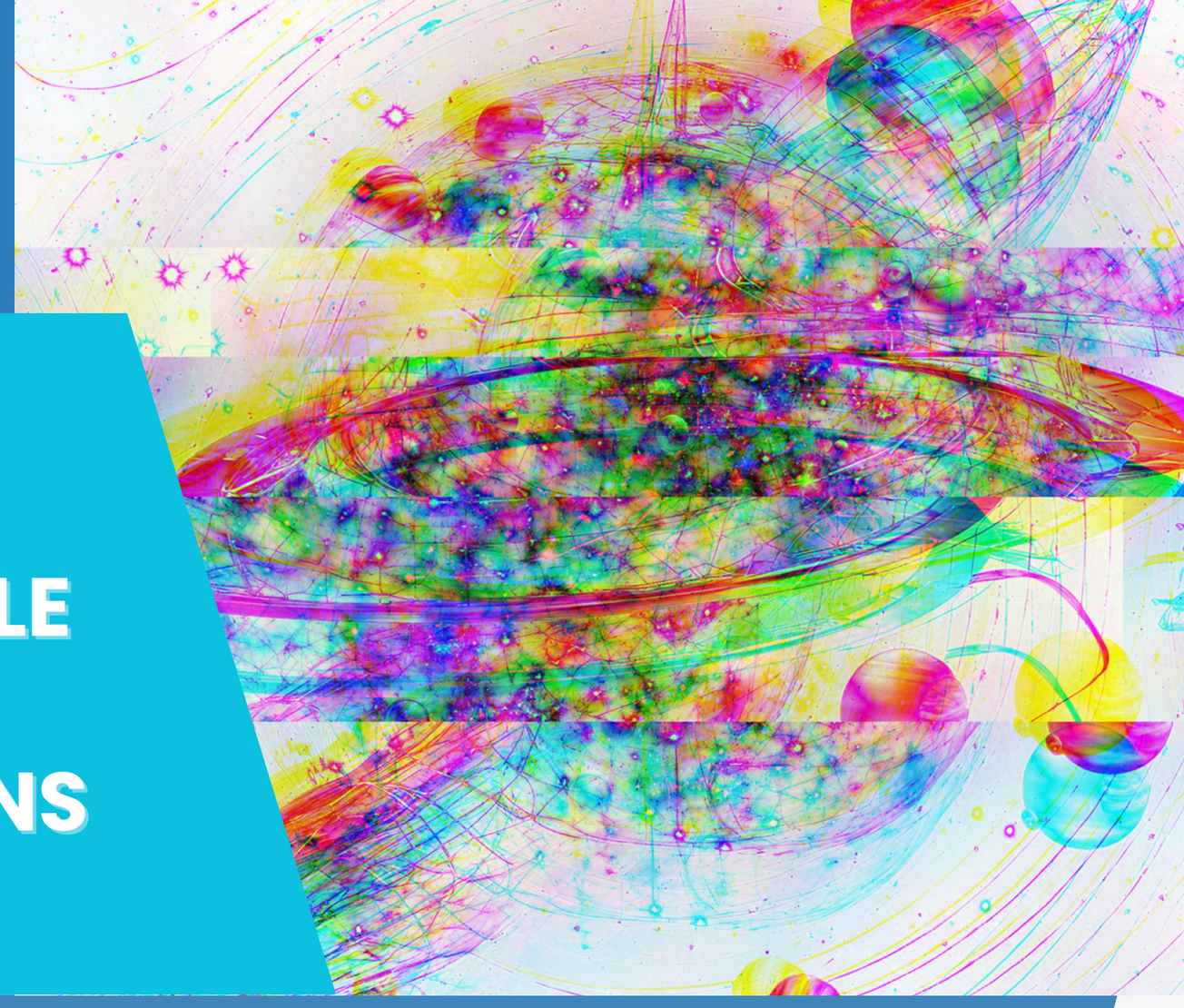
Politecnico di Torino

DIMEAS SEMINAR

MULTI-BODY MODELLING AND CONTROL OF FLEXIBLE STRUCTURES FOR FINE POINTING SPACE MISSIONS



SPEAKER

Francesco Sanfedino

ISAE-SUPAERO

ABSTRACT

With the development of the next generation Earth observation and science Space missions, there is an increasing trend towards highly performing payloads. This trend is leading to increased detector resolution and sensitivity, as well as longer integration time which directly drive pointing requirements to higher stability and lower line-of-sight (LOS) jitter. Such instruments typically come with stringent pointing requirements and constraints on attitude and rate stability over an extended frequency range well beyond the attitude control system (ACS) bandwidth, by entailing micro-vibration mitigation down to the arcsecond (arcsec) level or less. In order to guarantee high pointing performance, it is necessary to entirely characterize the transmission path between the micro-vibration source and the payload. The earlier the model is available, the easier it is to meet the stringent pointing requirements, by designing appropriate control strategies.

In this talk I will present a multi-body approach developed in ISAE for modelling a flexible spacecraft and designing robust control solutions by coping with all design uncertainties. Several applications of this method to real scenarios, like mitigation of micro-vibrations in space telescopes and in-orbit estimation of vibration sources, will be outlined in this talk.

Short bio

Francesco Sanfedino received a double degree in Aerospace Engineering from Politecnico di Torino and the Institut Supérieur de l'Aéronautique et de l'Espace (ISAE-SUPAERO) in 2015. The same year he obtained a Research Master degree in automatic control and signal and image processing from the École Normale Supérieure de Cachan.

He obtained his Ph.D. degree in automatic control in 2019. His thesis, entitled "Experimental Validation of High Accuracy Pointing System", was a collaboration among the European Space Agency (ESA), ISAE-SUPAERO and Airbus DS in the frame of a Networking/Partnering Initiative (NPI).

From 2019 he is Associate Professor in Dynamics and Control of Space Systems in ISAE-SUPAERO. His research areas include: multibody dynamics, flexible structures, robust control and analysis, micro-vibration control, line-of-sight stabilization, system identification and Space systems.

Friday 28 March 2025, 10.00 am

Meeting room, III floor, DIMEAS Politecnico di Torino