

# Adrien Mélot

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Research interests

Nonlinear Dynamics – Numerical analysis – Rotordynamics

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Education

**Ecole Centrale de Lyon** Lyon, France  
PhD in Nonlinear Dynamics April 2019 – May 2022

**CentraleSupélec** Paris, France  
MSc in Computational Mechanics Sept. 2017 – Oct. 2018

**ISAE-Supméca – Institut Supérieur de Mécanique de Paris** Paris, France  
"Diplôme d'ingénieur" – MSc in Mechanical Eng. Sept. 2015 – Oct. 2018

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Research experience

**Optimization of nonlinear mechanical systems with bifurcating behaviour**

Statistical Inference for Structural Health Monitoring Team Inria Rennes  
Academic Visitor in the Dynamics group Imperial College London  
Supervisors: Dr E. Denimal - Dr L. Renson Dec. 2022 – Present  
Responsible for the development of a mathematical and computational framework to optimize the bifurcation structure of nonlinear mechanical systems.  
**Keywords:** Bifurcation Analysis, Optimization, Reduced-Order Modelling, Global and Local Nonlinearities

**Computational nonlinear dynamics of large-scale geared systems**

Laboratoire de Tribologie et Dynamique des Systèmes Ecole Centrale Lyon  
Supervisors: Dr E. Rigaud - Dr J. Perret-Liaudet Apr. 2019 – Sept. 2022  
Responsible for the development and implementation of computational methods to carry out nonlinear dynamic analyses of large-scale geared systems subjected to multi-harmonic excitations.  
**Keywords:** Nonlinear Gear Dynamics, Harmonic Balance Method, Bifurcation Analysis, Contact Modelling, Reduced-Order Modelling

**Modal analysis of rotating structures with digital image correlation**

Vibration University Technology Centre Imperial College London  
Supervisor: Dr C. W. Schwingshackl Aug. 2016 – Feb. 2017  
Responsible for the development of a new contactless technique to carry out modal analysis on rotating structures. The proposed methodology was used to study the effect of Coriolis forces on the dynamics of a bladed disk. Findings were in good agreement with strain gauges results and numerical simulations.  
**Keywords:** Bladed Disks, Digital Image Correlation, Modal Analysis

Student supervision	<b>Internship supervisor, LTDS (Ecole Centrale Lyon)</b> Nonlinear modal analysis of gear transmissions	Summer 2021
	<b>Project supervisor, LTDS (Ecole Centrale Lyon)</b> Sound synthesis of gear rattle noise (two students)	Spring 2021
Teaching experience	<b>Teaching assistant, INSA Rennes</b> Strength of materials (28h) Teach students key mechanical properties of materials, stress-strain relationship, static behaviour of beams under axial and transverse loads	Spring 2023
	<b>Teaching assistant, Ecole Centrale Lyon</b> Introduction to nonlinear vibrations (2h) Teach students key concepts in nonlinear dynamics (Stability, bifurcations, Poincaré sections)	Fall 2020
	<b>Teaching assistant, Ecole Centrale Lyon</b> Numerical modelling (30h) Teach students basic knowledge of CAD and Finite Element Analysis, application to the design of flywheels	2019-2020
Industry experience	<b>Safran Aircraft Engines</b> Fan and LP compressor R&D dept. Internship Modelling and analysis of a 3D multi-shaft bladed rotor with planetary gearbox <b>Keywords:</b> Rotordynamics, Bladed Disks, Geared Rotor, Multistage Cyclic Symmetry	Paris, France Apr. 2018 – Oct. 2018
Skills	<b>Programming</b> Proficient in: Matlab, Julia. Familiar with: C, Python.	
	<b>Finite element analysis/Computer-aided design</b> Proficient in: ANSYS, Catia. Familiar with: Abaqus, SAMCEF, SimScale, Onshape.	
	<b>Languages</b> French (fluent), English (fluent)	
Publications	<u>A. Mélot</u> , E. Denimal, L. Renson. <b>Harmonic balance-based multi-parametric optimization of bifurcation structures.</b> <i>Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences</i> , Preprint.	

A. Mélot, E. Rigaud, J. Perret-Liaudet. **Robust design of vibro-impacting geared systems with uncertain tooth profile modifications via bifurcation tracking.** *International Journal of Non-Linear Mechanics*, 149 :104336, 2023.

A. Mélot, J. Perret-Liaudet, E. Rigaud. **Vibro-impact dynamics of large-scale geared systems.** *Nonlinear Dynamics* (111), 4959-4976, 2023.

A. Mélot, E. Rigaud, J. Perret-Liaudet. **Bifurcation tracking of geared systems with parameter-dependent internal excitation.** *Nonlinear Dynamics* (107), 413-431, 2022.

A. Mélot, Y. Benaïcha, E. Rigaud, J. Perret-Liaudet, F. Thouverez. **Effect of gear topology discontinuities on the nonlinear dynamic response of a multi-degree-of-freedom gear train.** *Journal of Sound and Vibration*, 516 :116495, 2022.

Y. Benaïcha, A. Mélot, E. Rigaud, J-D. Beley, F. Thouverez, J. Perret-Liaudet. **A decomposition method for the fast computation of the transmission error of gears with holes.** *Journal of Sound and Vibration*, 532 :116927, 2022.

H. André, Q. Leclère, D. Anastasio, Y. Benaïcha, K. Billon, M. Birem, F. Bonnardot, Z.Y. Chin, F. Combet, P.J. Daems, A.P. Daga, R. De Geest, B. Elyousfi, J. Griffaton, K. Gryllias, Y. Hawwari, J. Helsen, F. Lacaz, L. Laroche, X. Li, C. Liu, A. Mauricio, A. Mélot, A. Ompusunggu, G. Paillot, S. Passos, C. Peeters, M. Perez, J. QI, E.F. Sierra-Alonso, W.A. Smith, X. Thomas. **Using a smart-phone camera to analyse rotating and vibrating systems: Feedback on the SURVISHNO 2019 contest.** *Mechanical Systems and Signal Processing*, 154 :107553, 2021.

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Communications at  
refereed conferences

A. Mélot, E. Denimal, L. Renson. **Parametric optimization of fold bifurcation points.** *3rd International Nonlinear Dynamics Conference*, Rome, Italy, 2023.

A. Mélot, Y. Benaïcha, E. Rigaud, J. Perret-Liaudet. **Influence of gear topology discontinuities on the nonlinear dynamic response of a gear train subjected to multiharmonic parametric excitation.** *10th European Non-linear Dynamics Conference*, Lyon, France, 2022.

A. Mélot, E. Rigaud, J. Perret-Liaudet. **Nonlinear parametric analysis of geared systems: a bifurcation tracking approach.** *11th European Solid Mechanics Conference*, Galway, Ireland, 2022.

A. Mélot, E. Rigaud, J. Perret-Liaudet. **Suivi de bifurcations pour l'analyse paramétrique des transmissions par engrenages.** *15ème Colloque National en Calcul des Structures*, Giens, France, 2022.

Talks and seminars	<b>Computational methods for bifurcation analysis and control</b>	Apr. 2023
	Invited seminar, Inria/CMAP, Ecole Polytechnique, Paris, France	
	<b>Nonlinear dynamics of gear transmissions</b>	Jun. 2021
	Invited seminar at a meeting of the industrial consortium CIRTRANS.	
	<b>Periodic solutions of vibro-impacting systems</b>	Dec. 2019
	LTDS seminar, Ecole Centrale Lyon, Lyon, France	
	<b>Modal analysis of rotating structures with DIC</b>	Apr. 2017
	Invited seminar, Quartz laboratory, ISAE-Supméca, Paris, France	
Responsibilities	Reviewer for Journal of Sound and Vibration	2022 – Present
	Reviewer for Nonlinear Dynamics	2022 – Present
	Reviewer for Applied Mathematical Modelling	2021 – Present
	Member-elect of the laboratory council	Apr. 2021 – Sept. 2022
Professional memberships	Member of International Society of Nonlinear Dynamics	2023 – Present
	Member of GDR EX-MODELI	2023 – Present
	Member of Computational Structural Mechanics Association	2022 – Present