Hatem **Zehir**

PhD in Electronic Engineering

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Annaba, Algeria
Born July 14, 1996 (29 years old)

Education

Feb 2022–July 2025 — **PhD**, Electronic Engineering (Biometrics)
Badji Mokhtar - Annaba University, Annaba, Algeria
Thesis : *"Development of a Hybrid Multimodal Biometric System"*
Supervisor : Dr. Toufik Hafs

Sep 2019–Aug 2021 — **Master of Science**, Electronics Engineering (Instrumentation)
Badji Mokhtar - Annaba University, Annaba, Algeria

Sep 2016–Aug 2019 — **Bachelor of Science**, Electronics Engineering
Badji Mokhtar - Annaba University, Annaba, Algeria

Research Experience

Today – February 2022 — **PRFU Project Member, Badji Mokhtar - Annaba University LERICA**

- Participated in a PRFU project titled "Multidimensional Signal Processing : Applications in Biometrics"
- Developed and tested algorithms using MATLAB for feature extraction and preprocessing
- Built deep learning models and evaluation pipelines using Python (TensorFlow)
- Assisted in literature reviews and dissemination of results through publications

Biometrics | Tensorflow | Multidimensional Signal Processing | Literature Review

July 2025 – February 2022 — **Doctoral Researcher, Badji Mokhtar - Annaba University LERICA**

- Conducted PhD research on deep learning-based biometric systems, focusing on multimodal fusion
- Designed and implemented deep learning models using TensorFlow robust biometric recognition
- Utilized MATLAB for signal processing, data analysis, and neural networks implementation
- Collaborated with cross-disciplinary teams
- Contributed to peer-reviewed publications and presented research at international conferences

Biometrics | Deep Learning | Tensorflow | Multimodal fusion | Python | Matlab

Peer-Reviewed Papers

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 5.2

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

Badji Mokhtar – Annaba University, Annaba, Algeria

Winter 2025 | **Lecturer, Informatics 2 : Image Processing**
Department of Urban Planning — 1st Year Bachelor's (LMD)
Fundamentals of digital image processing | Fundamentals of Transmission | Basic Editing Using Photoshop

Winter 2025 | **Lecturer, Introduction to Artificial Intelligence**
Department of Urban Planning — 1st Year Master's (LMD)
Introduced concepts of AI | Machine Learning | Deep Learning | Practical Applications

Fall 2024 | **Lab Instructor, Computer Vision**
Department of Electronics — 1st Year Master's (LMD)
Image Analysis | Transformations | Feature Extraction

Winter 2024 | **Tutorial Instructor, Fundamentals of Electronics**
Department of Common Core Engineering — 2nd Year Engineering
Ohm's law | Kirchhoff's Laws | Analog Filters

Winter 2024 | **Tutorial Instructor, Signal Processing**
Department of Common Core Engineering — 2nd Year Engineering
Fourier/Laplace transforms | Convolution | Filtering.

Fall 2023 | **Lab Instructor, C++ Programming**
Department of Electronics — 1st Year Bachelor's (LMD)
Arrays | Functions | Strings

Fall 2022 / Winter 2023 | **Lab Instructor, C Programming**
Department of Common Core Science and Technology — 1st Year Bachelor's (LMD)
Variables | Functions | Arrays | Structured data

Online Certificates

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

2020 | **Leading Beyond the COVID-19 Health Care Crisis** — *Harvard Medical School*
View Certificate

2020 | **Search Engine Optimization** — *Google*
View Certificate

2018 | **Arduino Workshop 2018 | A step-by-step Arduino how-to guide** — *Core Electronics*
View Certificate

Technical Skills

Technical Skills	Programming (Python, MATLAB, C/C++), Artificial Intelligence & Machine Learning, Scratch & ScratchJR, Electronics, Educational Robotics (mBlock, mBot), Embedded Systems & Microcontrollers (Arduino, Raspberry Pi, STM32, ESP32), Basic Web Development
Teaching & Educational Skills	University-level lecturing (AI, programming), Curriculum design and practical workshops, Simplifying complex technical concepts for different age groups
Soft Skills	Communication & Public Speaking, Creativity in educational activities, Teamwork & Collaboration, Problem-solving mindset, Patience and adaptability when working with children

Languages

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