جامعة عبد المالك السعدي
Université Abdelmalek Essaadi

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

# ANNOUNCEMENT OF DOCTORAL THESIS DEFENSE

## M. ABIBOU Rachid

**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

**On 11/04/2026 at 11H00 at the Meeting Room of the Computer Science Department, Faculty of Sciences of Tetouan, UAE**
**Under the Theme**

## Blockchain Security For The Internet of Things

**Front of the jury composed of :**

| First Name & Last Name | Establishment | Designation |
|---|---|---|
| Pr. EL HIBAOUI Abdelaaziz | FS of Tetouan, UAE | President |
| Pr. OMARA Hicham | FP of Taza, USMBA | Reviewer |
| Pr. JELLOULI Ismail | EST of Kenitra, UIT | Reviewer |
| Pr. EL MHOUTI Abderrahim | FS of Tetouan, UAE | Reviewer |
| Pr. BEN MAÂTI Mohamed Larbi | FS of Tetouan, UAE | Examiner |
| Pr. SOURI Adnan | FS of Tetouan, UAE | Examiner |
| M. EL MOUNAOUI Monir | GT2S Comapany, Villeneuve-d'Ascq, France | Guest |
| Pr. MOTAHHIR Saad | ENSA of Fez, USMBA | Co-Supervisor |
| Pr. ZAZ Youssef | FS of Tetouan, UAE | Supervisor |

***Host Research Structure:*** Emerging Computer Technologies (ECT)

# Abstract

This research focuses on the integration of two major technologies, artificial intelligence(AI) and blockchain, unlocking the potential of whose combined capabilities hold significant transformative promise in various fields. Our literature review studies, based on the analysis of several integration approaches in different application sectors, revealed significant gaps that hinder a more coherent and efficient exploitation of these technologies together. In particular, few studies propose a unified architecture that integrates real-time AI models with decentralized blockchain architectures in critical operational environments. To address these limitations, this thesis proposes a modular layering integration approach applied to the context of vehicle inspection centers in Morocco, a sector where reliability, transparency, and process automation remained major challenges. Firstly, we developed an AI system based on computer vision techniques for vehicle detection and automatic license plate recognition. Given that the AI component, combined with IoT devices forms an extensible cognitive layer of the platform, enabling standardized and autonomous data acquisition. We then designed and deployed a blockchain architecture based on Ethereum, including a set of smart contracts dedicated to orchestrating operational workflows within vehicle inspection centers, assisted by AI, and enabling interaction with end users through interfaces. Additionally, we implemented a federated learning-based classification framework as a proof of scalability, interoperability, and robustness of the architecture. It should be noted that this decentralized model was evaluated using a public online dataset and by adopting performance metrics dedicated to decentralized machine learning, due to the unavailability of standardized operational data from inspection systems at the national level.

As a result, this architecture ensures the integrity, immutability, and traceability of information throughout the inspection process. Consequently, the integration of these two technological layers resulted in a hybrid AI and Blockchain platform capable not only of automating the collection of technical data and reducing errors and tampering risks, but also of enhancing operational transparency and strengthening trust among stakeholders. Implementation results confirmed the technical feasibility of this integration and paved the way for future system versions and applications in other domains. To conclude, this contribution addresses a range of gaps identified in the literature by providing a complete, reproducible, and extensible model for the operational integration of AI and blockchain in a critical sector, while offering perspectives for evolution toward an intelligent and auditable automotive inspection infrastructure.

**Keywords** : Artificial Intelligence (AI), Blockchain, Smart Contracts, Internet of Things (IoT), Vehicle Inspection, Federated Learning, Data Integrity, Traceability, Process Automation.