Hatem ZEHIR
PhD in Electronic Engineering

https://hatemzehir.com/ linkedin.com/in/hatem-zehir github.com/Hatem-Zehir
scholar.google.com/citations?user=WrOVooEAAAAJ
+213 663 91 82 10 hatem.zehir@gmail.com

I have a PhD in Electronics with expertise in biometrics, deep learning, signal processing, and computer vision, seeking opportunities for postdoctoral research, lectureships, assistant professorships, research scientist roles, or applied AI engineering positions in academia, industry R&D labs, or healthcare technology companies. My doctoral research at Badji Mokhtar University focused on developing deep learning-based multimodal biometric recognition systems, integrating ECG and voice modalities using TensorFlow, Keras, and MATLAB, with applications extending to medical signal analysis and embedded AI deployment. With technical skills spanning CNNs, RNNs, transformers, time-frequency analysis, computer vision with OpenCV, and edge AI implementation on ESP32 and ARM Cortex-M platforms, I have contributed to 15+ peer-reviewed publications, collaborated on cross-disciplinary research projects, and gained teaching experience. Fluent in Arabic (native), English (C2), and French (C1).

Education

Feb 2022–July 2025	**PhD**, Security & Biometrics Badji Mokhtar - Annaba University, Annaba, Algeria
Sep 2019–Aug 2021	**MSc**, Instrumentation Badji Mokhtar - Annaba University, Annaba, Algeria
Sep 2016–Aug 2019	**BSc**, Electronics Engineering Badji Mokhtar - Annaba University, Annaba, Algeria

Research Experience

Today – February 2022 — PRFU Project Member, Badji Mokhtar - Annaba University, LERICA
- Developed multimodal deep learning models (CNN, GRU, LSTM) for robust ECG and voice-based biometrics.
- Implemented signal preprocessing pipelines (FFT, EMD, MFCC) in Python and MATLAB.
- Contributed to literature reviews and dissemination of results.

July 2025 – February 2022 — Doctoral Researcher, Badji Mokhtar - Annaba University, LERICA
- Designed preprocessing algorithms in MATLAB for biometric signal analysis.
- Designed fusion strategies improving recognition accuracy by >1% over unimodal systems.
- Built TensorFlow-based pipelines for evaluation of multimodal biometric systems.
- Published 6+ peer-reviewed papers in Q1/Q2 journals and presented at international conferences.

Peer-Reviewed Papers

Daas, S., **Zehir, H.**, Chebli, A., Hafs, T., & Hadef, C., *ABO-BTI : An Open-Source ABO Blood Typing Image Dataset for Medical AI Applications*. Advances in Electrical and Electronic Engineering, 2025.DOI Q3 IF 0.23

Zehir, H., Hafs, T., Daas, S., & Nait-Ali, A., *EMD based biometric identification system from electrocardiogram signals using GRU neural networks*. Multimedia Tools and Applications, 2025.DOI Q2 IF 3.2

Zehir, H., Hafs, T., & Daas, S., *Hardware-Optimised CNN Architecture for ECG Biometric Identification on Embedded Systems*. International Journal of Signal and Imaging Systems Engineering, 2025.DOI Q3 IF 0.6

Zehir, H., Hafs, T., & Daas, S., *Unifying Heartbeats and Vocal Waves : An Approach to Multimodal Biometric Identification At the Score Level*. Arabian Journal for Science and Engineering, 2025.DOI Q1 IF 2.9

Zehir, H., Hafs, T., & Daas, S., *Empirical mode decomposition-based biometric identification using GRU and LSTM deep neural networks on ECG signals*. Evolving Systems, vol. 15, no. 6, 2024. DOI Q2 IF 2.7

Hafs, T., **Zehir, H.**, Hafs, A., Brahmia, H., & Nait-Ali, A., *Enhancing Recognition in Multimodal Biometric Systems : Score Normalization and Fusion of Online Signatures and Fingerprints*. Romanian Journal of Information Science and Technology (ROMJIST), vol. 27, no. 1, 2024. DOI Q1 IF 3.9

Zehir, H., Hafs, T., & Daas, S., *Involutional neural networks for ECG spectrogram classification and person identification*. International Journal of Signal and Imaging Systems Engineering, vol. 13, no. 1, 2024. DOI Q3 IF 0.6

Hafs, T., **Zehir, H.**, Hafs, A., & Nait-Ali, A., *Multimodal Biometric System Based on the Fusion in Score of Fingerprint and Online Handwritten Signature*. Applied Computer Systems, vol. 28, no. 1, 2023. DOI

Zehir, H., Hafs, T., Daas, S., & Nait-Ali, A., *Support Vector Machine for Human Identification Based on Non-Fiducial Features of the ECG*. Journal of Engineering Studies and Research, vol. 29, no. 1, 2023. LINK

Peer-Reviewed Conferences

Zehir, H., Hafs, T., & Daas, S.. *TinyCNN : An Embedded CNN Model for Speaker Identification Using ESP32*. The 1st International Conference on Electrical Engineering & Renewable Energies Systems, 2023, Bechar, Algeria.LINK

Zehir, H., Hafs, T., & Daas, S.. *ECG-Based Biometric System using TinyML : Implementation and Performance Evaluation on ESP32*. ICAECCT'23 : The 1st International Conference on Advances in Electronics, Control and Computer Technologies, 2023, Mascara, Algeria.

Zehir, H., Hafs, T., & Daas, S.. *Healthcare Decision-Making with an ECG-Based Biometric System*. 2023 International Conference on Decision Aid Sciences and Applications (DASA), 2023, Annaba, Algeria.DOI

Zehir, H., Hafs, T., Daas, S., & Nait-Ali, A.. *An ECG Biometric System Based on Empirical Mode Decomposition and Hilbert-Huang Transform for Improved Feature Extraction*. 5th International Conference on Bio-engineering for Smart Technologies (BioSMART 2023), 2023, Paris, France.DOI

Zehir, H., Hafs, T., & Daas, S.. *Edge Based Online Signature Identification : A TinyML Approach with ESP32 Microcontroller*. 4th International Conference on Technological Advances in Electrical Engineering (ICTAEE'23), 2023, Skikda, Algeria.LINK

Zehir, H., Hafs, T., & Daas, S.. *Bidirectional Long Short-term Memory Neural Networks Based Electrocardiogram Biometric System*. International Conference on Embedded Systems in Telecommunications and Instrumentation (ICESTI'22), 2022, Annaba, Algeria.LINK

Teaching Experience

July 2025 – February 2025 | **Lecturer, Badji Mokhtar – Annaba University**
Courses : Introduction to Artificial Intelligence, Image processing.
Taught fundamentals of image processing, AI, ML, and deep learning with practical case studies.

October 2022 – February 2025 | **Lab/Teaching Assistant, Badji Mokhtar – Annaba University**
Courses : Computer Vision, Signal Processing, Fundamentals of Electronics, C/C++ Programming.
Supervised lab sessions and mentored students on applied projects.

Peer Reviewing Activities

BMC Cardiovascular Disorders (Springer) Q2.3 IF 2

Scientific Reports (Springer) Q3.9 IF 1

International Journal of Signal and Imaging Systems Engineering (Inderscience) Q0.6 IF 3

2025 International Conference on Decision Aid Sciences and Applications (DASA'25), December 2025, Eker, Bahrain

2024 International Conference on Decision Aid Sciences and Applications (DASA'24), December 2024, Eker, Bahrain

2024 International Conference of the African Federation of Operational Research Societies (AFROS'24), September 2024, Tlemcen, Algeria

Event Organization

May 2025 | **AI Masters Challenge, House of AI, Badji Mokhtar – Annaba University**
Competition setup, participant coordination, and technical support during live events.

December 2022 | **5th International Conference on Embedded Systems in Telecommunications and Instrumentation, Badji Mokhtar – Annaba University**
Logistics, coordination, and on-site support for speakers and participants.

Languages

Arabic (*Native*)
English (*C2 (EF SET)*)
French (*C1 (TCF SO)*)

Technical Skills

Biometric systems	Multimodal fusion, identity verification, authentication protocols.
Research methods	Experimental design, dataset collection and annotation, data augmentation strategies, performance evaluation, cross-validation techniques, statistical hypothesis testing, academic writing (LaTeX), literature review and systematic analysis, research proposal development, grant writing.
Signal processing	ECG and speech processing, biomedical signal analysis (EEG, EMG, PPG), time–frequency analysis, FFT, wavelet transforms, EMD, MFCC, spectrograms, mel-spectrograms, filtering techniques (FIR, IIR), noise reduction, signal denoising, feature extraction.
Computer vision	Feature extraction, image enhancement and preprocessing, edge detection, morphological operations, object detection and tracking, OpenCV, deep feature learning for vision, attention mechanisms in vision models, image quality assessment, digital image watermarking.
Deep learning	CNNs (ResNet, VGG, EfficientNet, MobileNet), RNNs, LSTM, GRU, bidirectional networks, autoencoders, variational autoencoders (VAE), GANs (generative adversarial networks), transfer learning, fine-tuning pretrained models, transformers (Vision Transformers, BERT basics), attention mechanisms, model optimization and pruning, hyperparameter tuning.
Machine learning	Classification (binary and multi-class), clustering (k-means, hierarchical, DBSCAN), SVM, decision trees, random forest, gradient boosting (XGBoost, LightGBM), dimensionality reduction (PCA, LDA, t-SNE), ensemble methods, feature selection techniques, model evaluation and validation, imbalanced data handling.
Frameworks	TensorFlow, Keras, PyTorch, scikit-learn, pandas, NumPy, SciPy, Matplotlib, seaborn.
Programming	Python (advanced), MATLAB (advanced), C, C++, basic PHP, shell scripting (Bash), version control workflows.
Tools	Git/GitHub, Linux, LaTeX, Jupyter Notebook, Google Colab, Anaconda, Docker (basics), reference management (Zotero, Mendeley), data visualization tools.
Embedded AI & IoT	TinyML, edge AI deployment (ESP32, ARM Cortex-M, Raspberry Pi), model quantization and compression, IoT protocols (MQTT, HTTP), IoT platforms (Thinger.io, Blynk), sensor networks, real-time processing on embedded devices, power-efficient AI implementations.
Electronics	PCB design (KiCad, Eagle, Proteus), schematic capture, power supply design (linear and switching regulators), microcontroller programming (Arduino, STM32, ESP32, PIC, AVR), interfacing sensors (accelerometers, temperature, biometric sensors) and actuators, analog and digital circuit design, embedded systems debugging, serial communication protocols (UART, SPI, I2C).
Instrumentation	Measurement systems design, sensor calibration and characterization, data acquisition systems, signal conditioning circuits, amplifier design (instrumentation amplifiers, operational amplifiers), analog-to-digital conversion (ADC), LabVIEW (basics), virtual instrumentation, measurement uncertainty analysis, oscilloscope and spectrum analyzer operation, biomedical instrumentation.

Online Certificates

2025 | **Overview of IoT Technologies** — *Huawei*
View Certificate

2025 | **Introduction to LLMs in Python** — *DataCamp*
View Certificate

2022 | **Intro to Machine Learning** — *Kaggle*
View Certificate

2021 | **Introduction to Embedded Machine Learning** — *Edge Impulse*
View Certificate

2020 | **Introduction and Programming with IoT Boards** — *Pohang University of Science and Technology*
View Certificate

2020 | **Introduction to Quantum Computing** — *LinkedIn*
View Certificate