جامعة عبد المالك السعدي
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Université Abdelmalek Essaadi

**Pole for Doctoral Studies**
**Center for Doctoral Studies Sciences, Technologies, and Medical Sciences**

# ANNOUNCEMENT OF DOCTORAL THESIS DEFENSE

**M. AOULALAY Ayoub**

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

**Doctoral program:** Mathematics, Physics, and New Technologies
**Discipline:** Computer Science
**Specialty:** Computer Science and Artificial Intelligence

**On 27/12/2025 at 10H00 at the Thesis Defense Hall, Faculty of Sciences of Tetouan, UAE**
**Under the Theme**

## Contribution to texture recognition based on computer vision approaches: application to the recognition of decorative patterns and varieties of Moroccan dates

**Front of the jury composed of:**

| First Name & Last Name | Establishment | Designation |
|---|---|---|
| Pr. EL HIBAOUI Abdelaaziz | FS of Tetouan, UAE | President |
| Pr. ABDOUN Otman | FS of Tetouan, UAE | Reviewer |
| Pr. AMJAD Souad | FS of Tetouan, UAE | Reviewer |
| Pr. EL AFIA Abdellatif | ENSIAS of Rabat, UM5 | Reviewer |
| Pr. BEN AHMED Mohamed | FST of Tangier, UAE | Examiner |
| Pr. BEN MAÂTI Mohamed Larbi | FS of Tetouan, UAE | Examiner |
| Pr. MASSAR Mohammed | FP of Khouribga, USMS | Co-Supervisor |
| Pr. EL MHOUTI Abderrahim | FS of Tetouan, UAE | Supervisor |

***Host Research Structure:*** Information Security Intelligent Systems and Applications (ISISA)

# Abstract

With technological progress accelerating, the preservation of cultural heritage has become increasingly urgent. Morocco, with its long history and unique geopolitical position, possesses a rich heritage that remains vulnerable to the pressures of globalization and industrialization. This research concentrates on two major domains: decorative arts and agricultural traditions, in particular date cultivation, both of which represent essential components of Moroccan cultural identity. Decorative arts embody diverse historical influences, reflected in architecture, ceramics, and carpets, while date cultivation plays a vital role in the Moroccan economy and cultural practices.

Artificial intelligence has recently emerged as a powerful tool for cultural heritage applications, and this work explores its potential for Moroccan contexts. The research aims to design innovative computer vision methods for decorative pattern recognition and fine-grained classification of date fruit varieties, with a strong focus on real-world usability through smartphones.

The proposed approaches combine convolutional neural networks with multi-scale processing, transfer learning, and handcrafted descriptors. For Islamic geometric styles, a new model named WallpaperNet integrates mid-level CNN representations with structural symmetry features, addressing data scarcity. For date fruits, images collected under uncontrolled conditions were analyzed through handcrafted descriptors and fine-tuned CNNs.

The results are significant: 95% classification accuracy for decorative patterns, 69% for geometric style recognition compared to 36% for structural methods, and 98.9% for date fruit recognition. These contributions highlight the potential of AI in reinforcing cultural heritage preservation and agricultural sustainability. They also open the way to practical tools enabling the identification of Moroccan heritage elements on everyday devices, thereby fostering awareness, supporting tourism, and limiting fraud in agricultural labelling.

**Keywords**: *Cultural heritage, Moroccan decorative patterns, Islamic geometric patterns, WallpaperNet, texture recognition, computer vision, convolutional neural networks, date fruit classification.*