

# PFE/Master Internship

## Uncertain Model Order Reduction

Institut de Recherche en Informatique, Mathématiques, Automatique et Signal (IRIMAS), EA 7499  
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### General Information

**Profile:** 2<sup>nd</sup> year Master or 3<sup>rd</sup> year Engineer student in Control Theory

**Period:** February 2024 – for 6 months

**Gratification:** ~ 567 €/month (4,05 €/hour)

**Team:** Modélisation et Identification en Automatique et Mécanique (MIAM)

**Application deadline:** 21th January 2024

### Context

The modelling of physical processes or mechatronic systems can lead to high order mathematical models including numerous uncertain parameters. Such models are generally hardly tractable for real-time applications. It appears a trade-off between the model accuracy and the computational constraints.

Therefore, it is desirable to approximate such systems by reduced-order models obtained through a Model Order Reduction (MOR) [1].

Several technics can be used to take into account parametric uncertainties. Among the best known, we can cite the polytopic approach and fractional linear representations [2].

### Objectives

After having reviewed the main order reduction methods on the one hand and having reviewed the main methods to take into account uncertainties on the other hand, the aim of this project is to perform model order reduction of uncertain models.

**Keywords:** Order reduction, Robust control,  $\mathcal{H}_\infty$ -norm, Linear Fractional Transformation.

### Required skills

Control theory (state space, stability, optimisation . . . ), linear algebra, Matlab/simulink programming.

### Contacts

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### References

- [1] A. C. Antoulas, *Approximation of large-scale dynamical systems*. Cambridge University Press, 2005.
- [2] M. Green and D. J. N. Limebeer, *Linear robust control*. Prentice Hall, 2004.