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. AHNOUCH Mohammed

Will present here research work with the aim of earning a Doctorate

Doctoral program: Engineering Sciences and Techniques
Discipline: Computer Science
Specialty: Computer Science and Artificial Intelligence

On 25/10/202 at 10H00 at the Conference Hall, F Building, Faculty of Sciences and Techniques of Tangier, UAE
Under the Theme

Deep Learning Under Constraints and Dynamic Systems : Applications to Pricing, Risk Management, and MLOps architectures

Front of the jury composed of :

First Name & Last Name	Establishment	Designation
Pr. BOUHORMA Mohammed	FST of Tangier, UAE	President
Pr. HADDOUCH Khalid	ENSA of Fez, USMBA	Reviewer
Pr. FENNAN Abdelhadi	FST of Tangier, UAE	Reviewer
Pr. EN-NAIMI El Mokhtar	FST of Tangier, UAE	Reviewer
Pr. ZOUHAIR Abdelhamid	FST of Tangier, UAE	Examiner
Pr. GIBET TANI Hicham	FP of Larache, UAE	Examiner
Pr. ELAACHAK Lotfi	FST of Tangier, UAE	Co-Adviser
Pr. GHADI Abderrahim	FST of Tangier, UAE	Supervisor

Host Research Structure: C3S, FSTT. Tanger Maroc

Abstract

This thesis lies at the intersection of quantitative finance, artificial intelligence, and information systems architecture. It focuses on two main areas. The first area is devoted to improving price estimates and risk thresholds. The first study involves developing a framework that combines Wasserstein generative adversarial networks (WGANs) and constrained Schrödinger bridges for market risk estimation. This approach rigorously integrates fundamental financial constraints, such as martingale properties, resulting in a significant improvement in the estimation of Value-at-Risk (VaR) and Expected Shortfall (ES), particularly in periods of high volatility. In the second chapter, we also introduce a new calculation method for optimizing large portfolios, which considerably reduces the complexity of solving dynamic programming equations using Lie theory while ensuring strict compliance with financial constraints

The second focus area concerns systemic technological transformation. We propose two architectural frameworks, based on our research, to optimize DevOps and MLOps practices within financial institutions. These architectures provide operational models for reconciling agile development with strict regulatory requirements (e.g., Basel III, SR 11-7), data aggregation, and model governance. Finally, we develop a framework based on linear-quadratic mean-field game theory (LQ-MFG) to coordinate the large-scale deployment of AI models. This approach offers a transparent and digitally traceable solution that transforms the definition of performance objectives from a heuristic exercise into a rigorous mathematical modeling problem.

In short, all of this work contributes to the advent of a new generation of digital finance ecosystems: systems that are intelligent, robust, and compliant.

Keywords : Quantitative finance, Artificial intelligence, Risk management, MLOps, Model governance.