

Sileshi Nibret Zeleke (PhD)

Trustworthy & Uncertainty-Aware AI Systems · AI for Healthcare · Federated Learning & Explainability

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PROFILE

Innovative AI researcher completed a PhD at the University of Bari Aldo Moro, with a track record of peer-reviewed publications at IEEE BigData, PAKDD, ECAI, and AINA. Specialist in federated learning, explainable AI, and uncertainty-aware generative models applied to clinical data analysis. Experienced in full research lifecycle from methodology design and implementation to international conference presentation. Visiting researcher at The Pennsylvania State University, USA.

EDUCATION

University of Bari Aldo Moro

Feb 2023 – May 2026

PhD in Computer Science and Mathematics — Bari, Italy

- ▶ Thesis: "From Privacy to Trust: Federated, Explainable and Uncertainty-Aware AI for ECG Analysis"
- ▶ Supervised by Prof. Mario A. Bochicchio (KDDE Research Lab)
- ▶ Four integrated contributions: federated KAN, FedPerAda (personalized FL), Attention-TCN XAI system, CALM-ECG: uncertainty aware multimodal framework.

Addis Ababa Science and Technology University

Oct 2019 – Apr 2022

M.Sc. in Computer Engineering — GPA 3.89 / 4.0 — Addis Ababa, Ethiopia

- ▶ Thesis: "Encrypted Network Traffic Analysis for Malware Detection Using ML and Nature-Inspired Algorithms"

Bahir Dar University

Oct 2012 – Jun 2017

B.Sc. in Computer Engineering — GPA 3.77 / 4.0 — Bahir Dar, Ethiopia

- ▶ Thesis: "A Knowledge-Based Medical Expert System for Common Diseases"

RESEARCH EXPERIENCE

Free University of Bozen-Bolzano – AI Lab

Mar 2026 – Now

Research and AI Infrastructure Technologist · Supervisor: Prof. Giuseppe Di Fatta

- ▶ Provide hands-on technical support across AI research projects spanning data science, machine learning, computer vision, and semantic/logical methods.
- ▶ Manage and maintain AI-Lab infrastructure: GPU server, and data server in addition to conducting research.

University of Bari Aldo Moro – KDDE Lab

Feb 2023 – Jan 2026

PhD Student and Researcher · Supervisor: Prof. Mario A. Bochicchio

- ▶ **FedPerAda**: Designed a personalized federated learning framework with local adapter layers and gradient-similarity-aware aggregation; published IEEE BigData 2025
- ▶ **CALM-ECG**: Built a conformal prediction-gated multimodal system integrating ECG deep learning with LoRA fine-tuned VLM for uncertainty-aware arrhythmia classification; published PAKDD 2026
- ▶ **Explainable FL**: Developed an attention-based TCN with VLM-generated semantic explanations for federated ECG interpretation published on EXPLIMED@ECAI-2024
- ▶ **Federated KAN**: Conducted first systematic evaluation of Kolmogorov–Arnold Networks under federated ECG settings; published IEEE BigData 2024

The Pennsylvania State University – Data Science Lab

Dec 2024 – May 2025

Visiting Researcher · Supervisor: Prof. Fenglong Ma

- ▶ Investigated vision-language models for uncertainty-aware ECG interpretation under distribution shift
- ▶ Designed CALM-ECG multimodal pipeline integrating GPT-4o adjudication with conformal prediction

University of Gondar – Department of Computer Engineering

Apr 2022 – Feb 2023

Researcher & Lecturer

- ▶ Applied XAI techniques (SHAP, LIME) to encrypted malware traffic classification.
- ▶ Delivered courses in Computer Engineering to undergraduate cohorts of ~60 students.

TEACHING EXPERIENCE

University of Gondar — Lecturer

Apr 2022 – Jan 2023

- Delivered undergraduate courses: Algorithms & Data Structures, Computer Networks, Operating Systems.
- Mentored final-year project students on ML-based thesis topics.

HONOURS & AWARDS

- NGI Transatlantic Fellowship (Horizon Europe):** Prestigious EU-funded research fellowship supporting visiting research at Penn State (2024–25)
- Huawei ICT Competition 2021–22 — Global 3rd Place:** Network design & implementation track, competed against teams worldwide
- Huawei ICT Competition 2021–22 — National 1st Place:** Ethiopia national finalist, network track
- Excellence in Academic Achievement Award:** Recognized for outstanding GPA and research output

SELECTED PUBLICATIONS

- S. N. Zeleke, B. M., A. Chang, F. Ma. "CALM-ECG: Toward Accurate and Explainable ECG Analysis through Deep Learning and Vision-Language Model Integration." **PAKDD 2026, Springer, Hong Kong**, 2026.
- S. N. Zeleke, M. Bochicchio. "FedPerAda: Personalized Federated Learning via Local Adapters and Similarity-Aware Aggregation." **IEEE BigData, Macau**, 2025.
- S. N. Zeleke, M. Bochicchio. "Federated Kolmogorov–Arnold Networks for Health Data Analysis: A Study Using ECG Signal." **IEEE BigData, Washington DC (pp. 8070–8077)**, 2024.
- M. Bochicchio, S. N. Zeleke. "Personalized Federated Learning in Edge-Cloud Continuum for Privacy-Preserving Health Informatics." **AINA 2024, vol. 203**, 2024.
- S. N. Zeleke, M. Bochicchio. "Towards Explainable Federated Learning in Healthcare: A Study on Heart Arrhythmia Detection." **EXPLMED Workshop, ECAI, vol. 3831 (pp. 88–97)**, 2024.
- S. N. Zeleke, A. F. Jember, M. A. Bochicchio. "Integrating Explainable AI for Effective Malware Detection in Encrypted Network Traffic." **arXiv:2501.05387**, 2025.
- S. N. Zeleke, S. Zemene, M. Bochicchio. "Ensemble Learning for Encrypted Malware Detection and Classification." **IEEE ICT4DA (pp. 132–137)**, 2023.

TECHNICAL SKILLS

ML / DL Frameworks

PyTorch · TensorFlow · Scikit-learn · HuggingFace
Transformers · Flower FL · LoRA · LLaVA

XAI & Uncertainty

SHAP · LIME · Attention Visualization · Conformal Prediction
· Grad-CAM

Medical AI & Biosignal

ECG Analysis · Time-series Modeling · Wearable Sensor Data
· Health Informatics Pipelines

Languages & Tools

Python · JavaScript · FastAPI · Docker · Git · Linux · NumPy · Pandas
· OpenCV · Matplotlib

Cybersecurity Analytics

TLS Traffic Analysis · Markov Chain Modeling · Anomaly Detection ·
Feature Engineering

Research & Leadership

EU Horizon Grant Writing · Cross-continental Collaboration ·
Academic Writing · Mentoring

SELECTED CONFERENCE ACTIVITIES

Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD)

June 2026 — Hong Kong, China

IEEE International Conference on Big Data

Dec 2024 — Washington DC, USA and Dec 2025 — Macau, SAR China

AI for Medicine (AIME)

Jun 2025 — Pavia, Italy

European Conference on Artificial Intelligence (ECAI)

Oct 2024 — Santiago and Oct 2025 — Bologna

LANGUAGES

English (C2 — Proficient) **Italian** (A2 — Elementary) **Amharic** (Native)

REFERENCES

Prof. Fenglong Ma — College of Information Science and Technologies, Pennsylvania State University | fenglong@psu.edu

Prof. Mario A. Bochicchio — Department of Computer Science, University of Bari | mario.bochicchio@uniba.it