inversion

- Built a synthetic sparse-view acoustic inversion pipeline comparing time reversal, Tikhonov regularisation and learned U-Net refinement.
- Across 400 held-out images and five network seeds, learned refinement improved PSNR over calibrated time reversal by 4.9 dB (16 sensors) and 3.2 dB (64 sensors).

Ensemble Kalman Filtering for the Chaotic Lorenz-96 System

- Implemented ensemble Kalman filtering with cyclic localisation and inflation for partially observed Lorenz-96 dynamics.

- Cross-checked the assimilation implementation against a linear-Gaussian Kalman-filter reference and evaluated localisation, inflation and ensemble-size effects.

ROM, Hyper-Reduction and Neural Operators for Viscous Burgers’ Equation

- Compared a pseudo-spectral reference solver with POD–Galerkin reduced-order modelling, DEIM hyper-reduction, an MLP and a Fourier Neural Operator.
- The POD-ROM reached 0.152% relative L^2 error on the in-distribution benchmark, while the FNO reached 0.90%.
- Distinguished basis projection error, reduced-dynamics stability, hyper-reduction efficiency and learned-operator generalisation.

GENERATIVE AI & RETRIEVAL PROJECTS

Multimodal Visual RAG: Evaluated OCR-text, dense and visual retrieval over 1,360 textbook pages and 215 queries. Text hybrid nDCG@10 was 0.689; adding ColSmol reached 0.695. Grounded generation improved with OCR evidence, evaluating grounded answer generation.

Legal Research RAG: Compared BM25, dense and hybrid case-law retrieval over 2,000 queries. BM25 nDCG@10 was 0.176 versus 0.186 for score fusion; legal-domain dense retrieval improved over its general-purpose parent in a Kaggle T4 experiment, in a Kaggle T4 experiment.

Research & Innovation Monitor: Evaluated scholarly and patent retrieval on SciFact, SCIDOCS, LitSearch and DAPFAM; fusion nDCG@10 was 0.7598, 0.2104, 0.5324 and 0.2433 respectively. Completed a validated Kaggle T4 evaluation stage.

TECHNICAL SKILLS

Programming: Python | MATLAB | L^AT_EX
Machine Learning: PyTorch | scikit-learn | classification | predictive modelling | deep learning | generative modelling
Scientific Computing: NumPy | SciPy | numerical optimization | finite-element methods | pseudo-spectral methods | PDE solvers
Mathematics: Mathematical modelling | optimization | numerical analysis | PDEs | dynamical systems | variational methods | probability | statistics
Signal & Data Processing: FFT / spectral analysis | telemetry processing | statistical analysis | SQL | Apache Spark | Databricks
Software & Infrastructure: FastAPI | REST APIs | Git/GitHub | Kubernetes | MLflow | AWS | Terraform

TEACHING AND ACADEMIC LEADERSHIP

2016 – 2018	Founder & President, Inter-University Mathematics Club Nigeria • Established a cross-university mathematics mentorship network • Organised seminars on mathematics, research, and research careers
2015 – 2018	Academic Director / Peer Tutor, NAMSS Obafemi Awolowo University • Coordinated academic workshops • Tutored undergraduate students in mathematical analysis and mathematical reasoning

HONOURS AND SCHOLARSHIPS

University of L’Aquila International Scholarship University of L’Aquila	2018 – 2021
Professor S.S. Okoya Prize Excellence in Applied Mathematics	2018
MTN Foundation Scholarship Merit-based undergraduate scholarship	2014 – 2018
PTDF Scholarship Petroleum Technology Development Fund, Nigeria	2014 – 2018
Murli T. Chellaram Foundation Scholarship Academic Excellence Award	2014 – 2018

LANGUAGES

English: C1 | Italian: A2