Yusuf Brima

Biomedical AI Researcher

Date of Birth: 13.11.1992 | Place of Birth: Jaiama Nimikoro, Sierra Leone

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Research Profile

I am a Biomedical AI Early-Career Researcher with experience in medical image analysis, multimodal clinical AI, explainable AI, and robust representation learning. My work focuses on building clinically meaningful machine learning systems for imaging and structured health data, with attention to generalization, interpretability, and clinical translation.

Research Interests: My research interests include: Medical Image Analysis; Multimodal Clinical AI; Trustworthy and Explainable AI; Robustness and Generalization; Representation Learning; Clinical Decision Support; Low-resource Health AI.

Technical Skills

ML/DL: PyTorch, TensorFlow/Keras, scikit-learn, transformers, multimodal learning
Programming: Python, R, C/C++
Systems: Linux; Windows, High Performance Computing with SLURM (HPC), Grid Computing with Oracle Sun Gride Engine, Docker, GCP, GPU Computing
Data and Scientific Computing: SQL, NumPy, Pandas, Matplotlib, Seaborn
Neuroimaging Data and Tools: BIDS, FSL, FreeSurfer
Medical Imaging: OpenCV, SimpleITK, NiBabel, Pydicom, ANTsPy, scikit-image
Explainable, Fair, and Trustworthy AI: SHAP, Captum, Fairlearn, AIF360, LIME, TorchCAM, iNNvestigate

Soft Skills

Organization and project management; Communication; Independent working and self-responsibility; Solution-oriented problem solving; Flexibility and adaptability; Teamwork and collaboration

Languages

English (Bilingual Proficiency); German (Good); French (Elementary)

Professional Experience

Co-Founder & Biomedical AI Researcher Dec 2024 – Present
Research collaboration with Rhodes University (South Africa) and international academic partners

- Conduct research in multimodal representation learning for clinical data, focusing on early diagnosis, and prognosis with emphasis on robustness, explainability, fairness, and generalization.
- Contribute to collaborative research projects in biomedical AI using multi-institutional healthcare datasets spanning Africa, Asia, South America and Europe.
- Co-supervise 3 students (2 PhDs and 1 BSc) on projects in medical imaging and clinical AI, including transformer-based 3D medical image analysis and explainable/fair AI for low-resource healthcare settings.
- Contribute to scientific writing and dissemination of research outputs, including peer-reviewed manuscripts and preprints in biomedical AI.
- Co-created and lead an interdisciplinary research consortium comprising 33 members across 21 institutions focused on AI applications in neglected tropical diseases (NTDs).
- Coordinate research work packages, project milestones, and collaborative activities across the afore-

mentioned consortium members.

Research Associate (PhD Researcher) Nov 2021 – Dec 2024
University of Osnabrück, Osnabrück, Germany

- Conducted research in deep representation learning for artificial intelligence, with a focus on self-supervised learning methods including contrastive, generative, and joint-embedding approaches.
- Developed joint-embedding, contrastive, and generative models for disentangled representation learning, including methods such as Barlow Twins, variational autoencoders (VAEs), and supervised contrastive learning.
- Improved data processing efficiency by at least 20% and increased model performance by at least 25% across target machine learning tasks.
- Curated and maintained the SynSpeech dataset and managed associated open-source research codebases and accessibility.
- Presented research at international conferences and doctoral consortia, including NeurIPS (2023), German Conference on Artificial Intelligence (KI) Doctoral Consortium (2023), and ICLR (2024).
- Supervised and mentored Master's students in machine learning and deep learning research projects.

Research and Teaching Assistant Feb 2017 – Jul 2018 (part-time)
University of Makeni, Makeni, Sierra Leone

- Taught four undergraduate Computer Science courses with approximately 40 students per course.
- Designed and developed course materials, assignments, and examination assessments.
- Mentored and supervised student thesis.

Lecturer Jan 2018 – Jul 2018 (part-time)
Limkokwing University of Creative Technology, Freetown, Sierra Leone

- Taught Principles of Programming Logic and Design to more than 120 undergraduate students per semester.
- Delivered lectures, prepared teaching materials, and supported student assessment and academic evaluation.
- Facilitated practical programming exercises and supported students in foundational software development concepts.

Education

Ph.D. in Cognitive Science Nov 2021 – Nov 2025
Osnabrück University, Germany
Research focus: Deep Neural Representation Learning
Advisors: Prof. Günther Heidemann, Prof. Simone Pika
Funded by: DFG Research Training Group (RTG) in Computational Cognition

M.Sc. in Mathematical Sciences Sept 2020 – Jul 2021
African Institute for Mathematical Sciences (AIMS), Rwanda
Thesis focus: Deep Transfer Learning for Chest X-ray Image Analysis
Supervisor: Prof. Marcellin Atemkeng
Award: AIMS / Mastercard Foundation Scholarship

M.Sc. in Computer Science & Engineering Jul 2018 – Aug 2020
University of Dhaka, Bangladesh
Thesis focus: Deep Learning for Brain Tumor Detection using real-world T1-weighted brain MRI data in collaboration with Radiologists and Neuroscientists from the National Institute of Neuroscience, Bangladesh
Supervisor: Prof. Mosaddek Hossain Kamal
Award: Queen Elizabeth Commonwealth Scholarship

B.Sc. in Computer Science Sept 2012 – Feb 2017
University of Makeni, Sierra Leone
Award: Undergraduate Merit Scholarship

Selected Publications

First-authored publications

- *Brima Y. The Case for Multimodal Causal Representation Learning in Clinical Artificial Intelligence.* Perspective Under revision at *Nature Machine Intelligence.*
- *Brima Y*, Atemkeng M. *Explainable Multimodal Hybrid CNN–Transformer Models for Alzheimer's Disease Diagnosis.* Submitted to *npj Digital Medicine.*
- Brima Y, Atemkeng M, Kallon LH, Niyukuri D, Vacavant A, Saidu S, Chen D-G. *Few-shot Learning with Cross-country Generalization of Tabular Machine Learning and Foundation Models for Childhood Anemia Prediction under Distribution Shift.* Under revision at *Nature Machine Intelligence.*
- *Brima Y*, Atemkeng M, Ngueajio M, et al. *Artificial Intelligence in Neglected Tropical Diseases: Current Applications, Challenges, and Opportunities.* Under review at *npj Digital Medicine.*
- *Brima Y*, Atemkeng M. *An Empirical Study of Machine Learning Robustness and Scalability for Imbalanced Tabular Clinical Data in Emergency and Critical Care.* Under revision at *Scientific Reports.* Available from: arXiv preprint.
- *Brima Y*, Krumnack U, Pika S, Heidemann G. *Understanding Self-Supervised Learning of Speech Representation via Invariance and Redundancy Reduction.* Information. 2024 Feb 15;15(2):114.
- *Brima Y*, Krumnack U, Pika S, Heidemann G. *Learning Disentangled Speech Representations. New in Machine Learning Workshop, NeurIPS 2023*, New Orleans, USA.
- *Brima Y*, Krumnack U, Pika S, Heidemann G. *Learning Disentangled Audio Representations through Controlled Synthesis.* Presentation at ICLR Tiny Papers Track 2024. arXiv:2402.10547.
- *Brima Y*, Atemkeng M. *Saliency-driven Explainable Deep Learning in Medical Imaging: Bridging Visual Explainability and Statistical Quantitative Analysis. BioData Mining*, 2024, 17(1):18.
- *Brima Y*, Atemkeng M, Tankio Djiokap S, Ebiele J, Tchakounté F. *Transfer Learning for the Detection and Diagnosis of Types of Pneumonia Including COVID-19 from Chest X-ray Images. Diagnostics*, 2021, 11(8):1480.
- *Brima Y*, Kamal Tushar MH, Kabir U, Islam T. *Deep Transfer Learning for Brain Magnetic Resonance Image Multi-class Classification. Dhaka University Journal of Applied Science & Engineering*, 2022.

Selected co-authored publications

- Kamga L, Atemkeng M, *Brima Y*, Tchoupe Tchendji M. *Adaptive 2D sampling via prediction entropy for volumetric medical image classification: application to Alzheimer's disease diagnosis.* Under review at *IEEE Transactions on Medical Imaging.*
- Nguezet PV, Atemkeng M, Fute ET, *Brima Y*, *Bridging Visual Saliency and Large Language Models for Self-explainable Deep Learning in Medical Imaging.* Under review at *BioData Mining.*
- Nhlapho W, Atemkeng M, *Brima Y*, Ndogmo J-C. *Transformers for 3D Medical Image Analysis: A Systematic Review of Architectural Innovations, Performance, and Clinical Applications.* Accepted at *Artificial Intelligence Review.*
- Singh D., *Brima Y*, Levin F, Becker M, Hiller B, Hermann A, Villar-Munoz I, Beichert L, Bernhardt A, Buerger K, Butryn M. *An unsupervised XAI framework for dementia detection with context enrichment. Scientific Reports*, 2025, 15(1):39554.
- Hamlomo S, Atemkeng M, *Brima Y*, Nunhokee C, Baxter J. *A Systematic Review of Low-rank and Local Low-rank Matrix Approximation in Big Data Medical Imaging. Neural Computing and Applications*, 2025.
- Nhlapho W, *Brima Y*, Atemkeng M, Ndogmo J-C. *Bridging the gap: exploring interpretability in deep learning models for brain tumor detection and diagnosis from MRI images. Information*, 2024, 15(4):182.

Academic Service

- **Scholarship Selection Committee Member:** Masters in Mathematical Sciences in Mathematical Epidemiology (MathEpi), Africa Health Collaborative (AHC) | African Institute for Mathematical Sciences (AIMS), 2026.
- **Award Committee Member:** Deep Learning Indaba Kambule Doctoral Award Committee, 2025.

- **Conference and seminar organization:** Co-organized the "Bridging Biological and Artificial Neural Networks" workshop (Osnabrück University, 2022) and the Deep Representation Learning Seminar (Winter 2023/24).
- **Peer review since 2023:** Scientific Reports; BMC Medical Informatics and Decision Making; Healthcare Technology Letters; npj journals; ICLR; ICML MusIML Workshop; Deep Learning Indaba.
- **Memberships:** MICCAI Society (2023–present); Black in AI (2022–present); Deep Learning Indaba (2022–present); IEEE (2019–present); AIMS Alumni Network (2021–present).

Selected Talks and Invited Presentations

- *Multimodal Representation for Robustness and Generalization in Biomedical Applications*, Max Delbrück Center for Molecular Medicine, Germany, 2026
- *Artificial Intelligence and Its Role in Shaping Our Future*, University of Makeni Computer Science Alumni Forum, Sierra Leone, 2025.
- *Multimodal Federated Learning for Robust Lung Cancer Prognosis*, Fraunhofer SCAI, Germany, 2025.
- *Trustworthy Healthcare AI for Mental Health Risk Prediction*, Neurobiology Research Unit, Copenhagen University Hospital, Denmark, 2024.
- *Assessing Explainability in Deep Learning for Medical Image Analysis*, Fraunhofer SCAI, Germany, 2024.
- *Causal Representation Learning*, Computer Vision Colloquium, Osnabrück University, Germany, 2024.
- *Learning Disentangled Audio Representations through Controlled Synthesis*, Notable ICLR Tiny Papers, 2024.

Competitive Scholarships and Awards

- CIFAR Deep Learning and Reinforcement Learning (DLRL) Summer School Inclusive AI Scholarship, Canada, 2024
- Deep Learning Indaba Scholarship, 2023
- Cambridge Ellis Machine Learning Summer School Fully-funded Scholarship, 2022

Further Training and Certifications

- DeepLearning.AI AI for Medicine Specialization (*Coursera, online*, 2026) (3 months)
  Focus: diagnostic, prognostic, and treatment-effect AI models in healthcare. Certificate Link
- Stanford University AI for Healthcare Specialization (*Coursera, online*, 2025) (8 weeks)
  Focus: clinical data, healthcare systems, and evaluation of AI in medicine. Certificate Link
- MUST Deep Learning Bootcamp (*North-West University, South Africa*, 2025) (2 weeks intensive)
  Focus: CNNs, optimization, gradient descent, regularization, supervised learning.
- IBM AI Engineering Professional Certificate (*Coursera, online*, 2023) (5 months)
  Focus: deep learning, TensorFlow, Keras, neural networks, hyperparameter tuning. Certificate Link
- IBM Data Science Professional Certificate (*Coursera, online*, 2023) (6 months)
  Focus: Python, SQL, machine learning, data visualization, cloud computing. Certificate Link
- Python Programming and Data Structures (*University of Michigan, Coursera, online*, 2023) (8 weeks)
  Focus: Python, algorithms, recursion, object-oriented programming. Certificate Link
- Mediterranean Machine Learning School (*Università Milano Bicocca, Italy*, 2022) (5-day intensive)
  Focus: advanced deep learning lectures and hands-on sessions.
- Deep Learning Program (*Neuromatch Academy, online*, 2022) (3-week intensive program)
  Focus: end-to-end deep learning from theory to implementation.
- Machine Learning Summer School (*Bandung, Indonesia*, 2020) (2-week intensive)
  Focus: CNNs, VAEs, NLP, TensorFlow, transfer learning.
- Machine Learning Summer School (*University of Oxford, UK*, 2020) (2-week intensive)
  Focus: Bayesian ML, computer vision, NLP, reinforcement learning, causal inference.
- Mathematics for Machine Learning (*Imperial College London, Coursera, online*, 2020) (3 months)

Focus: linear algebra, multivariate calculus, optimization, PCA. Certificate Link

Data Access, Governance, and Compliance

- Approved access to Demographic and Health Surveys (DHS) data for research on trustworthy disease diagnosis.
- Credentialed access and training for controlled biomedical datasets and platforms, including UK Biobank/MRC, PhysioNet, LONI IDA, and the German FDPG framework.
- Training in research ethics, data privacy, and responsible data use (CITI Program); experienced with IRB-compliant workflows and secure handling of sensitive health data.

References

- **Prof. Marcellin Atemkeng** Rhodes University, South Africa
  Professor of Mathematical Sciences, Rhodes AI Research Group (RAIRG). Email: m.atemkeng@ru.ac.za
- **Dr. Ulf Krumnack** Osnabrück University, Germany
  Senior Researcher, Computer Vision & AI Groups, Institute of Cognitive Science. Email: ulf.krumnack@uni-osnabrueck.de