PhD Opportunity – Data-Driven Modeling and Control of Nonlinear Industrial Processes

Lab and company

Location: Michelin (Clermont-Ferrand) & LIAS Laboratory, University of Poitiers, France
Duration: 3 years (Fully funded)
Supervision: Joint industrial and academic supervision

Project Summary

To maintain its leadership in the increasingly competitive tire industry, Michelin is committed to developing products that achieve the best possible performance trade-offs. A key lever to meet this challenge lies in the optimal control of manufacturing processes, while also reducing the environmental impact of Michelin products through more efficient use of raw materials and energy.

This doctoral project aims to design innovative data-driven modeling and control strategies for complex tire manufacturing processes. These processes often involve nonlinear dynamics and are traditionally modeled using partial differential equations with delays, which are computationally intensive and unsuitable for real-time control.

Recent studies on calendering (a key manufacturing step) have highlighted the limitations of classical white-box models and the need for alternative approaches that blend physical insight with data-based learning.

The proposed research will focus on:

1. Developing data-driven models (grey or black-box) that capture the essential dynamics of industrial processes governed by complex physical laws.
2. Designing and validating optimal and robust control laws, minimizing time and energy consumption while coping with modeling uncertainties and noisy industrial sensor data.
3. Validating the proposed models and control strategies using high-fidelity finite element simulators and, eventually, on real industrial test benches at Michelin.

Candidate requirements

Applicants should have a MsC degree from a good-quality university. They should possess a strong background and interest in mathematics and, ideally, in estimation theory, system identification, and advanced control. They should have excellent analytical and problem solving skills and, preferably, well-developed programming skills. Applicants should have a good knowledge of Matlab and Python. A good knowledge in mechanics and physics is also expected. The candidate should have excellent oral and written communication skills in English.

Application procedure

To apply for this Ph.D. position, send email to guillaume.mercere@univ-poitiers.fr and teddy.virin@michelin.com with subject "Data-Driven Modeling and Control of Nonlinear Industrial Processes", attaching an academic CV, a cover letter, a pdf of your diplomas and transcript of course work and grades, a certificate of proficiency in English, and any other document deemed necessary by the candidate which can enrich the application.