

# PhD Defense

Wednesday, 27 November 2024 at 14:00 in A042

[lcis.grenoble-inp.fr](http://lcis.grenoble-inp.fr)



**Duc Tri VO** will defend his thesis titled

**Advanced control of separation processes: interactive and iterative coupling between online analysis and control systems**

in front of the jury members

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**Abstract:** Liquid-liquid extraction operations conducted in the PUREX process at the La Hague reprocessing plant must meet strict requirements. A high degree of performance is desired with respect to product purity and their recovery rate. However, controlling this process is challenging due to its nonlinear, high-dimensional, stiff, and sensitive dynamics, along with safety constraints and uncertainties. The primary goal of this thesis is to develop and experimentally validate control methods for the uranium extraction-scrubbing operation within the PUREX process. Specifically, the thesis introduces a hierarchical control architecture and investigates various control schemes, including Model Predictive Control (MPC), Moving Horizon Estimation (MHE), and implementations using Orthogonal Collocation, which represents the analytical approach, Particle Swarm Optimization (PSO), which represents the population-based approach, and Artificial Neural Networks (ANNs), which represent the model reduction approach. A Gain-scheduled PID controller is also explored as a low-cost alternative.

**Keywords:** Separation processes, Liquid-liquid extraction, Model Predictive Control (MPC), Moving Horizon Estimation (MHE).