Adrien Mélot

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DoB: 29/07/1995 **Nationality**: French **Email**: adrien.melot@inria.fr **Tel.**: +33687199952
Personal website Scholar profile ResearchGate profile ORCID profile

Research interests — Nonlinear Dynamics – Numerical analysis – Rotordynamics

Education

PhD in Nonlinear Dynamics — Apr. 2019 – May 2022
Ecole Centrale de Lyon — Lyon, France

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

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

Research experience

Starting Research Position - SRP for ERC — April 2024 – Present
Inference for Structures team — Inria Rennes
Competitive Postdoctoral Fellowship to prepare an ERC proposal

Optimization of nonlinear systems with bifurcating behaviour
Inference for Structures team — Inria Rennes
Academic Visitor in the Dynamics group — Imperial College London
Supervisors: Dr E. Denimal - Dr L. Renson — Dec. 2022 – March 2024
Responsible for the development of a mathematical and computational framework to optimize the bifurcation structure of nonlinear systems.
Keywords: Bifurcation Analysis, Optimization, Reduced-Order Modelling, Singularity theory

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

International Collaborations

Inria Associate Team, Integrating eigenspace and physical space information via PINN architecture: towards stochastic distance-based damage detection (PhyNet), team member, in collaboration between Inria, (France) and IIT Mandi (India)

Inria Exploratory Action, Optimization of nonlinear systems with bifurcating behaviour (NOBIF), team member, in collaboration between Inria (France) and Imperial College London (UK)

Student supervision

Manon Nolot – BSc student – Machine learning for Hopf bifurcation analysis, Inria Rennes, 2023

Ahmed Belhouari – MSc student – Nonlinear modal analysis of gear transmissions, Ecole Centrale Lyon, 2021

Lingyu Zhang – MSc student – Sound synthesis of gear rattle noise, Ecole Centrale Lyon, 2021

Teaching experience

Teaching assistant, INSA Rennes Spring 2023
Strength of materials (32h)
Teach students key mechanical properties of materials, stress-strain relationship, static behaviour of beams under axial and transverse loads

Teaching assistant, Ecole Centrale Lyon Fall 2020
Introduction to nonlinear vibrations (2h)
Teach students key concepts in nonlinear dynamics (Stability, bifurcations, Poincaré sections)

Teaching assistant, Ecole Centrale Lyon 2019-2020
Numerical modelling (30h)
Teach students basic knowledge of CAD and Finite Element Analysis, application to the design of flywheels

Industry experience

Safran Aircraft Engines Fan and LP compressor R&D dept. Paris, France
Internship Apr. 2018 – Oct. 2018
Modelling and analysis of a 3D multi-shaft bladed rotor with planetary gearbox
Keywords: Rotordynamics, Bladed Disks, Geared Rotor, Multistage Cyclic Symmetry

Skills

Programming
Proficient in: Julia, Matlab.
Familiar with: C, Python.

Finite element analysis/Computer-aided design
Proficient in: ANSYS, Catia.
Familiar with: Abaqus, SAMCEF, SimScale, Onshape.

Languages
French (fluent), English (fluent)

Publications

8. A. Mélot, E. Denimal Goy, L. Renson. **Control of isolated response curves through optimization of codimension-1 singularities**. Computers & Structures, 299 :107394, 2024.
7. A. Mélot, E. Denimal, L. Renson. **Multi-parametric optimization for controlling bifurcation structures**. *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences, 480:20230505.*
6. 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.
5. A. Mélot, J. Perret-Liaudet, E. Rigaud. **Vibro-impact dynamics of large-scale geared systems**. *Nonlinear Dynamics* (111), 4959-4976, 2023.
4. A. Mélot, E. Rigaud, J. Perret-Liaudet. **Bifurcation tracking of geared systems with parameter-dependent internal excitation**. *Nonlinear Dynamics* (107), 413-431, 2022.
3. 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.
2. 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.
1. 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 smartphone camera to analyse rotating and vibrating systems: Feedback on the SURVISHNO 2019 contest**. *Mechanical Systems and Signal Processing*, 154 :107553, 2021.

Communications at refereed conferences

11. A. Mélot, E. Denimal Goy, L. Renson. **Structural optimization for controlling isolated response curves**. *11th European Nonlinear Dynamics Conference*, Delft, Netherlands, 2024.

10. A. Mélot, E. Denimal Goy, L. Renson. **Nonlinear system identification with control-based continuation of bifurcation curves**. *11th European Nonlinear Dynamics Conference*, Delft, Netherlands, 2024.

9. A. Mélot, E. Rigaud, J. Perret-Liaudet. **Robust gear design with respect to the primary resonance induced by backlash nonlinearity**. *11th European Nonlinear Dynamics Conference*, Delft, Netherlands, 2024.

8. V. Mahé, A. Mélot, B. Chouvion, C. Droz. **Computing the dynamic response of a periodic structure coupled with a nonlinear junction using the harmonic balance method and Floquet-Bloch modelling**. *53rd International Congress & Exposition on Noise Control Engineering*, Nantes, France, 2024.

7. A. Mélot, E. Denimal Goy, L. Renson. **On the use of bifurcation curves for system identification and model updating purposes**. *9th European Congress on Computational Methods in Applied Sciences and Engineering*, Lisbon, Portugal, 2024.

6. A. Mélot, E. Denimal Goy, L. Renson. **Contrôle de courbes de réponses isolées par optimisation structurelle**. *16ème Colloque National en Calcul des Structures*, Giens, France, 2024.

5. A. Mélot, E. Rigaud, J. Perret-Liaudet. **Conception robuste d'engrenages droits au regard de la résonance non linéaire principale à l'aide de suivi de bifurcation**. *16ème Colloque National en Calcul des Structures*, Giens, France, 2024.

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

3. 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 Nonlinear Dynamics Conference*, Lyon, France, 2022.

2. 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.

1. 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

Optimisation structurelle pour le contrôle de bifurcations Nov. 2023
Talk at a workshop of GDR EX MODELI, Besançon, France

Perspectives on bifurcation analysis for structural design Nov. 2023
Invited seminar, D.SMART team, FEMTO-ST laboratory, Besançon, France

Computational methods for bifurcation analysis and control Apr. 2023

Invited seminar, Platon team, CMAP, Ecole Polytechnique, Paris, France

Nonlinear dynamics of gear transmissions Jun. 2021

Invited seminar at a meeting of the industrial consortium CIRTRANS.

Periodic solutions of vibro-impacting systems Dec. 2019

LTDS seminar, Ecole Centrale Lyon, Lyon, France

Modal analysis of rotating structures with DIC Apr. 2017

Invited seminar, Quartz laboratory, ISAE-Supméca, Paris, France

Editorial responsibilities

Reviewer for IFAC Conference on Modelling, Identification and Control of Nonlinear Systems	2024 – Present
Reviewer for Mechanical Systems and Signal Processing	2023 – Present
Reviewer for Journal of Sound and Vibration	2022 – Present
Reviewer for Nonlinear Dynamics	2022 – Present
Reviewer for Applied Mathematical Modelling	2021 – Present

Professional responsibilities

Chairman, Computational Nonlinear Dynamics session, *3rd International Nonlinear Dynamics Conference*, Rome, Italy, June 2023

Assistant chairman, *10th European Nonlinear Dynamics Conference*, Lyon, France, July 2022

Member-elect of the laboratory council, 2021 – 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