



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

## **ANNOUNCEMENT OF DOCTORAL THESIS DEFENSE**



**Ms. AMRI Soumaya**

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

**Doctoral program: Engineering Sciences (IS)**  
**Discipline: Computer Science**  
**Specialty: Computer Science**

**On 06/06/2026 at 10H00 at the Meetings Hall, National School of  
Applied Sciences of Tetouan, UAE**

**Under the Theme**

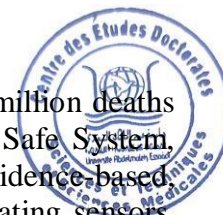
**Artificial Intelligence Based Approaches for Road Safety Development**

**Front of the jury composed of :**

<b>First Name &amp; Last Name</b>	<b>Establishment</b>	<b>Designation</b>
<b>Pr. CHERKAOUI Mohammad</b>	<b>ENSA of Tetouan, UAE</b>	<b>President</b>
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*Host Research Structure: NTTI ( New Technology Trends for Innovation)*

## Abstract



Road safety remains a persistent global challenge, causing nearly 1.19 million deaths annually and significant societal costs. Ambitious initiatives such as the UN Safe System, Vision Zero, and the Global Plan for Road Safety underscore the need for evidence-based, data-driven strategies. Advances in Intelligent Transportation Systems—integrating sensors, connectivity, AI, and machine learning—are transforming safety management from reactive crash mitigation to proactive, system-wide risk prevention.

This dissertation advances the field through four primary contributions. First, we propose a conceptual framework for an Intelligent and Safe Transportation System (ISTS) aimed at improving road user safety through AI and IoT integration. The ISTS consists of two components. The first is the Intelligent Secure Transport Management System (ISTMS), which combines a historical risk assessment layer with a real-time monitoring layer to dynamically compute safety metrics. The second component is the Safest Route Recommendation System (SRRS), which generates personalized route suggestions prioritizing safety based on user profiles and contextual data.

Second, we enhance injury severity prediction through a systematic evaluation of machine learning models applied to large, heterogeneous, and imbalanced crash datasets. Our approach addresses challenges in data preprocessing, feature engineering, and class imbalance mitigation, ultimately identifying the most suitable algorithms for accurately predicting severe injury outcomes.

Third, we focus on bus passenger safety through the development of a multi-layer, position-aware predictive framework. This approach evaluates and compares machine learning models specifically for bus crashes, implements feature selection to isolate critical determinants of injury severity, and investigates seating position patterns to uncover location-specific vulnerabilities, thus enabling targeted countermeasures for high-risk passenger groups.

Finally, we introduce a novel multitasking feature selection framework to robustly identify factors influencing severe injuries. This framework employs a Grey Wolf Optimizer with a classification-oriented fitness function and a knowledge transfer mechanism that prevents premature convergence by dynamically generating new candidate solutions. The predictive power of the selected features is then validated using the CatBoost algorithm, ensuring that the framework delivers high accuracy while addressing the computational challenges posed by high-dimensional accident data.

Collectively, these contributions provide a comprehensive framework for advancing road safety through predictive modeling, position-aware risk assessment, and intelligent transport system design. The findings offer actionable insights for policymakers, transport operators, and urban planners, supporting evidence-based decision-making to reduce injury severity and enhance passenger protection. By bridging the gap between data-driven research and policy implementation, this dissertation contributes to the development of safer, smarter, and more resilient mobility systems.

**Keywords :** Road Safety, Artificial intelligence, Machine learning, Feature selection, Intelligent Transport Systems, Road Traffic Accident, Injury severity, Predictive Systems, Recommendation Systems.