M2 Research Internship – Master (M2) 2025

Laboratory:	LIS (UMR 7020)
Subject Title:	Robust Guaranteed Control of AI-Assisted Anesthesia
Supervisors:	Moussa Labbadi (Associate Professor). Christophe Roman (Associate Professor).
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Context and Objectives

The integration of artificial intelligence (AI) with classical control methods in anesthesia management has made significant strides, especially in addressing inter- and intra-patient variability in the effects of anesthetic agents such as Propofol and Remifentanil. While traditional pharmacokinetic (PK) and pharmacodynamic (PD) models are valuable tools, they face notable limitations in real-world clinical settings, including uncertainties, patient-specific variability, and the need for robust identification techniques. These challenges underscore the necessity of exploring innovative, AI-driven control strategies.

This internship project identifies the critical challenges in anesthesia management and proposes solutions leveraging AI. Specifically, it focuses on the integration of **Sliding Mode Control (SMC)** to enhance robustness and ensure fast convergence in conjunction with AI methods. The project aims to address the following fundamental question:

How can the stability and safety of this coupling of methods be mathematically guaranteed?

Envisaged Activities

1. Literature review of the related works.
2. Develop a method to guarantee learning-based control (Machine Learning with SMC).
3. Implement and validate the proposed algorithm in simulation using real data.

Candidate Profile

- Strong background in Control Theory, Computer Science, Mathematics, or closely related fields.
- Solid programming skills in Matlab, C++, or Python.

Application: Please send your full application materials, including:

- A complete CV.
- Academic transcripts.
- A motivation letter.