

Hamdi Yahya

Researcher and Lecturer

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Languages

Arabe - A1
Français - A1
Anglais - A1

Hobbies

Travel
Cinema
Sports

Summary

Researcher and Lecturer in Computer Science specializing in Signal and Image Processing, Machine Learning, and Computer Vision.

Key Skills

Machine Learning:

Artificial Neural Networks, CNN, SVM, Recurrent Neural Networks (LSTM, BLSTM), Transformer, K-means Clustering.
Computer Graphics: GAN, Diffusion Models.
TensorFlow, Keras, Jupyter, Scikit-learn, Scikit-image, PyTorch.

- Fine-tuning

Programming languages : Java, Java Script, C, C++, C#, HTML5, PHP, CSS, Python, Docker, Matlab.

Database Management

Fuzzy logic

Other skills: LATEX, Weka

Degrees and Academic Qualifications

2025: Qualifications for Sections 27 and 61

2017-2022: Ph.D. in Computer Systems Engineering, National School of Engineers of Sfax, Tunisia. (Highest Honors)

Research Topic: Analysis and Recognition of Online Arabic Handwriting Using the Beta-Elliptic Model and Deep BLSTM Networks.

Thesis Advisor: Prof. Adel M. Alimi

Field: Automatic Signal and Image Processing

- ✓ Development of an application for online Arabic handwriting word recognition.
- ✓ Use and manipulation of deep networks (CNN, RNN, DNN).
- ✓ Development of an application for evaluating online Arabic handwriting in collaboration with the French company 'Kaligo' (School in Rennes, France).

Committee: Mohamed CHTOUROU, Monji KHERALLAH, Lamia BELGUITH, Olfa JEMAI.

2012-2014 : Master's Degree in Information Systems and New Technologies (SINT) - University of Sfax, Tunisia (Honors: Very Good)

Research topic: Personalization of document warehouses

Supervisor: Prof. Jamel Feki

Key areas: Data warehouses, personalization, user profiling, databases

2007-2011 : Bachelor's Degree in *Computer Science University of Sfax Tunisia* (Honors: Very Good)

Professionnel Activities

2024-2025 (Currently): Temporary Teaching and Research Associate (ATER) at the University of the Littoral Côte d'Opale, Calais, France.

- **Teaching activities:** Digital Skills, Web Programming, Real-Time Programming & Scheduling, Databases

2023-2024: Temporary Teaching and Research Associate (ATER) at the University of the Littoral Côte d'Opale, Calais, France.

- **Teaching activities:** System and Network Administration, Object-Oriented Programming in Java, Web Programming, C++, Databases.

2019-2021: Assistant at the Faculty of Sciences of Sidi Bouzid, Tunisia (FSSB).

- **Teaching activities:** Algorithms, Databases, Object-Oriented Programming (Lectures and Tutorials), Multimedia (Tutorials and Lab Sessions).

Other:
IEEE Member (Membership Number: 93297297)
Member of the IEEE Computer Society

- Core Skills:**
- Team Leadership/Training
 - Software Development
 - Application Development
 - Project Management
 - Mobile Application Development

Knowledge:

- **DBMS:** Oracle, MySQL, Access, SQL Server, Oracle Warehouse Builder (for Data Warehouse implementation), GPAO
- **Software Engineering Tools:** WinDev, AMCDesigner, Rational Rose
- **Design Methods:** Merise, O, Rational Unified Process

Institution	Level	Subject	Volume
ULCO Calais	Bachelor’s Year 1 – Computer Science	Database	20h TD
ULCO Calais	Bachelor’s Year 1 – Computer Science	Web Programming	36h TP
ULCO Calais	Bachelor’s Year 2 – Computer Science	Java Object-Oriented Programming	48h TP
ULCO Calais	Bachelor’s Year 3– Computer Science	System and Network Administration	6h cours 21h TP
ULCO Calais	Bachelor’s Year 1 – Computer Science	Supervision of Learning and Assessment Situations (SAÉ) in C++	27h TP
ULCO Calais	Bachelor’s Year 1 – Computer Science	Compétences numériques	36h TD
ULCO Calais	Master 1	Real-Time Programming & Scheduling	27h TD
ISETSB Tunis	Bachelor’s Year 2 – Computer Science	Database	27h TD
FSSB Tunis	Bachelor’s Year 3 – Computer Science	Web Programming	21h TP
FSSB Tunis	Bachelor’s Year 2 – Computer Science	Java Object-Oriented Programming	24h TP
FSSB Tunis	Bachelor’s Year 3 – Computer Science	Multimedia	9h TP

Supervision

Year	Level	Subject
2022	ING3 (Master 2)	Title: Deep Learning Application for Handwriting Evaluation University: National Engineering School of Sfax, Tunisia Duration: 6 months
2023	Master 2	Title: A New System for Arabic Sentiment Detection on Twitter University: Higher Institute of Applied Sciences and Technology of Gafsa, Tunisia Duration: 6 months
2023	Master 2	Title: Airborne Signature Verification System University: Higher Institute of Applied Sciences and Technology of Gafsa, Tunisia Duration: 6 months

Certificats

Programming languages: JavaScript, HTML5, PHP, CSS, SQL, MySQL, deep learning (CNN networks).

Microsoft Technology Associate (MTA) Certification 98-365.

Research Activities

1. Master Work

Title: Personalization in Document Warehouses

Institution: Faculty of Economics and Management Sciences of Sfax (FSEGS), University of Sfax, Tunisia

Supervisor: Prof. Jamel Feki

Publications:

1 paper presented at a conference

1 research report (Master's thesis)

Research Topics:

Data warehousing

Data personalization

Ontologies

❖ Summary of My Master's Internship Work

The work presented falls within the scope of personalization in document warehouses, with a particular focus on user needs (decision-makers) and the shared contexts among them.

After introducing the fundamental concepts used in this research—namely decision support systems, data warehouses, document warehouses, information personalization, and ontologies—we reviewed and analyzed existing approaches addressing personalization in information retrieval and data warehouse domains. A comparative synthesis table helped highlight the limitations of current methods and define the core problem addressed in this thesis: personalization in document warehouses.

Our main objective was to improve the quality of OLAP query responses by integrating user profiles into the document warehouse. To achieve this, we extended the document warehouse meta-model proposed by Khrouf et al. (2011), by:

Reusing the ontology component (to provide semantic structure to textual document content),
Integrating a new user component.

This extension enables both personalized document integration into the warehouse and collaborative recommendation between users with shared interests.

To validate our approach, we extended the DocWare tool (Document Warehouse) by developing graphical interfaces allowing users to define profiles and integrate new documents into the warehouse. We also evaluated our personalization method through experiments using the CLEF 2007 document collection (Müller et al., 2007), demonstrating the impact of newly created profiles on document relevance.

This master's research work led to the publication of a paper presented at an international workshop.

2. PhD Research Work

Title: *Online Handwriting Analysis and Recognition using Beta-Elliptic Model and Deep BLSTM Network*

Research Unit: Intelligent Machines Research Group (LR11ES48)

Institution: National Engineering School of Sfax (ENIS), University of Sfax, Tunisia

Thesis defense: October 24, 2022

Publications:

- 6 articles in international peer-reviewed journals
- 5 papers presented at international conferences
- 2 paper presented at an international workshop
- 1 book chapter
- 1 patent

❖ PhD Thesis Summary**Context and Objectives**

My PhD project highlighted the advancements in the field of online handwriting analysis and recognition, as well as related applications leveraging artificial intelligence techniques. Automatic handwriting analysis and recognition is a complex task that combines various strategies and methods drawn from computer vision.

In the initial phase of the research, I conducted a comprehensive review of the main families of systems used for handwriting analysis and recognition. This allowed me to clearly outline the state of the art in the field and identify gaps and opportunities.

Building upon this foundation, I developed a handwriting recognition system capable of analyzing individual letters and words, addressing several challenges inherent in handwriting variability and real-time processing.

Proposed Approaches

In our work, we applied two methods for online handwriting modeling: the beta-elliptic model and grapheme segmentation. Specifically, we leveraged the dynamic and geometric features of the beta-elliptic model to represent the trajectory of online handwriting. We also utilized a developed algorithm for trajectory segmentation into graphemes, which operates by detecting the baseline of the script through alignment between trajectory points and their tangent directions. In this model, handwritten or pseudo-words are segmented into continuous parts called graphemes, which are delimited by the local minima (valleys) of ligatures aligned with the baseline.

The first objective of my PhD project was to simulate the beta-elliptic approach using a stacked deep recurrent neural network of the BLSTM (Bidirectional Long Short-Term Memory) type. The proposed architecture integrates preprocessing, segmentation, and trajectory approximation steps across both dynamic (velocity) and geometric profiles, using neural computation sequences. We implemented and compared various models for online handwritten character and word recognition within a predefined context, using both LSTM and BLSTM recurrent neural network architectures. Furthermore, we introduced multiple data augmentation methods (geometric, frequency-based, and beta-elliptic-based techniques) to improve the recognition rates of characters and words in the proposed architectures.

In the second part of this thesis, we contributed by developing an online Arabic handwriting recognition system with an open (unlimited) lexicon. Research in this area is still in its early stages. Our focus in this section was on the proposed neural beta-elliptic model and grapheme segmentation model for feature extraction, along with a deep BLSTM recurrent network followed by the Connectionist Temporal Classification (CTC) algorithm for sequence labeling.

In addition to the recognition system, we developed a mobile application for multilingual online handwriting quality analysis and evaluation (Arabic, Urdu, Persian, and Latin), aimed at primary school children. This application assesses handwriting quality and provides informative feedback. It is based on multiple criteria such as letter shape, writing order, kinematic direction, and adherence to the baseline. The assessment combines features from the neural beta-elliptic model and perceptual convolutional neural networks (CNNs). Specifically, beta-elliptic parameters were used to capture both the visual and

dynamic characteristics of segmented beta strokes that make up the handwriting trajectory. Furthermore, the CNN model was used to express the overall trajectory and its final visual rendering after drawing.

Finally, this work has demonstrated the validity of the proposed architectures, which emerge as candidate standard approaches for solving various tasks in computer vision. It paves the way for new developments in handwriting recognition, and further significant improvements are expected through the integration of other deep learning methods. To evaluate our work, a database called **ADAB (Arabic DataBase)** was built in 2011, consisting of handwritten text based on 937 names of Tunisian towns and villages.

This thesis has resulted in:

- 6 papers published in international journals**
- 6 papers in international conferences**
- 1 book chapter**
- 2 workshop paper**
- 1 patent**

3. Research Work During My ATER Position at ULCO Calais

Project1:

Title: *"3D CGAN Completion and Generation of Broken 3D Objects from a Reduced Dataset"*

Research Unit: Laboratory of Computer Science, Signal and Image of the Côte d'Opale (LISIC)

Location: University of the Littoral Côte d'Opale (ULCO), Calais, France

Team Members: Yahia Hamdi, Nicola Andrialovanirina, Pierre Alexandre, Kélig Mahé, Émilie Poisson Caillault

This work led to a paper published at the IACD Workshop - EGC 2025 in Strasbourg [13].

Project2:

Title: *"Advanced Detection and Classification of Floating Marine Plastic Waste Using Swin Transformer Architecture"*

Location: University of the Littoral Côte d'Opale (ULCO), Calais, France

Team Members: Yahia Hamdi, Mohamed Fnadi (Associate Professor, Department of Computer Science & Signal Processing, ULCO, LISIC Laboratory, Calais)

Such a system can be applied to environmental monitoring, ocean cleanup, and autonomous navigation [pdf].

Responsibilities and Scientific Activities

Outreach and Technology Transfer Activities

- Participation in the 1st Tunisian Forum on Artificial Intelligence AI@tn'2020, organized online from December 28 to 30, 2020.
- Conducted a training session titled: Deep Learning Network: CNN with Python, March 15, 2022, Faculty of Science of Sidi Bouzid, Tunisia.
- Participation in the 35th Workshop on Intelligent Machines: Theory & Applications, December 19-21, 2022, Sousse, Tunisia.
- 2019: Best Poster, University of Pittsburgh Department of Computer Science 10th Annual Computer Science.

Scientific Evaluation Activities

I have been asked to review publications for the following journals and conferences:

- o Online Handwriting Recognition with Sensor-Enhanced Pens Optimized Using Knowledge-Aware Attentional Neural Network, *Neurocomputing*, 2025, **Q1**.
- o Potential Enablers for IoT Data Analytics: Big Data, Machine Learning Technique and Computing Paradigms, *International Journal of Multimedia Tools and Applications Journal* (2023), **Q1**.
- o Gradient-Boosted Convolutional Neural Network Malware Detection Technique for Android Smartphones, *International Journal of Multimedia Tools and Applications Journal*, (2022), **Q1**
- o Concurrent and Predictive Validity of a Cycloid Loops Copy Task to Assess Handwriting Disorders in Children, *International Journal of Children*. (2023), **Q2**
- o Course Outcome Attainment Through Assessments: A Comprehensive Approach, *International Journal of Multimedia Tools and Applications*, (2022), **Q1**.
- o BiLSTM-CRF Manipuri NER with character-level Word Representation, *Arabian Journal for Science and Engineering* (2022), **Q2**.

Publications

Journals

Y. Hamdi, Bisma Rabhi, Thameur Dhieb, Adel M Alimi: Enhanced Multi-Head Attention Mechanism and BGRU for Lexicon-Free Online Arabic Handwriting Recognition. *Signal, Image and Video Processing*, 2026. [\[PDF\]](#)

B. Rabhi, A. Elbaati, Y. Hamdi, H. Dhahri, U. Pal, H. Chabchoub, K. Ouahada, A. M. Alimi Novel Multi-head Attention and Long Short-Term Network for Enhanced Inpainting of Occluded Handwriting. *Cogn Comput* 17, 6 (2025). <https://doi.org/10.1007/s12559-024-10382-1>. [\[PDF\]](#) (**SJR: 1.18, Q1, discipline: Computer science and applications**)

Y. Hamdi, H. Akouaydi, H. Boubaker, Alimi, A.M. Handwriting quality analysis using online-offline models. *Multimed Tools Appl* (2022). <https://doi.org/10.1007/s11042-022-13228-w>. [\[PDF\]](#) (**SJR: 0.72, Q2, discipline: Computer networks and communications**)

Y. Hamdi, A. Chaabouni, H. Boubaker and Adel M. Alimi: Deep learned BLSTM for Online Handwriting Modeling Simulating the Beta-Elliptic approach. *Engineering Science and Technology, an International Journal (JESTCH)* on July 2 (2022). <https://doi.org/10.1016/j.jestch.2022.101215>. [\[PDF\]](#) (**SJR 2022 : 1.04, Q1, Computer networks and communications**)

Y. Hamdi, H. Boubaker, & Alimi, A.M. Data Augmentation using Geometric, Frequency, and Beta Modeling approaches for Improving Multi-lingual Online Handwriting Recognition. *International Journal on Document Analysis and Recognition (IJ DAR 24)*, 283-298 (2021). <https://doi.org/10.1007/s10032-021-00376-2>. [\[PDF\]](#) (**SJR 2022 by: 1.5, Journal Q1, discipline: Computer vision and pattern recognition**)

B. Rabhi, A. Elbaati, H. Boubaker, Y. Hamdi, and Adel M. Alimi. Multi-lingual character handwriting framework based on an integrated deep learning based sequence-to-sequence attention model. *Memetic Comp.* 13, 459-475 (2021).

International Conferences

Y. Hamdi, Nicola Andrialovanirina, Pierre Alexandre, Kélig Mahé, Émilie Poisson Caillault. " A Sparse 3D GAN-Based Mixture-of-Experts Framework for Object Generation and Completion", International Conference on Pattern Recognition (ICPR 2026). [PDF]

Y. Hamdi, R. Besma, D. Thameur, Adel M. Alimi, "Multi-head Self-attention and BGRU for Online Arabic Grapheme Text Segmentation," 2023 *International Conference on Cyberworlds (CW)*, Sousse, Tunisia, 2023, pp. 78-85, doi: [10.1109/CW58918.2023.00021](https://doi.org/10.1109/CW58918.2023.00021). [PDF] (Conf Classe B, Indexed in DBLP)

Y. Hamdi, A. Chaabouni, H. Boubaker and Adel M. Alimi: Hybrid DBLSTM-SVM based Beta-elliptic-CNN Models for Online Arabic Characters Recognition. In *International Conference on Document Analysis and Recognition (ICDAR)*, 2019. DOI: [10.1109/ICDAR.2019.00093](https://doi.org/10.1109/ICDAR.2019.00093). [PDF] (Conf Classe A, Indexed in DBLP and scopus)

R. Besma, E. Abdelkarim, Y. Hamdi and Adel M. Alimi, "Handwriting Recognition Based on Temporal Order Restored by the End-to-End System," *International Conference on Document Analysis and Recognition (ICDAR)*, 2019, pp. 1231-1236. Doi:[10.1109/ICDAR.2019.00199](https://doi.org/10.1109/ICDAR.2019.00199). [PDF] (Conf Classe A, Indexed in DBLP and scopus)

Y. Hamdi , A. Chaabouni, H. Boubaker and Adel M. Alimi Off-lexicon online Arabic handwriting recognition using neural network ", *Ninth International Conference on Machine Vision (ICMV2016)*. <https://doi.org/10.1117/12.2268650>. [PDF] (Conf Classe C, Indexed in DBLP and scopus)

Y. Hamdi, A. Chaabouni, H. Boubaker and Adel M. Alimi, 'Hybrid neural network and genetic algorithm for off-lexicon online Arabic Handwriting Recognition', *International Conference on Hybrid Intelligent Systems (HIS 2016)*. https://doi.org/10.1007/978-3-319-52941-7_43. [PDF] (Conf Classe C, Indexed in DBLP and scopus)

Chapter

Y. Hamdi, H. Boubaker, Alimi A.M.: Online Arabic Handwriting Recognition Using Graphemes Segmentation and Deep Learning Recurrent Neural Networks. In: Hassanien A.E., Darwish A., Abd El-Kader S.M., Alboaneen D.A. (eds) *Enabling Machine Learning Applications in Data Science. Algorithms for Intelligent Systems*. Springer, Singapore (2021). https://doi.org/10.1007/978-981-33-6129-4_20. [PDF]

Workshops

Y. Hamdi, Nicola Andrialovanirina, Pierre Alexandre, Kélig Mahé, Émilie Poisson Caillault. " DCGAN pour la Complétion et la Génération d'Objets 3D Cassés à partir de Jeux de Données Réduits." Atelier IACD EGC, 28 janvier 2025 à Strasbourg. [PDF]

Y. Hamdi, H. Boubaker H., Hamdani T.M., Alimi A.M. (2021) ASAR 2021 Competition on Online Arabic Character Recognition: ACRC. In: Barney Smith E.H., Pal U. (eds)

Document Analysis and Recognition - ICDAR 2021 Workshops. ICDAR 2021. Lecture Notes in Computer Science, vol 12916. Springer, Cham. https://doi.org/10.1007/978-3-030-86198-8_27. [PDF]

Yahia Hamdi, Kaïs Khrouf, Jamel Feki. "Personnalisation dans les entrepôts de documents." *16ème édition des Atelier des Systèmes Décisionnels (ASD 2012)*, 1-3 avril 2012, Université Saad Dahlab, Blida, Algérie. https://asd2021.sciencesconf.org/data/pages/6_Actes_2012.pdf. [PDF]

Patent

Yahia Hamdi, Besma Rabhi, Abdelkarim Elbaati, Thameur Dhieb and Adel M. Alimi, "Smart Device for the Detection and Identification of Motor Impairments in Children," published by the French National Institute of Standardization and Industrial Property (INNORPI) under application number TN2018/0143 dated April 26, 2023. [PDF]

Submitted papers

Y. Hamdi, H. Boubaker, Hamdani T.M., Alimi A.M: Hybrid Architecture based on RNN-SVM for Multilingual Online Handwriting Recognition using Beta-elliptic and CNN models, Arabian journal for science and engineering, 2024

Y. Hamdi, Akouaydi H., Alimi A.M. Workbook for e-Education: Children's Online Handwriting Quality Analysis. Multimed Tools and Applications (MTA), 2024. [under review]

Y. Hamdi, F. Mohamed. Advanced Detection and Classification of Floating Marine Plastic Waste Using Swin Transformer Architecture. Journal of Environmental Management, 2025. [under review]

Thesis

Y. Hamdi, Online Analysis and Recognition of Arabic Handwriting Using the Beta-Elliptic Model and Deep BLSTM Networks. Doctoral Thesis, ENIS, University of Sfax, 2022. Under the supervision of M. Adel Alimi and Houcine Boubaker. [PDF], [Slides].