



**Pole for Doctoral Studies**  
**Center for Doctoral Studies Sciences and Techniques and Medical Sciences**

## **ANNOUNCEMENT OF DOCTORAL THESIS DEFENSE**



**Ms. EL HABTI Fatima Ezzahraa**

**Will present their research work with the aim of earning a  
Doctorate**

**Doctoral program: Mathematics, Physics, and New Technologies**  
**Discipline: Computer Sciences**  
**Specialty: Intelligence Artificielle**

**On 10/07/2026 at 15H00 at the Thesis Defense Hall, Faculty of  
Sciences of Tetouan, UAE**  
**Under the Theme**

**Toward Smarter E-Learning Ecosystems: Data-Driven Prediction  
and Recommendation through Machine Learning and Cloud-  
Based Infrastructure**

**Front of the jury composed of :**

<b>First Name &amp; Last Name</b>	<b>Establishment</b>	<b>Designation</b>
Pr. AKNIN Noura	FS of Tetouan, UAE	President
Pr. ABTOY Anouar	ENSA of Tetouan, UAE	Reviewer
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Pr. BENAMEUR Lamia	FS of Tetouan, UAE	Reviewer
Pr. BOUZIDI Abdelhamid	ENSA of El Jadida, UCD	Examiner
Pr. AL-AMRANI Yassine	FP of Larache, UAE	Examiner
Pr. EL KADIRI Kamal Eddine	Independent Researcher	Expert
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## Abstract



The rapid growth of digital education has given rise to complex e-learning ecosystems designed to meet the evolving needs of today's learners. These ecosystems bring together multiple components—learners, educators, content providers, technological platforms, and institutional frameworks—to create environments where technology and data work in harmony to deliver, manage, and enhance learning experiences.

At the heart of this ecosystem is the learner, the primary consumer of educational content and services. Their success depends on the system's ability to adapt to individual behaviors, needs, and learning progress. A truly learner-centered e-learning ecosystem must therefore rely on intelligent tools capable of predicting outcomes, personalizing content, and scaling services to support diverse educational journeys.

This thesis contributes to that vision by applying machine learning techniques to enhance learning outcomes and provide personalized support in e-learning environments. The first part of the study focuses on predicting student performance using classification models such as Random Forest, Support Vector Machine, Logistic Regression, and Linear Discriminant Analysis. These models are trained on behavioral and academic data to forecast performance and identify students at risk of failure. Early predictions enable timely pedagogical interventions, allowing educators to tailor their support strategies and improve academic retention.

The second part of the thesis introduces a course recommendation system based on content similarity. By leveraging vectorization techniques and similarity measures, the system compares course features to suggest relevant learning opportunities aligned with the learner's interests and goals. This method enhances personalization and supports efficient navigation across large course catalogs, empowering students to make more informed learning decisions.

In addition to these machine learning applications, the thesis proposes a scalable cloud-based infrastructure model to support the integration and delivery of intelligent learning systems. The model outlines a multi-layered architecture that enables efficient data management, content services, and predictive analytics. It ensures interoperability, scalability, and responsiveness—critical attributes for modern digital education platforms. Together, these contributions support the advancement of adaptive, data-driven e-learning ecosystems. By focusing on student performance prediction, personalized course recommendation, and scalable infrastructure, this thesis aims to enhance learner engagement, improve academic outcomes, and strengthen institutional capacity to meet the evolving demands of digital education.

**Keywords:** E-learning Ecosystem, Student Performance Prediction, Machine Learning, Educational Data Mining, Random Forest, Learning Analytics, Predictive Modeling, Cloud-Based Learning.