PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA
MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH
Yahia Farès University of Médéa
Faculty of Sciences

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PhD PROGRAM OFFER
FOR THE ACADEMIC YEAR 2024/2025

Field: Artificial Intelligence and its applications

1- Global Objective of the Doctoral Project

The overarching goal of this doctoral project is to leverage advanced artificial intelligence (AI) techniques to address pressing societal challenges across several strategic domains. It covers diverse PhD research areas, including AI-based hate speech detection, medical image analysis, early heart disease prediction, intelligent agricultural diagnostics, cybersecurity within Internet of Things (IoT) environments, mental health diagnostics, intelligent stress detection systems, and fake news identification.

The project utilizes cutting-edge AI methodologies—such as deep learning, large language models (LLMs), and computer vision—to foster technological innovation and create tangible societal impact.

Practically, the project aims to provide both theoretical frameworks and applied solutions to improve the operations of the Emergency Medical Aid Service (SAMU) and the Algerian Civil Protection, with a focus on responder health and communication efficiency in critical situations.

In agriculture, the goal is to integrate Agriculture 4.0 technologies to boost productivity through customized solutions spanning all stages—from land preparation to post-harvest processes.

This interdisciplinary approach aligns with the visions of Industry 4.0 and University 4.0 by promoting the adoption of smart technologies, fostering cross-disciplinary collaboration, and contributing to human and social development. By tackling challenges related to Information and Communication Technology (ICT) and digitalization, reducing biases, and promoting safer, more inclusive environments, the project contributes to the digital transformation of key sectors such as healthcare, agriculture, and information security.

2- Curriculum Highlights

- **Deep Learning**: Using advanced neural networks to analyze complex data such as medical images and text
- **Large Language Models (LLMs)**: Models like GPT and BERT for natural language processing, hate speech detection, and fake news analysis
- **Computer Vision**: For image and video processing in domains like medical diagnostics and smart agriculture
- **Big Data Analytics**: Extracting patterns from large and multi-source dataset
- **Predictive Artificial Intelligence**: For forecasting heart diseases and mental stress based on diverse input data

- **Intelligent and Hybrid Systems**: Combining multiple techniques (e.g., neural networks and fuzzy logic) for enhanced performance in real-world applications
- **Ethical AI**: Ensuring transparency, fairness, and minimizing biases in AI systems

3- Access to Doctoral Training

This offer opens access to doctoral training in the field of artificial intelligence and its applications for all holders of a Master's degree in artificial intelligence and computer science (informatics) in all its specialties.

4- Core Courses

During the initial years of training, the PhD student is required to attend advanced courses that support their scientific research and provide them with modern methodological and technical tools. The core courses include:

- **Advanced Artificial Intelligence:** Concepts and techniques of AI, machine learning, deep learning, and intelligent algorithms.
- **Deep Neural Networks Modeling:** Design and training of neural networks with applications in computer vision and language processing.
- **Data Analytics & Data Science:** Techniques for collecting, cleaning, and analyzing big data and extracting knowledge.
- **Research Methodology & Thesis Writing:** Skills for preparing research projects, analyzing results, and academic publishing.
- **AI Ethics & Societal Impact:** Issues of privacy, algorithmic biases, and the ethical responsibilities of researchers.
- **Cybersecurity in Smart Systems:** Concepts of information security and data protection in IoT and intelligent systems.
- **Multidisciplinary AI Applications :** AI applications in health, agriculture, public services, and emergency response.

5- Advanced Topics

Artificial Intelligence and Deep Learning

Generative Models
Explainable AI (XAI)
Real-Time Deep Learning
Reinforcement Learning

AI in Healthcare

Disease diagnosis using medical imaging
Mental health tracking through behavior and language analysis
Early detection of heart disease and diabetes using AI

Computer Vision and Image Processing

Automated image and video recognition
Medical and industrial image processing
Object tracking and motion analysis

Natural Language Processing

Large Language Models (LLMs)
Discourse analysis and hate speech detection
Real-time machine translation and sentiment analysis

Cybersecurity and Artificial Intelligence

Malware detection using machine learning
Protecting Internet of Things (IoT) infrastructures
Identity verification using digital fingerprints

Smart Agriculture and Agriculture 4.0

Use of drones and AI for crop analysis
Predictive modeling for agricultural yield
Precision and data-driven farming

AI in Emergency Services and Civil Protection

Smart support systems during disasters
First responder behavior analysis
Smart communication and data analysis in the field

6- Knowledge Enhancement Training Program:

Activities	Semester 1	Semester 2
Specialization reinforcement courses related to the Doctoral training	**Course title and number of hours**	**Course title and number of hours**
	Neural Networks / 26H	Advanced Deep Learning / 26H
	Data Visualisation / 26H	Advanced Natural Language Processing / 26H
	Networks - Fundamentals / 26H	Distributed systems / 26H
	Bioinformatics / 26H	
Seminars	(02) **Doctoral Workshop on Artificial Intelligence:** models, techniques, and ethics	(02) **Doctoral Workshop on Healthcare**: Challenges and Strategies
	(02) **Doctoral Workshop on Cybersecurity**: issues, techniques and strategies	(02) **Agriculture 4.0**: AI in Agriculture

Material Resources Provided:

The Faculty of Sciences at the University of Médéa has substantial means and infrastructures to create a favorable environment for doctoral research and training in computer science. These infrastructures and personal workspaces are as follows:

I)- General Infrastructures :

- 48 classrooms and tutorial rooms
- 07 practical work rooms
- 05 lecture halls
- 43 offices equipped with high-speed Internet for teachers and PhD students
- A library with a wide range of documentary resources in computer science
- A seminar and conference room
- Two Internet rooms
- A computing center equipped with an HPC

All lecture halls and rooms are equipped with audiovisual equipment such as projectors and microphones, etc.

II)- Teaching Laboratories : The faculty also has 6 teaching laboratories, each accommodating up to 20 students. These laboratories are equipped with 157 desktop computers, distributed as follows :

- 144 HP computers (i3-i5), with the following specifications: Processor: 2.7 GHz, RAM: 4GB-8GB, Hard Drive: 500GB-1TB
- 13 Compaq-Pentium Core Duo computers, with the following specifications: Processor: 3 GHz, RAM: 2GB, Hard Drive: 320GB

III)- Research Laboratory : The faculty hosts a research laboratory named "Laboratory of Mathematics and its Applications" (LMA).

IV)- Additional Laboratory: The faculty also houses the Artificial Intelligence Laboratory (AI House).